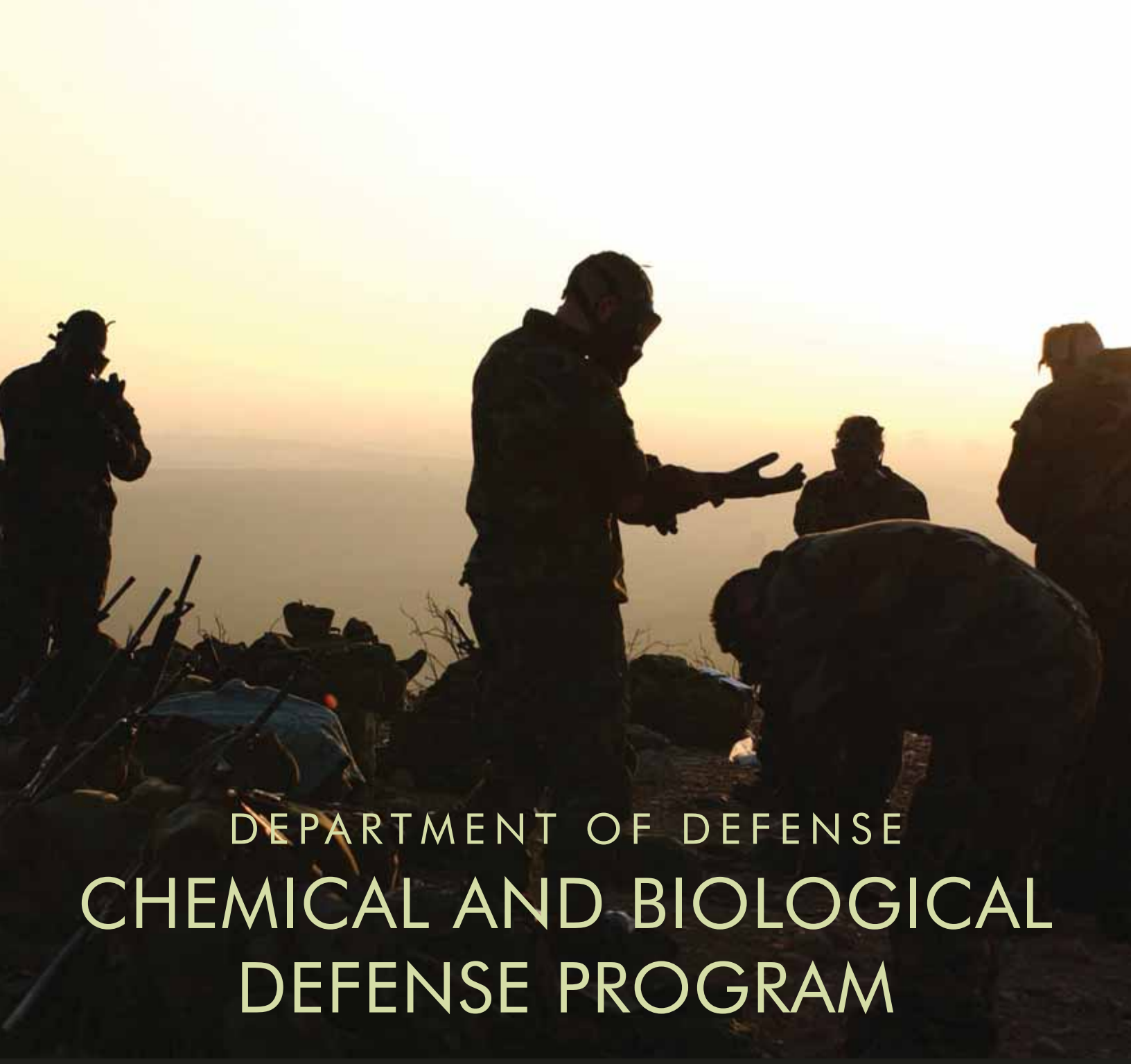


DEPARTMENT OF DEFENSE

CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM

ANNUAL REPORT TO CONGRESS

April 2007

This report was coordinated and prepared by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics and the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs in accordance with 50 USC 1523 and related requirements.

Copies of this report may be downloaded from the World Wide Web through the Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs Web Site at http://www.acq.osd.mil/cp under the reports section as an Adobe Acrobat (.pdf) file.

April 2007

It is our responsibility to provide our Warfighters the best capability and support in the world. America remains a nation at war. The Armed Forces of the United States are engaged in a global war on terrorism while simultaneously deterring further attacks on Americans here at home. In doing so, our military faces many challenges, but one in particular—the threat posed by weapons of mass destruction (WMD)—is among our greatest challenges.

The Department of Defense (DoD) is pursuing a comprehensive strategy to counter this threat. The purpose of this strategy is to build readiness for current and future challenges. The Chemical and Biological Defense Program (CBDP) is a critical component supporting both the national strategies and DoD strategies. The program exists to provide chemical and biological defense capabilities in support of the goals and objectives of our national military strategies, ensuring that the Department's operations are unconstrained by chemical or biological effects.

To effectively execute this program, the Department is depending upon continued congressional support in three priority areas:

- Stable funding for the Transformational Medical Technologies Initiative to fully exploit the advanced science and technology innovation necessary to successfully counter future genetically engineered biological weapons.
- Adequate long-term investment in the Research, Development, Test, and Evaluation (RDT&E) infrastructure to enhance our RDT&E capabilities, including the modernization and construction of laboratories and test facilities to ensure we develop advanced countermeasures against current and emerging chemical and biological threats.
- Consistent resources for the overall program itself to ensure that, year after year, we are able to field the improved defensive capabilities essential to ensure our military can operate in any environment, unconstrained by chemical or biological weapons.

With the support of the President, the Secretary of Defense, and Congress, we have developed and resourced an integrated CBDP to best serve the Nation, to build readiness for current and future challenges, and to sustain our armed forces in time of war.

To continue countering the existing and future threat from hostile WMD and to meet the critical operational needs of our military, the Department requires the full support of the resources requested in the program budget.

Kenneth J. Krieg
Under Secretary of Defense for
Acquisition, Technology and Logistics

PURPOSE OF THE REPORT

The Chemical and Biological Defense Program (CBDP) provides U.S. forces the best capability and support in the world. The CBDP is a key component of national and defense strategies aimed at defending the nation from the hostile use of weapons of mass destruction (WMD)—particularly chemical and biological (CB) weapons—against U.S. citizens, military forces, friends, and allies. The CBDP seeks to ensure that Department of Defense (DoD) operations are unconstrained by chemical and/or biological effects by providing CB defense capabilities to build readiness for current and future challenges. (see ***Figure 1.***)

The program depends on support in three priority areas:

(1) Stable funding for the Transformational Medical Technolgies Initiative (TMTI);

(2) Adequate long-term investment in the Research, Development, Test, and Evaluation (RDT&E) infrastructure, including laboratories and test facilities; and

(3) Consistent, predictable, and sustained resource levels for the CBDP.

This annual report of the Department of Defense Chemical and Biological Defense Program describes how the Department is executing the CBDP and provides the context for a management framework that seeks to identify and balance investment priorities against risks over time. The report provides detailed information and assessments regarding:

(1) the overall readiness of the armed forces to fight in a CB warfare environment, along with efforts undertaken and ongoing plans to improve such readiness; and

(2) the requirements for the CBDP, including requirements for training, detection, protective equipment, decontamination equipment, medical prophylaxis, and treatment of casualties resulting from the use of CB weapons.

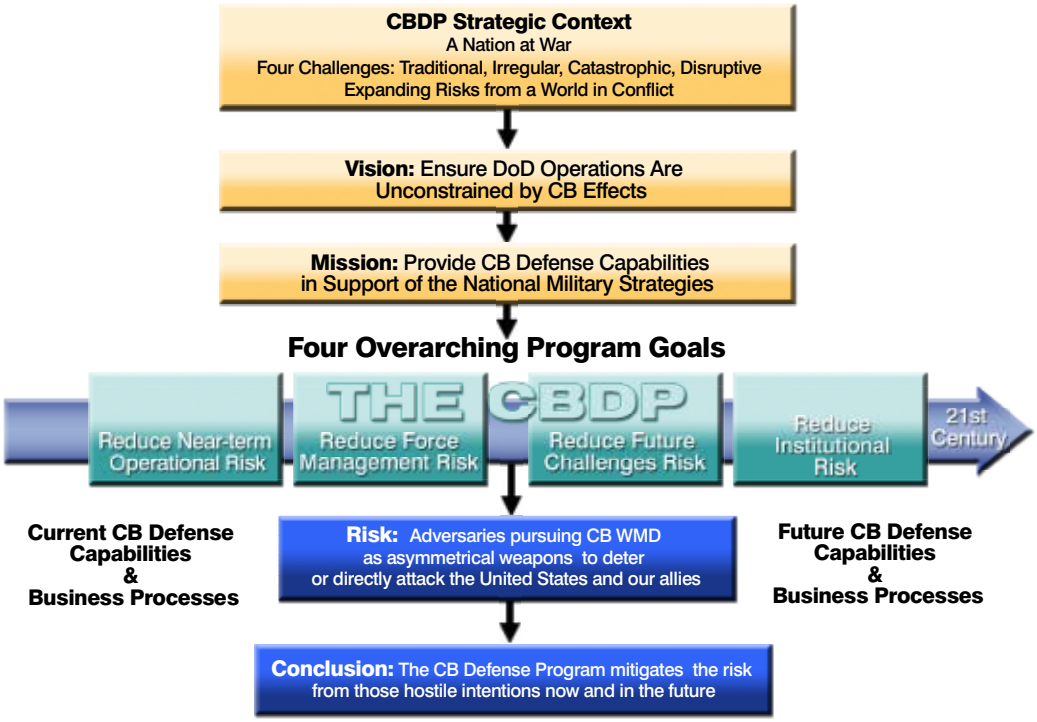


Figure 1. CBDP Strategic Context

STRATEGIC CONTEXT

STRATEGIC REALITY

We are a nation at war. For the foreseeable future, the CBDP anticipates expanding risks (see ***Figure 2***) from a world in conflict, fueled primarily by these global drivers:

- Increasing competition for limited resources, particularly in underdeveloped regions with rapidly growing populations that creates internal displacements, refugee flows and humanitarian emergencies.
- Expanding reach of often amorphous nonstate actors (terrorist organizations, criminal gangs, religious fanatics, ethnic groups, etc.), all increasingly operationalized by global communications and financial resources, and all actively seeking to exploit societies weakened by ineffective governance.
- Persistent obstruction from rogue states (Iran, North Korea, Cuba, and others) determined to exercise influence on the international stage by sowing physical chaos and political turmoil.

PREMISE

The United States possesses overwhelming military capabilities. In response, adversaries are pursuing chemical-biological-radiological-nuclear (CBRN) WMD as a comparatively cheap, easy-to- deploy, and disproportionately influential tool to deter U.S. power asymmetrically or to attack the United States directly. *With the support of the President, the Secretary of Defense, and the Congress, we have developed and resourced the CBDP, an integrated program to best serve the nation, to build readiness for current and future challenges, and to sustain U.S. forces in time of war.*

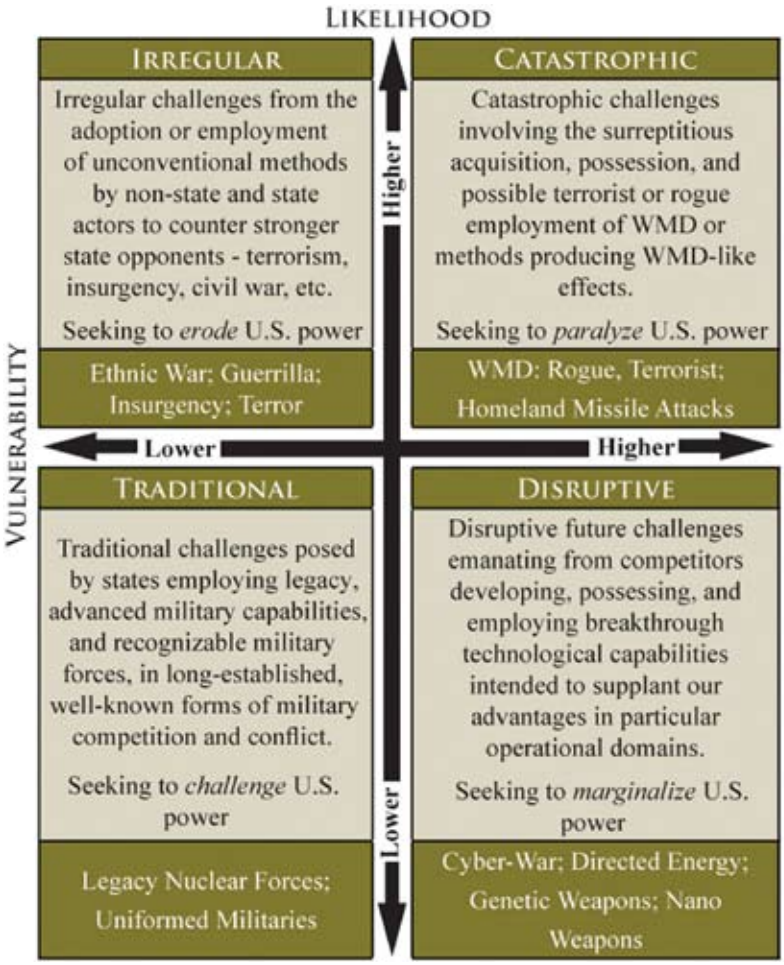


Figure 2. DoD Security Environment

ACTIVE PLAYERS

A wide spectrum of opposing and supporting actors directly affect the CBDP:

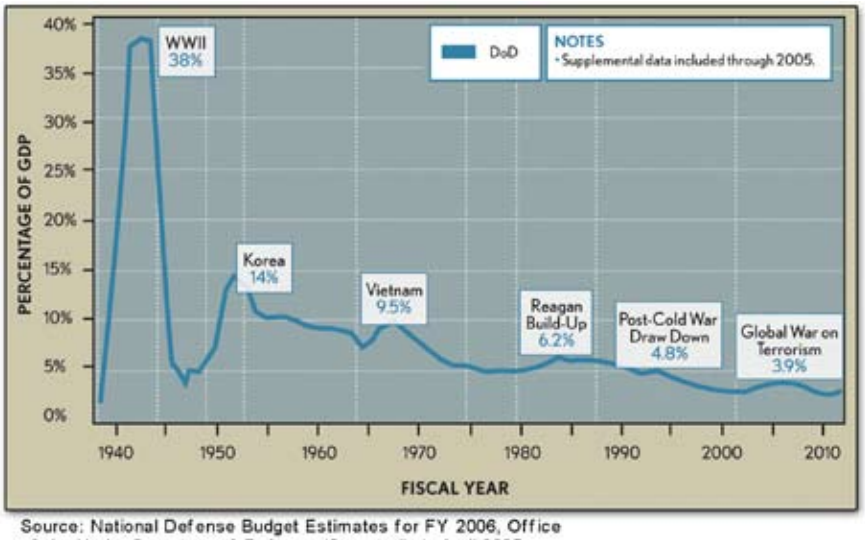
- **Antagonists.** Rogue states such as North Korea and Iran have WMD programs designed both as an asymmetrical counter to the U.S. and as a source of illicit revenue. Similarly, intelligence reporting consistently documents the interest of terrorist groups such as Al Qaeda in obtaining chemical, biological, and radiological materials in order to inflict disproportionate psychological and physical impact on the United States and our allies. Even nominally friendly states, such as India and Pakistan, seek the perceived prestige offered by WMD, notably nuclear weapons. While no single antagonist offers an insurmountable obstacle, in aggregate they constitute a daunting and ever-evolving problem set for the CBDP to manage.
- **Protagonists.** The United States and its Western partners, particularly North Atlantic Treaty Organization (NATO) countries, are essentially united in opposition to the further spread of WMD technology and resources, despite being in occasional disagreement about preferred tactics and strategy. International bodies, such as the United Nations (UN) and the European Union, are also generally sympathetic, if often not particularly operationally effective. Within the executive branch, there is comprehensive presidential and departmental leadership that provides detailed guidance and resources to pursue WMD defense in general and the CBDP in particular. DoD's Total Force approach to the CBRN defense mission creates synergy between Active and Reserve components. In sum, the CBDP has significant allies, but generating efficient unity of effort among them is a challenge.

PASSIVE CONSTRAINTS

Other less-obvious factors exert more indirect yet also significant influence:

- **International Complexity**. Treaties registered with the UN more than tripled between 1970 and 1997, and the number of international institutions increased by two-thirds from 1985 thru 1999. At the same time, those entities became more complex, more interrelated with often overlapping areas of responsibility, and more closely linked to transnational networks and private groups. The global scope of the CB threat necessitates effective multi-lateral cooperation to present an efficient, unified response to proliferation and use. However, the cited complexity of the world stage makes it difficult for the CBDP to maximize needed international policy integration, research and development (R&D), or financial burden-sharing, a situation which is exacerbated by opponents who exploit their membership in international organizations to actively undermine multilateral cooperation.
- **Different Perspectives.** Another constraint is created by the differing priorities and perspectives of various U.S. government branches and depart–ments, which may impede effective interagency cooperation and burden-sharing. For example, the military may emphasize preventive medicine in support of military operations, while civilian planners may focus on effective responses to terrorist attacks. As a result of these different perspectives, DoD emphasizes pretreatments and vaccines rather than therapeutics, and may have different information architectures to support military operations rather than civilian life.
- **Competing Fiscal Priorities.** Through 2025, the United States is forecast to maintain not only one of the highest population growth rates among developed countries ranging between 0.7 and 1.0 percent, but it also has an aging population, necessitating expanded long-term investment in nondefense health care, social services, and R&D. Within DoD, the requirement to provide pensions and medical care for millions of retirees is imposing similar financial demands. Further, DoD's need to simultaneously transform and recapitalize U.S. forces while prosecuting conventional operations in Iraq and Afghanistan and unconventional warfare against global terrorism also strains finite resources. The resultant national economic competition affects funding for the CBDP and potentially dilutes its long-term ability to promptly counter threats emerging from the accelerating explosion of global scientific competency and technological innovation.

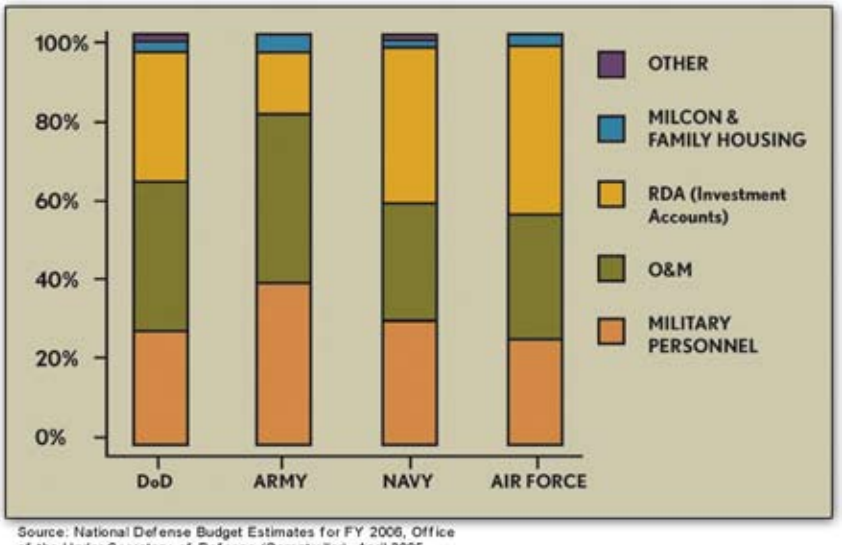
- *National Budget*. The Office of the Secretary of Defense, Comptroller, projects 2007 Defense spending will be 3.9 percent of Gross Domestic Product (GDP), continuing a downward trend. Defense resources have not kept pace with the growth in GDP. Between 1968 and 2005, GDP increased over 300 percent (from $3.7 to $11 trillion), while defense spending increased only 62 percent, (from $358 to $523 billion). (See ***Figure 3.***)



Source: National Defense Budget Estimates for FY 2006, Office of the Under Secretary of Defense (Comptroller), April 2005.

Figure 3. DoD Outlay as a Percentage of U.S. GDP

- *Defense Budget*. The buying power of DoD will decline by approximately $92 billion over the next ten years, according to a U.S. defense industry consensus forecast. After adjusting for inflation, DoD's raw spending power is expected to decline by about $80 billion over the next five years alone. Additionally, much of national defense funding is committed to sustaining people, maintaining vital infrastructure, and preparing equipment for combat deployment. As a result, annual funding for investment accounts must compete with these other equally pressing priorities. (See ***Figure 4.***) Also, according to projections in its 2007 budget proposal, DoD plans to reduce its spending for R&D from $72.5 billion this year to $71.2 billion in 2011. After inflation is taken into account, this is a cut of 11.6 percent from 2006.



Source: National Defense Budget Estimates for FY 2006, Office of the Under Secretary of Defense (Comptroller), April 2005.

Figure 4. Investment Dollars

- *CBDP Budget*. The CBDP received $1.5 billion in fiscal year 2007 (FY07), an increase of $84 million above the initial budget request. Although this is encouraging recognition of the importance of CBD to national security, future program funding must be similarly stable and insulated from the broadly negative funding trends cited above. Continued support for the FY08 President's Budget Request for the CBDP will be a key part of the national strategies to counter the threats from CB weapons. (See ***Figure 5.***)

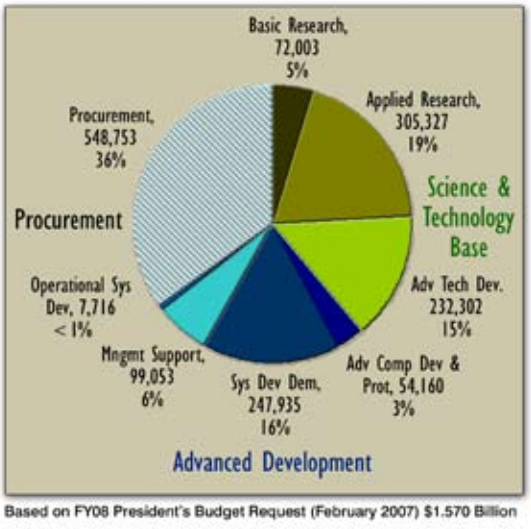


Figure 5. CBDP Budget

THE CHALLENGE

Today's environment of global conflict is not unique. The human struggle for power and influence remains much the same as it has been throughout history. What has changed, and changed dramatically for the worse, is the expanding roster of antagonists who have access to, or who are actively seeking, WMD with the capacity to inflict catastrophic damage. It is this increasingly dangerous strategic context that gives the CBDP its particular urgency to our nation. Of all the forms of WMD, CB weapons are among the cheapest and easiest to produce quickly and to deploy with the greatest likelihood for catastrophic effect. The challenge is compounded by the ease of disseminating knowledge related to developing WMD, increasing the dual-use nature of technologies, and the rapid technological advancements that continue to lower the threshold for acquiring WMD, and developing novel threats through various techniques, including genetic engineering. Thus, relevant implications for the CBDP are as follows:

- The nation will continue to be engaged in a long struggle of continuous, evolving conflict against adversaries employing irregular, catastrophic, and disruptive strategies, including terror, asymmetric attacks, and WMD to challenge, marginalize, erode, and paralyze U.S. power.
- As a result, military forces must be prepared to deal with the full spectrum of threats. More specifically, they must be able to operate in all WMD environments, unconstrained by CB effects.
- In particular, units that have been designated to be available for employment need CBD equipment and training to be ready for immediate deployment from the U.S.'s power projection infrastructure. Therefore, the CBDP must provide improved defensive capabilities in support of the national military strategies and force generating base.
- Building capabilities to manage risk and ensure U.S. forces are ready to meet current and future WMD challenges remain paramount, requiring stable funding for the TMTI; adequate long-term investment in the RDT&E infrastructure, including laboratories and test facilities; and consistent, predictable, and sustained resource levels for the CBDP.
- Failure to invest in the right CBDP capabilities—by improving doctrine, training, material, leaders, people, facilities, and infrastructure—will increase risk for our nation. The ability of the CBDP to respond to new and emerging threats is critically dependent on continued support of integration and awareness of revolutionary advances in in science and technology (S&T) such as genetic engineering and nanotechnology.

These implications combine to underscore a strategic national security imperative to place the highest priority on sustaining and further improving DoD's CBDP.

CONTENTS

EXECUTIVE SUMMARY

It is our responsibility to provide our warfighters the best capability and support in the world. America remains a nation at war. The armed forces of the United States are engaged in a global war on terror while simultaneously deterring further attacks on Americans here at home. In doing so, our military faces many challenges, but one in particular—the threat posed by weapons of mass destruction (WMD)—is among our greatest.

DoD is pursuing a comprehensive strategy to counter this threat. The purpose of this strategy is to build readiness for current and future challenges. The Chemical and Biological Defense Program (CBDP) is a critical component supporting both the national strategies and department's strategies. The program exists to provide chemical and biological defense capabilities in support of the goals and objectives of our national military strategies, ensuring that DoD operations are unconstrained by chemical or biological effects.

To effectively execute this program, the department depends on continued congressional support in three priority areas:

- Stable funding for the Transformational Medical Technologies Initiative (TMTI) to fully exploit the advanced science and technology innovation necessary to successfully counter future genetically engineered biological weapons.
- Adequate long-term investment in the RDT&E infrastructure to enhance our research, development, test and evaluation capabilities, including the modernization and construction of laboratories and test facilities to ensure we develop advanced countermeasures against current and emerging chemical and biological (CB) threats.
- Consistent resources for the overall program itself to ensure that, year after year, we are able to field the improved defensive capabilities essential to ensure our military can operate in any environment, unconstrained by chemical or biological weapons.

With the support of the President, the Secretary of Defense, and the Congress, we have developed and resourced an integrated CBDP to best serve the nation, to build readiness for current and future challenges, and to sustain our armed forces in time of war.

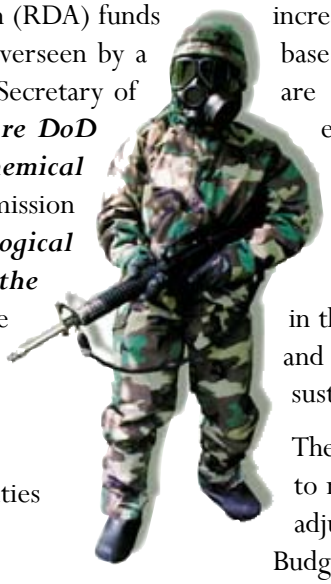
To continue countering the existing and future threat from hostile WMD and to meet the critical operational needs of our military, the department requires full support for the resources requested in the program budget.

This report is provided in accordance with 50 U.S. Code Section 1523. (The complete reporting requirement is detailed in ***Annex L***.) The report describes the accomplishments, initiatives, management, and oversight of the CBDP, as well as strategies and plans for the development and acquisition of capabilities in each of the program commodity areas for the near term, midterm, and far term; a description and assessment of RDT&E programs and infrastructure; an analysis of CB defense logistics posture; and CB defense education, training, exercises, and doctrine.

This report also demonstrates compliance with the Government Performance and Results Act (GPRA) by providing a performance plan, which is integrated into the overall structure of the report. The performance plan provides an assessment of the overall program for the most recently completed fiscal year (FY06).

Since its establishment in 1994 following congressional

passage of the FY94 National Defense Authorization Act (50 U.S. Code, Section 1522), the CBDP has integrated research, development, and acquisition (RDA) funds into defense-wide accounts that are overseen by a single office within the Office of the Secretary of Defense. The CBDP vision is to ***ensure DoD operations are unconstrained by chemical and biological effects***. The program's mission is ***to provide chemical and biological defense capabilities in support of the national military strategies***. The vision and mission statements guide the program, and its activities and are supported by four corporate goals:



Goal 1: Provide CB defense capabilities to the warfighter to ***reduce near-term operational risk***.

Goal 2: ***Reduce force management risks*** through enhanced joint CB defense education, training, and exercises.

Goal 3: Develop transformational CB defense technologies to ***reduce future challenges risk*** to DoD operations and forces.

Goal 4: ***Reduce institutional risk*** by improving DoD CB defense management practices – become a high-performance organization.

These goals reflect the CBDP's implementation of DoD's balanced scorecard concept, which provides a management and oversight framework to balance investment priorities against risks over time.

The CBDP budget request for FY08 is $1.570 billion. An overview of the budget is provided in ***Annex I***. This request focuses on *reducing the future challenges risk* by increasing resources for the science and technology base. The CBDP seeks to ensure that DoD operations are unconstrained by chemical and/or biological effects by providing chemical and biological defense capabilities to build readiness for current and future challenges. The program depends on support in three priority areas: (1) stable funding for the TMTI; (2) adequate long-term investment in the RDT&E infrastructure, including laboratories and test facilities; and (3) consistent, predictable and sustained resource levels for the CBDP.

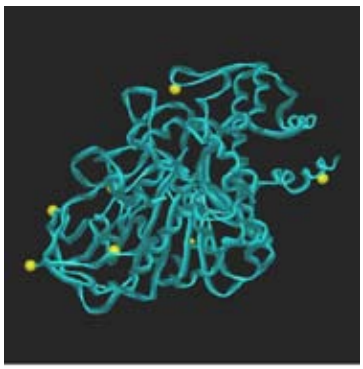
The CBDP employs multiple complementary processes to monitor performance and provide programmatic adjustments. First, the Planning, Programming, Budget and Execution System is employed to ensure program performance goals and targets are implemented. The CBDP annual report to Congress as well as assessments by the Joint Requirements Office-CBRN Defense also play key roles. Additionally, each materiel solution's progress is measured by monitoring specific performance goals and targets in the planning years, and the results of the data analysis are compared against performance goals, operational goals, corporate goals, and the overall CBDP mission. These processes support the objective of fielding improved CB defense equipment to our military forces.

Transformation

To achieve its objectives in response to global CB threats, the U.S. military must continue the transformation process. The *Transformation Planning Guidance* of April 2003 calls for transformational business and planning practices. Transformation challenges include management of defense, speed of mass (life and mobility) and information, fiscal barriers, values, and attitudes. The principles of jointness and developing an adaptable and responsive military carry over into CB defense.

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 CB research efforts are easy to conceal and difficult to detect and monitor. Based on the demonstrated ease with which uncooperative states and nonstate actors can conceal WMD programs and related activities, the United States, its allies, and its partners must expect further intelligence gaps and surprises. Consequently, the United States must couple responses to known and validated threats with an agressive and adaptive capability development process that anticipates potential novel and emerging threats.

Science and Technology



Recombinant Human Acetylcholinesterase

CB defense requires new capabilities and technologies to meet and counter novel threats, including genetically engineered weapons. In 2007, funding was shifted from procurement to S&T to invest more heavily in preparing for future threats while sustaining and enhancing current force protection levels. The FY08 President's Budget reinforces this effort. The TMTI identifies multiple scientific approaches to deliver broad-spectrum therapeutics, genomic sequences of known threats, and rapid response countermeasure capabilities. TMTI is a first critical step in S&T efforts to defend and protect against the dangers of future CB threats. Additional initiatives in science and technology include the Transformational Countermeasures Technologies Initiative (TCTI), which focuses on the physical (nonmedical) aspects of CB defense, and the Nanotechnology Initiative, which cross-cuts medical and physical CB defense. Together, these initiatives address needs for advanced technologies for detection, individual protection, information systems, and decontamination capabilities. The new capabilities will reduce future risks in the future by leading to capabilities that will defeat genetically engineered biological threats and other as yet unknown threats.

DOD CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM PERFORMANCE PLAN

DoD's management priorities often focus on responses to near-term operational threats. A key purpose of the performance plan is to shift the emphasis to a more anticipatory approach that incorporates other factors into a comprehensive risk management framework. The balanced scorecard concept provides a risk management framework that demonstrates compliance with the Government Performance and Results Act and includes operational risks, while also addressing additional challenges that defense managers must consider to balance investment priorities against risks over time. DoD has tailored the balanced scorecard concept to four broad areas of risk management with performance management measures, all of which support the department's vision, mission, and goals and ensure an integrated collection of systems and capabilities in order to reduce overall program risk. DoD pursues an investment strategy that seeks to reduce overall program risk by balancing risk in each of the following areas.

- ***Operational risk*** stems from factors shaping the ability to achieve military objectives in a near-term conflict or other contingency. Within the CBDP, this includes investments in procurement and advanced development to address near-term needs. This is represented by Budget Activities 4, 5, and 7 and procurement accounts.
- ***Force management risk*** results from issues affecting the ability to recruit, retain, train, and equip sufficient numbers of quality personnel and sustain the readiness of the force while it accomplishes its many operational tasks. Force management risk addresses investments to ensure sustainment of fielded systems and initiatives for CB defense education and training. This is represented by elements of various operations and maintenance accounts of the military departments, the Defense Logistics Agency, and the Defense Health Program. Resources for force management are not included within the budget of the CBDP; the CBDP leadership coordinates with the Services and Defense Agencies to ensure integration between acquisition programs and sustainment and force management activities.
- ***Future challenges risk*** derives from issues affecting the ability to invest in new capabilities and develop new operational concepts needed to dissuade or defeat mid- to long-term military challenges. Within the CBDP, this includes investments in the S&T base, Joint Capability Technology Demonstrations, and related efforts to address mid- to far-term needs. This is represented by Budget Activities 1, 2, and 3.
- ***Institutional risk*** results from factors affecting the ability to develop management practices, processes, metrics, and controls that use resources efficiently and promote the effective operation of the defense establishment. Within the CBDP, this includes investments in management activities to enhance the effective and efficient use of department resources, including investment in infrastructure to conduct research, development, and acquisition. This is represented by Budget Activity 6.

As illustrated in ***Figure 6***, reductions in risk in one area may reduce total program risk. However, because of resource constraints, investment decisions must be made to make trade-offs among different accounts in a manner that ensures balance or reduces total risk.

Figure 6. Risk Management Strategy

The increased complexity of modern warfare demands that CB defense equipment be fielded in the most cost-effective and expeditious manner possible. Furthering that complexity, the evolving threat environment calls for a capabilities-based approach that requires identifying capabilities that U.S. military forces will need to conduct a range of military operations. Put simply, determination of each specific adversary's intentions and capabilities may not be possible, underscoring the need to smartly balance overall program risk.

VISION, MISSION OF THE CBDP

The vision statement (***Figure 7***) provides focus and direction for CB defense RDT&E, and acquisition efforts. This vision encompasses a wide range of military environments and missions. These range from traditional battlefield force-on-force combat to homeland defense and civil support operations, and include special operations, anti-terrorism, force protection, consequence management, and other stability operations. Ultimately, the vision is focused on outcomes. That is, an effective CB defense capability will be one that facilitates the conduct of all DoD operations, in spite of a complex and varied CB threat, regardless of the range of operational environments.

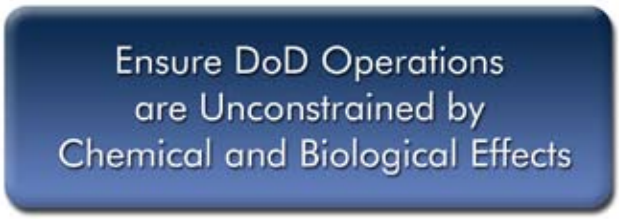


Figure 7. CBDP Vision

The vision is not focused on any specific chemical or biological threat. While it is focused on those CB agents that may be employed intentionally, it addresses classical threat agents as well as novel and emerging threats. The vision also encompasses various methods of delivery. Currently, CB defense capabilities impose some degree of burden on the user. The vision points forward to the development of capabilities free of such constraints and providing effective defensive capabilities that are transparent to the users.

As outlined in the 2006 Quadrennial Defense Review (QDR), the Department has refined its Force Planning Construct to better reflect the nature of DoD's mission and tasks. In addition to normal force generation, sustainment and training activities, this updated wartime force planning construct calls for U.S. forces to be able to do the following:

- Defend the homeland
- Prevail in the war on terror and conduct irregular operations
- Conduct and win conventional campaigns

In each area, the Force Planning Construct accounts for activities that the department conducts continuously (steady-state) and those it conducts periodically (surge). The CBDP's mission (***Figure 8***) is to provide the capabilities needed to support military operations in each of these areas for various durations. RDA programs within the DoD CBDP aim to provide U.S. forces with the best equipment to ensure their survivability and mission accomplishment on any future battlefield where chemical or biological agents may be employed.

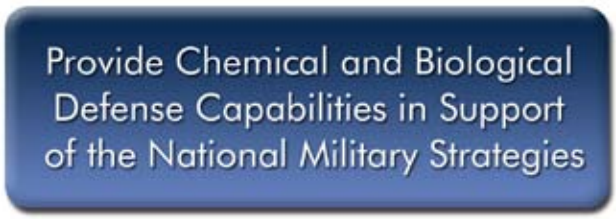


Figure 8. CBDP Mission

CHEMICAL AND BIOLOGICAL DEFENSE GOALS AND FUNDING

CBDP CORPORATE GOALS

The CBDP corporate goals used in ***Figure 9*** are a key element in providing a means to establish progress in fulfilling the program's mission.

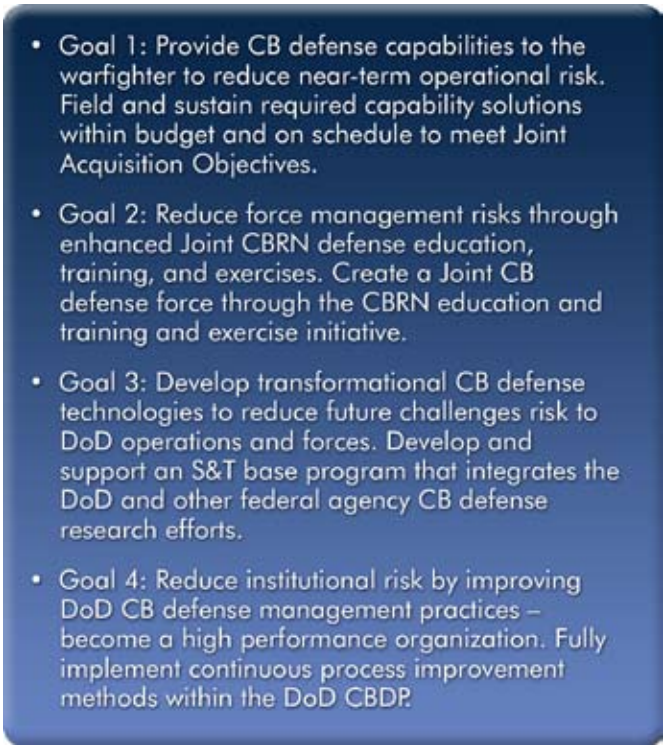


Figure 9. CBDP Corporate Goals

Corporate goals provide the broad framework needed by the CBDP to meet warfighter requirements for CB defense operational capabilities. These goals provide strategic program direction for the development, acquisition, and fielding of CB defense equipment while reducing acquisition costs and time of development. ***Figure 9*** defines the corporate goals (and provides a summary of the key focus areas that support these goals.) To implement the goals of the program, the CBDP seeks to ensure that DoD operations are unconstrained by chemical and/or biological effects by providing CB defense capabilities to build readiness for current and future challenges. The program depends on support in three priority areas: (1) stable funding for the TMTI; (2) adequate long-term investment in the RDT&E infrastructure, including laboratories and test facilities; and (3) consistent, predictable, and sustained resource levels for the CBDP.

JOINT CBRN DEFENSE FUNCTIONAL CONCEPTS AND OPERATIONAL CAPABILITY GOALS

The Joint Staff Joint Requirements Office for CBRN Defense (JRO-CBRND) completed a Capabilities-Based Assessment (CBA) of Joint CBRN defense warfighting operational capabilities during 2005. This 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. The focus of the CBA 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. CBAs are updated every three years.) Joint warfighter CBRN defense capability requirements are divided into four functional concept areas—Sense, Shape, Shield, and Sustain, as described in ***Figure 10***. These functional areas represent an integrated network of capabilities to support the warfighter. 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 pretreatments; and ***Sustain*** includes decontamination, restoration, and postexposure medical capabilities (i.e., therapeutics and diagnostics).

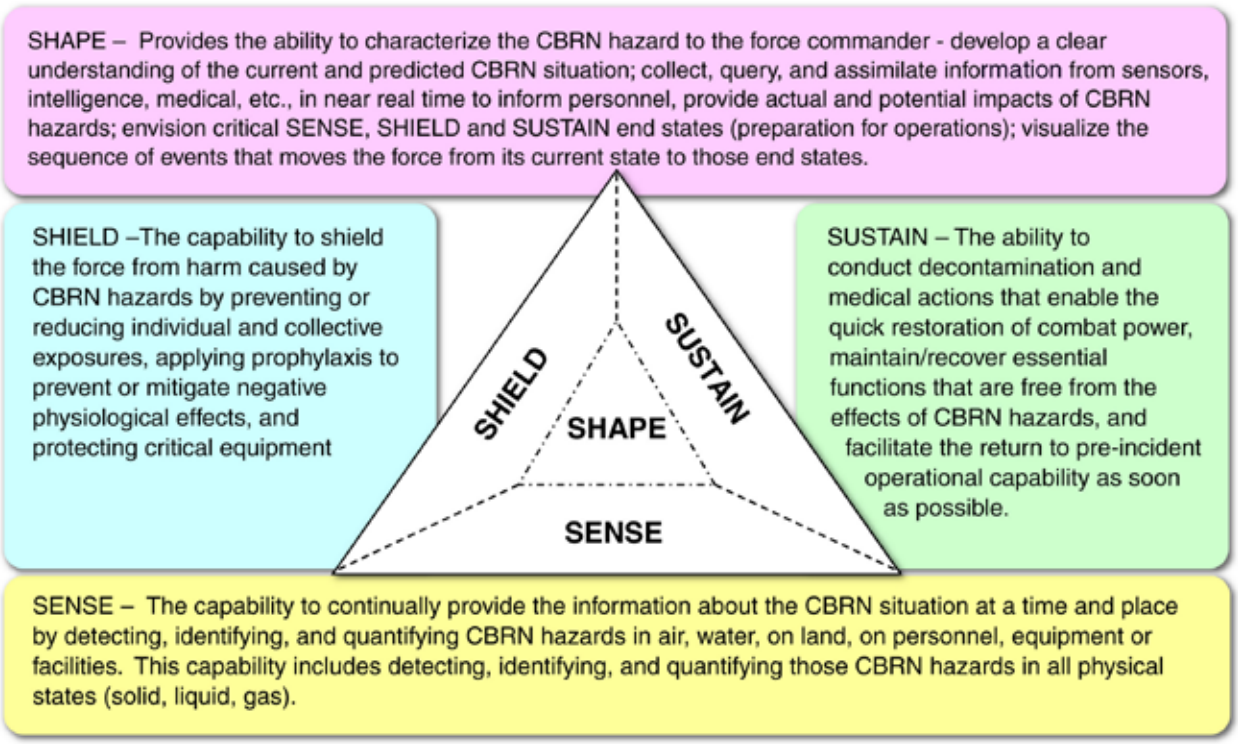


Figure 10. Joint CBRN Defense Enabling Concept and Supporting Core Capabilities

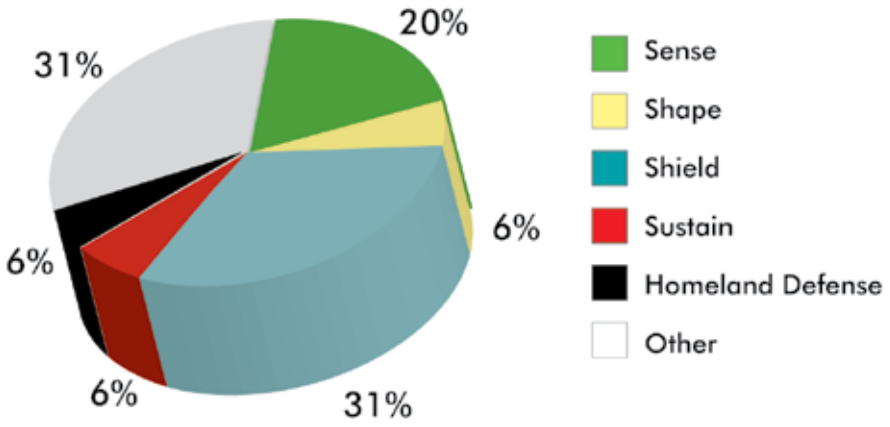
CBRN defense operational capability goals, as defined in the 2005 CBA, are aligned under the four functional concept areas (***Figure 11***). Assessments are under way to determine whether additional goals may be needed, or if existing goals need to be tailored to support evolving mission areas, including consequence management and homeland security. Specific projects and programs within advanced development and procurement are associated with one or more of the operational goals.

SENSE	SHAPE	SHIELD	SUSTAIN
1. Point Detection (Chemical, Biological, and Radiological) 2. Stand-off Detection (Chemical, Biological, and Radiological) 3. NBC Reconnaissance	4. Integrated Early Warning 5. Battlespace Management 6. Battlespace Analysis	7. Respiratory and Ocular Protection 8. Percutaneous Protection 9. Expeditionary Collective Protection 10. Medical Prophylaxes	11. Individual Decontamination 12. Equipment Decontamination 13. Fixed Site Decontamination 14. Medical Diagnostics 15. Medical Therapeutics

Figure 11. CBRN Defense Operational Goals

CBDP FUNDING

As illustrated in ***Figure 12***, the total CBDP investment for FY08 is $1.570 billion. In FY07, the department restructured funds within this investment portfolio. The FY08 program continues the investment and focuses on *reducing the future challenges risk* by increasing resources for the S&T base. The overall program risk optimizes a balance among the competing needs of the department. To implement the goals of the program, the CBDP seeks to ensure that DoD operations are unconstrained by chemical and/or biological effects by providing chemical and biological defense capabilities to build readiness for current and future challenges. The program depends on support in three priority areas: (1) stable funding for the TMTI; (2) adequate long-term investment in the RDT&E infrastructure, including laboratories and test facilities; and (3) consistent, predictable, and sustained resource levels for the CBDP.



Sense	$308.111
Shape	$91.415
Shield	$488.676
Sustain	$101.223
Homeland Defense	$86.418
Other	$494.406
CB Defense Program Total	$1,570.249

(Dollars in Millions)

Note: Homeland defense includes the Installation Protection Program, the Military Mail Screening Program, and the WMD–Civil Support Teams.

"Other" includes: Dugway Proving Ground funds; the Joint Concept Development and Experimentation Program; management support for the joint organizational offices; the Joint Test Infrastructure Working Group; laboratory infrastructure; test equipment, strategy, and support; and S&T funds that may be applicable to two or more of the functional areas.

Figure 12. FY08 President's Budget Request for the CBDP

The investment in the Shield capability area includes the TMTI investment. Investment in the Sense area was decreased due to a delay in the procurement of future biological standoff detection systems, and homeland defense also decreased, due to a reduction in funding for the Installation Protection Program.

SUMMARY OF KEY PERFORMANCE METRICS

Measuring Progress Toward Operational Goals (Operational Risk)

The investment in RDA is critical to the successful implementation of national security and military strategies for combating WMD, the global war on terrorism, and homeland security. At the end of FY06, there were 38 programs of record within the CBDP. For FY07, 37 of these programs are projected (from an annual perspective) to be on track to meet program cost, schedule, and performance parameters. This annual assessment, conducted by the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD), incorporates the consideration of risk within the following categories:

- Cost
- Schedule
- Performance
- Funding
- Contracts
- Test & Evaluation
- Logistics
- Production
- Management
- Interoperability

The department is making overall progress in the acquisition programs, as illustrated in ***Figure 13***, and consequently, is making progress towards advancing the capabilities for U.S. forces. ***Table 1*** illustrates progress across the broad range of capabilities that provide a comprehensive approach to managing risk.

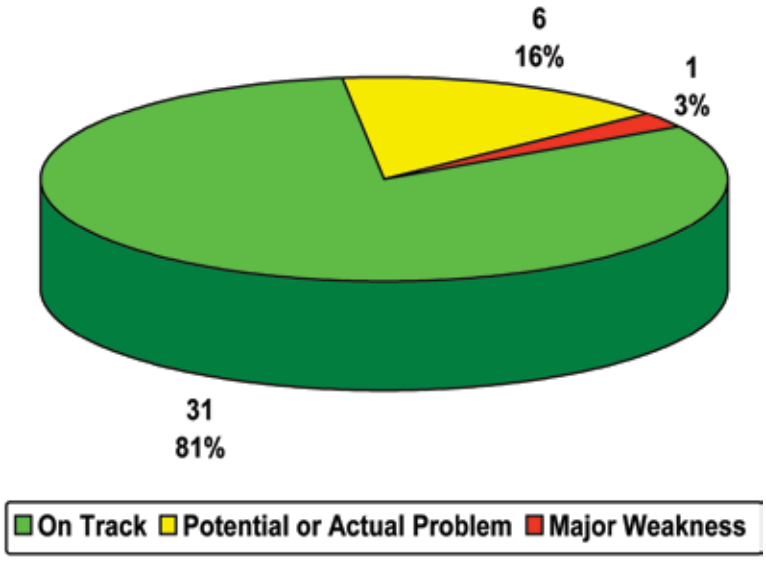


Figure 13. Summary Status of Acquisition Programs Demonstrates Overall Progress

Table 1. Summary Status of Acquisition Programs Demonstrates Overall Progress

JPM Collective Protection	
Shipboard Collective Protection System (SCPE)	G
Joint Collective Protection Equipment (JCPE)	G
Collectively Protected Field Hospitals (CPFH)	G
Joint Expeditionary Collective Protection (JECP)	G
Chemical Biological Protective Shelter (CBPS)	G
JPM Guardian	
Analytical Laboratory System (ALS)	G
Unified Command Suite (UCS)	G
Installation Protection Program (IPP)	G
JPM Individual Protection	
Joint Service Air Crew Mask (JSAM)	Y
Joint Service Lightweight Integrated Suit Technology (JSLIST) Ensemble	G
Joint Service Mask Leakage Tester (JSMLT)	G
Joint Service Chemical Environment Survivability Mask (JSCESM)	G
Joint Protective Aircrew Ensemble (JPACE)	G
Joint Service General Purpose Mask (JSGPM)	Y
JPM NBC Contamination Avoidance	
Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)	R
Joint Chemical Agent Detector (JCAD)	Y
Stryker NBC Recon Vehicle (NBCRV)	G
Joint Service Light NBC Reconnaissance System (JSLNBCRS)	G
Joint Chemical Biological Radiological Agent Water Monitor (JCBRAWM)	G
M93/M93A1 NBC Recon Vehicle (FOX)	G
JPM Information Systems	
Joint Effects Model (JEM)	Y
Joint Operational Effects Federation (JOEF)	G
Joint Warning and Reporting Network (JWARN)	Y
JPM Chem-Bio Medical Systems	
Anthrax Vaccine Adsorbed (AVA)	G
Recombinant Botulinum A/B Vaccine (rBot)	G
Smallpox System	G
Plague Vaccine	G
Skin Exposure Reduction Paste Against CW Agents (SERPACWA)	G
Joint Biological Agent Identification & Diagnostic System (JBAIDS)	G
Advanced Anticonvulsant System (AAS)	G
Improved Nerve Agent Treatment System (INATS)	G
pBioscavenger	G
Bioscavenger Increment II	G
JPM Decontamination	
Joint Service Transportable Decontamination System (JSTDS) - SS	G
Joint Service Personnel Decontamination System (JSPDS)	G
Joint Material Decontamination System (JMDS)	G
JPM Biological Defense	
Joint Biological Standoff Detection System (JBSDS)	Y
Joint Biological Point Detection System (JBPDS)	G

The overall rating of each program is assessed by JPEO-CBD and is based on a variety of factors tailored to the individual program. The overall assessment is based on whether the programs are on track (green), facing potential or actual problems (yellow), or have major weaknesses (red) compared to requirements defined in the Acquisition Program Baseline (APB) document for each program.

The vast majority (81%) of the programs are on track to meet defined and approved program requirements. Only six programs are identified as having potential or actual problems. However, appropriate solutions to these problems are within the Joint Program Manager's ability to solve. For example, two of these programs—the Joint Warning and Reporting Network (JWARN) and the Joint Effects Model (JEM)—are at risk as a result of the deliberate decision to synchronize the schedules and planned fielding of these programs with the Joint and Service command and control programs with which they must interface. The realignment caused schedule delays in the short term, but will result in enhanced overall performance and integration.

One program—Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)—faces major weaknesses. While JSLSCAD represents an improvement over currently fielded capabilities, it faced technical limitations in its performance during testing. As a result, JSLSCAD requirements are being re-evaluated to determine whether the program should continue in support of modified requirements or whether other options (including program cancellation) would be appropriate. The program decision will be reviewed by the Joint Requirements Oversight Council during FY07.

RDT&E progress within the programs is illustrated within ***Figure 14***. The predominance of programs entering/completing Operational Testing or completing/conducting a Milestone C Decision Review in FY06 and FY07 indicates significant near-term program RDT&E completion and product fielding.

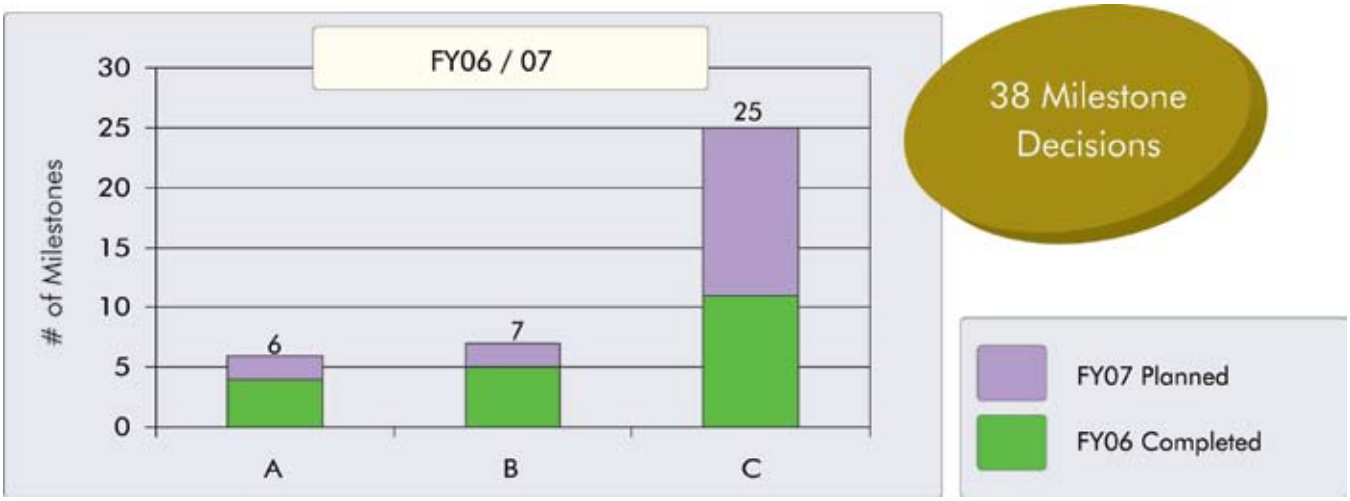


Figure 14. Milestone Decisions

In FY06 and FY07, 16 new capabilities are or will be fielded to the operational forces. These capability upgrades range across the spectrum of nuclear, biological, and chemical defense and include major detection, decontamination, medical, warning and prediction, and individual protection capabilities. Acquisition flexibility and customer focus within the programs of record are illustrated in ***Figure 15***. Concurrent with program-of record events and development, a wide spectrum of capability has been generated during FY06 to meet the immediate needs of operational forces.

1. Joint Service Chemical Environment Survivability Mask	9. Fox Survivability upgrade
2. Joint Service General Purpose Mask	10. Stryker NBC Reconnaissance Vehicle
3. Joint Service Decon System–Small Scale	11. Analytical Laboratory Suite (ALS) Block 1 Upgrade
4. Joint Service Personnel Decontamination System/ Reactive Skin Decontamination Lotion (RSDL)	12. Battlefield Anti-Intrusion Detection System (BAIS) AN/PRS9 (FUE 2QFY06)
5. Joint Biological Agent Identification & Diagnostics System	13. Mobile Detection Assessment Response System (MDARS) (1QFY07)
6. Joint Service Mask Leakage Tester	14. Joint Service Lightweight Integrated Suit Technology (JSLIST) Block 2 Glove Upgrade (FY07)
7. Joint Effects Model Block I	15. Alternative Footwear System (AFS) / Integrated Footwear System (IFS) (FY07)
8. Joint Service Light Nuclear, Biological, Reconnaissance System	16. Joint Service Aircrew Mask (JSAM) (FY07)

Figure 15. CBDP Capability Fieldings (FY06 and FY07)

In addition to monitoring progress by tracking programs of record, other assessments of DoD's current and projected CBD capabilities took place. In August 2005, the Joint Requirements Office (JRO) completed the report *Chemical, Biological, Radiological, and Nuclear Defense (CBRND) Functional Needs Analysis/Functional Solution Analysis*. This report, also referred to as the CBA, is structured in accordance with the Chairman of the Joint Chief of Staff Instruction (CJCSI) 3170.01D, *Joint Capabilities Integration and Development System (JCIDS)*. The 2005 CBRND CBA was coordinated with the services and the Combatant Commands and was approved by the Joint Requirements Oversight Council (JROC). The CBRND CBA contains the most comprehensive and current assessment of DoD's current and projected CBRN defense capabilities and is therefore used here as the basis for the assessment of CB operational risk.

The JCIDS process provides a structured methodology that defines functional tasks, capabilities to perform the tasks, capability gaps, and potential nonmateriel and materiel solutions. Based on national defense policy and centered on a common joint warfighting construct, the analyses initiate the formal development of integrated joint capabilities, to include the identification and justification of requirements necessary to initiate development and acquisition. The requirements are derived from an analysis of existing joint force operations and include doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) capabilities and deficiencies.

Table 2 provides a summary of the results of the analysis. This assessment provides a summary of current capability levels of U.S. forces and planned capabilities at all levels of war. The 2005 CBRND CBA did not address any materiel deficiencies at the strategic or operational levels of war, so ratings for those levels are based solely on assessments of DOTMLPF capabilities. This assessment assumes planned schedules will be achieved and threshold key performance parameters (KPPs) will be met for all systems. Investment decisions are based on optimizing

Table 2. JROC Capability Based Assessment of CBRN Defense

Operational Area *(Tactical level)*	Overall Capability		
	Current	Near/Mid (FY06-11)	Far (FY12-20)
SENSE	A	A	A
SHAPE	A	A	A
SHIELD	A	A	A
SUSTAIN	A	A	A
OVERALL	A	A	A

capability performance and reducing overall program deficiencies. The assessment provides an evaluation of CBRN defense:

by *Operational Area*—Sense, Shape, Shield, and Sustain

by *Level of War*—Strategic National, Strategic Theater, Operational, and Tactical[1] and

by *Time*—current, near term/midterm (FY06-11), and far term (FY12-20)

In qualitative terms, green, amber, and red typically indicate the following about the capabilities within each area:

G "Green" indicates a full capability to perform the task to the designated standard(s).

A "Amber" indicates a partial capability to perform the task to the designated standard(s).

R "Red" indicates little or no capability to perform the task to the designated standard(s).

A summary of the results of the 2005 CBRN Defense CBA is shown in ***Table 2***. The overall capability in each operational area is rated as amber through the far term. While the overall ratings do not change through the far term, the assessments are based on current and projected capabilities that will allow U.S. forces to operate against current and projected threats, respectively. Thus, even as capabilities improve, they must contend against transforming threats.

Additionally, this table provides an aggregate summary of material and non-material activities. The CBDP supports and directs research, development, and acquisition of material solutions while leveraging nonmaterial approaches. For example, inadequate doctrine or training may lower the rating for a task, even if material solutions exist. One example of this is found in a Shield task that involves protecting individuals from CBRN hazards. The CBA notes that DoD operations increasingly involve U.S. and non U.S. civilians who play an important role in supporting U.S. forces and therefore must be protected. However, military doctrine and training programs were not designed to ensure that the unprecedented number of civilians that were employed in early 2003 to support operations against Iraq were adequately prepared for CBRN defense. The information that follows in this report details the various measures being taken to address shortfalls identified in the JROC CBA. Consistent resource levels, as detailed in the FY08 President's Budget Request, and congressional support for the overall program will be critical to the department's ability to field improved defensive capabilities and to ensure U.S. forces can operate in any environment, unconstrained by chemical or biological weapons.

[1] As defined by the Universal Joint Task List (UJTL), the strategic level of war is divided into two sublevels: strategic national, which encompasses DoD, service, and interagency tasks, and strategic theater, which encompasses combatant command tasks. Establishing these sublevels provides clarity and focus for task development and execution. At this level, a nation, often as a member of a group of nations, determines national or multinational (alliance or coalition) security objectives and guidance, and develops and uses national resources to accomplish these objectives.
At the operational level of war, campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or areas of operations.
At the tactical level of war, battles and engagements are planned and executed to accomplish military objectives assigned to tactical units or task forces.

Table 3. JSTO-CBD Panel Assessment of CB Defense Technology Areas

Defense Technology Objective	Panel Rating
CB.35 Standoff Bio Aerosol Detection	GREEN
CB.37 CB Agent Water Monitor	AMBER
CB.42 Environmental Fate of Agents	GREEN
CB.45 Self-Detoxifying Materials	AMBER
CB.46 Recombinant Ricin Vaccine	AMBER
CB.50 Lightweight Integrated CB Detection	GREEN
CB.51 Low Level CW Agent Exposure	GREEN
CB.53 Wide-Area Aerial Reconnaissance for Chemical Agents	GREEN
CB.54 Therapy for Smallpox	GREEN
CB.55 CB Hazard Environment Prediction	GREEN
CB.56 Methodology for BW Agent Detection and Diagnostics Systems	GREEN
CB.57 Nontraditional Nerve Agent Medical Countermeasures	GREEN
CB.58 Western and Eastern Equine Encephalitis Vaccine	GREEN
CB.59 Therapeutic Strategies for Botulinum Neurotoxins	AMBER
CB.60 Vaccine Technologies for Filovirus Exposure	GREEN
CB.61 Advanced Air Purification System	GREEN
CB.62 Hazard Prediction with Nowcasting	GREEN
CB.63 Therapeutic Strategies for Filovirus Infection	GREEN
CB.64 Detection/Assessment of Genetically Engineered Biothreats	GREEN

Logistics and Training Capabilities *(Force Management Risk)*

Critical CB defense capabilities for the warfighter are provided through the operations and sustainment (O&S) accounts of the military departments, in addition to the RDA funds of the CBDP. *Logistics Risks Assessments* are provided in ***Chapter 3*** of this report. These assessments provide information on capabilities in stock and available to the warfighter at the end of FY06 and planned for future years.

Data on personnel training and education is provided in ***Chapter 4*** of this report. Additional information on exercises, training standards, and related CB defense training activities is also detailed. A key aspect of the program is the establishment of the CBRN Education and Training Integration -Directorate.

Developing and Deploying Transformational Capabilities (*Future Challenges Risk*)

The CBDP addresses risks from future challenges through research conducted in the S&T base. In early 2006, the Joint Science & Technology Office for Chemical/Biological Defense (JSTO-CBD) conducted a stakeholder's review of the science and technology program and provided an assessment of Defense Technology Objectives (DTOs). The results are summarized in ***Table 3***. In particular, the JSTO panel identified DTOs CB.42, CB.60, and CB.61 as excellent performance areas.

During 2007, the DoD will be phasing out the use of DTOs as the basis of science and technology base performance. Two key measures will include (1) a series of expert panel reviews and (2) a measure of the number of technologies transitioned. One of the key measures of success of the science and technology base is the demonstration and transition of advanced capabilities to the materiel developer for eventual production and fielding. JSTO-CBD and JPEO-CBD currently maintain over 40 Technology Transition Agreements (TTAs) to facilitate the exchange of information and ensure successful transition of new technologies and capabilities. ***Table 4*** provides a summary of actual and planned technology for transition to the materiel developer.

Table 4. Actual & Planned Technologies Transferred to JPEO-CBD

	Core Programs				Test and Evaluation			
	FY06	FY07	FY08	FY09	FY06	FY07	FY08	FY09
Detection	1	0	2	0	0	3	0	2
Information Systems	1	5	4	1	0	0	0	4
Protection	0	2	6	0	0	1	3	5
Decon	0	1	1	0	0	0	2	0
Threat Agent Sciences	1	0	0	0	0	4	0	1
Diagnostics (Systems)	4	4	4	4	0	0	0	0
Diagnostics (Assays)	0	8	8	8	0	0	0	0
Diagnostics (Hardware)	0	2	2	0	0	0	0	0
Pretreatments	1	0	2	1	0	0	0	0
Therapeutics	0	0	2	0	0	0	0	0
Totals	8	14–18	23–27	6–10	0	8	5	12

A key programmatic decision of the 2006 QDR (Quadrennial Defense Review) was the direction to implement a $1.5 billion Transformational Medical Technologies Initiative (TMTI) over FY07–11 to develop broad-spectrum medical countermeasures against the threat of genetically engineered bioterror agents. The TMTI focuses on broad-spectrum defenses against intracellular bacterial pathogens and hemorrhagic fevers. The TMTI builds on efforts started in FY06 as a result of the Enhanced Planning Process. It shifts the investment balance to reduce future risks and decrease overall program risk by maintaining a balance among countermeasures against near- and 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.

In a parallel effort, the S&T program will initiate plans for the investigation into nanotechnology, biotechnology, information technology, and cognitive sciences (NBIC) in an effort to advance CB defense capabilities through revolutionary and innovative areas of research. This program has been titled "The Transformational Countermeasures Technologies Initiative" or TCTI. The intent of this program is to leverage NBIC developments to provide a fully integrated protective ensemble to protect the future warfighter in a highly mobile force, and to expand this concept to CB defense capabilities to protect fixed and semi-fixed facilities. Up to one-third of the physical S&T funds will directly support technologies in this cross-cutting initiative.

Improving Management Practices (*Institutional Risk*)

Managing institutional risk deals with factors affecting the ability to develop management practices, processes, metrics, and controls that use resources efficiently and promote effective operations. Following are key management activities that are being pursued to manage institutional risk.

Streamlining the decision process — ***Chapter 1*** of this report describes the CBDP's management and oversight structure. The most significant change in the management structure was the program reorganization that was approved on April 22, 2003. This reorganization streamlined the decision process by reducing the number of Milestone Decision Authorities (MDAs) from nine to one. From April 22, 2003, through May 9, 2006, Defense Acquisition Executive (DAE) oversight was implemented through a tailored index of systems labeled "Sentinel Systems" that sought to measure performance of CBDP functional areas based on the criticality, complexity, and cost of individual programs. On May 9, 2006, the DAE suspended the Office of the Secretary of Defense's (OSD's) use of the Sentinel oversight systems, delegated full MDA for all CBDP programs to the Army Acquisition Executive (AAE) and designated the CBDP

a Special Interest program in accordance with DoD Instruction (DoDI) 5000.2. This MDA authority was further delegated by the AAE to the JPEO-CBD on June 7, 2006. In July 2006, the CBDP implemented an alternative review process, which is detailed in ***Chapter 1***.

Program Balance — ***Annex I*** of the annual report of the CBDP provides information on RDA funding. DoD annually reviews the program budget to ensure that program activities are balanced among science & technology, advanced development, and procurement to ensure technology transitions as well as to ensure capabilities are being developed to address near-term, midterm, and far-term operational needs.

Improving Test & Evaluation Infrastructure — ***Chapter 2*** of this annual report provides information on the DoD test and evaluation (T&E) infrastructure. In the FY07 President's Budget Submission, budget needs for the T&E infrastructure were integrated with the RFA programs. Based on technology needs and directions, this budget restructured acquisition programs, and integrated the T&E capabilities to execute these programs. The programs were time and funding sequenced so that the technologies could be demonstrated and transitioned in synchronization with the T&E capabilities. Thus, the program milestones were based on the availability of not only the financial resources, but also the technology and T&E resources needed to execute the programs. ***Figure 16*** illustrates the significant number of test events sponsored by the CBDP and occurring at a variety of locations for operational testing (OT), developmental testing (DT), combined test events, and clinical testing (for medical systems requiring Food and Drug Administration [FDA] approval).

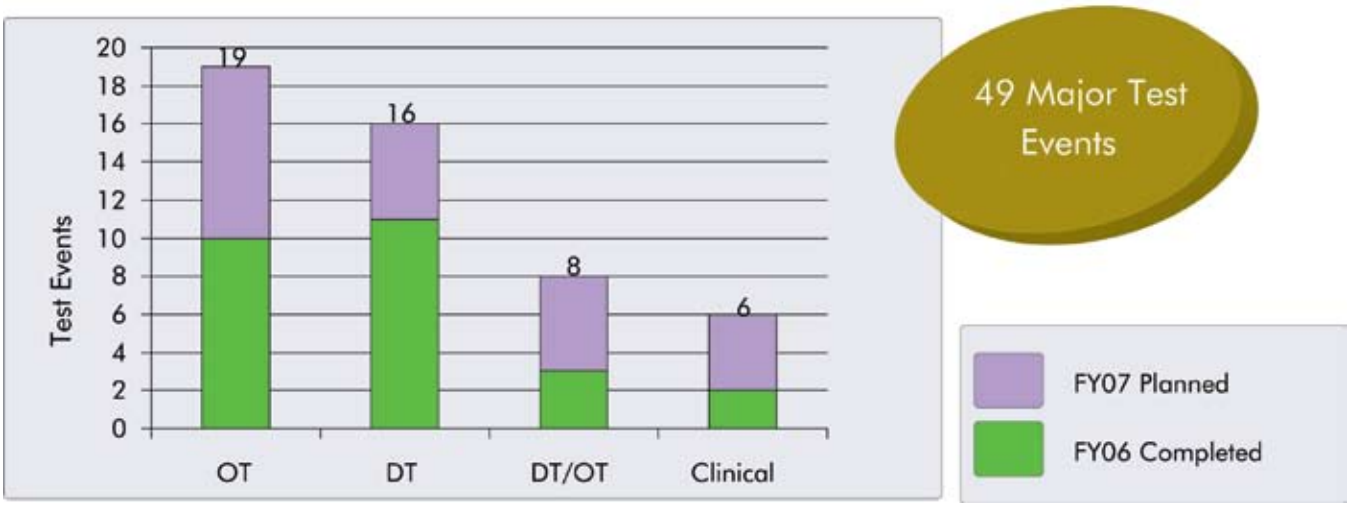


Figure 16. Major Test Events

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[1] within the Department of Defense (DoD) are overseen by a single office within the Office of the Secretary of Defense(OSD). The Assistant to the Secretary of Defense for Nuclear and 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, and revised on July 10, 2006. This revision to the Implementation Plan provided detailed instructions for a new review process for the CBDP and added an Advanced Development Working Integrated Product Team (WIPT) to the Overarching Integrated Process Team (OIPT)/WIPT process. 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 management structure are portrayed in ***Figure 1-1***, which illustrates processes to (1) provide policy guidance; (2) conduct planning, programming, budgeting, and execution of chemical, biological, radiological, and nuclear (CBRN) defense RDA; (3) establish military requirements for CBRN defense; (4) test and evaluate CBRN defense programs; (5) manage CB defense science and technology (S&T) programs; (6) provide program analysis and integration; and (7) provide program oversight.

[1] While the public law specifically addresses only CB defense RDA activities, DoD planning includes radiological and nuclear defense along with CB defense in its planning activities. Radiological and nuclear defense capabilities within the CBDP are limited to certain types of radiation detection equipment, modeling and simulation capabilities, and 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 programs are outside the scope of the CBDP. These efforts are discussed where they are related to or complement CBDP efforts.

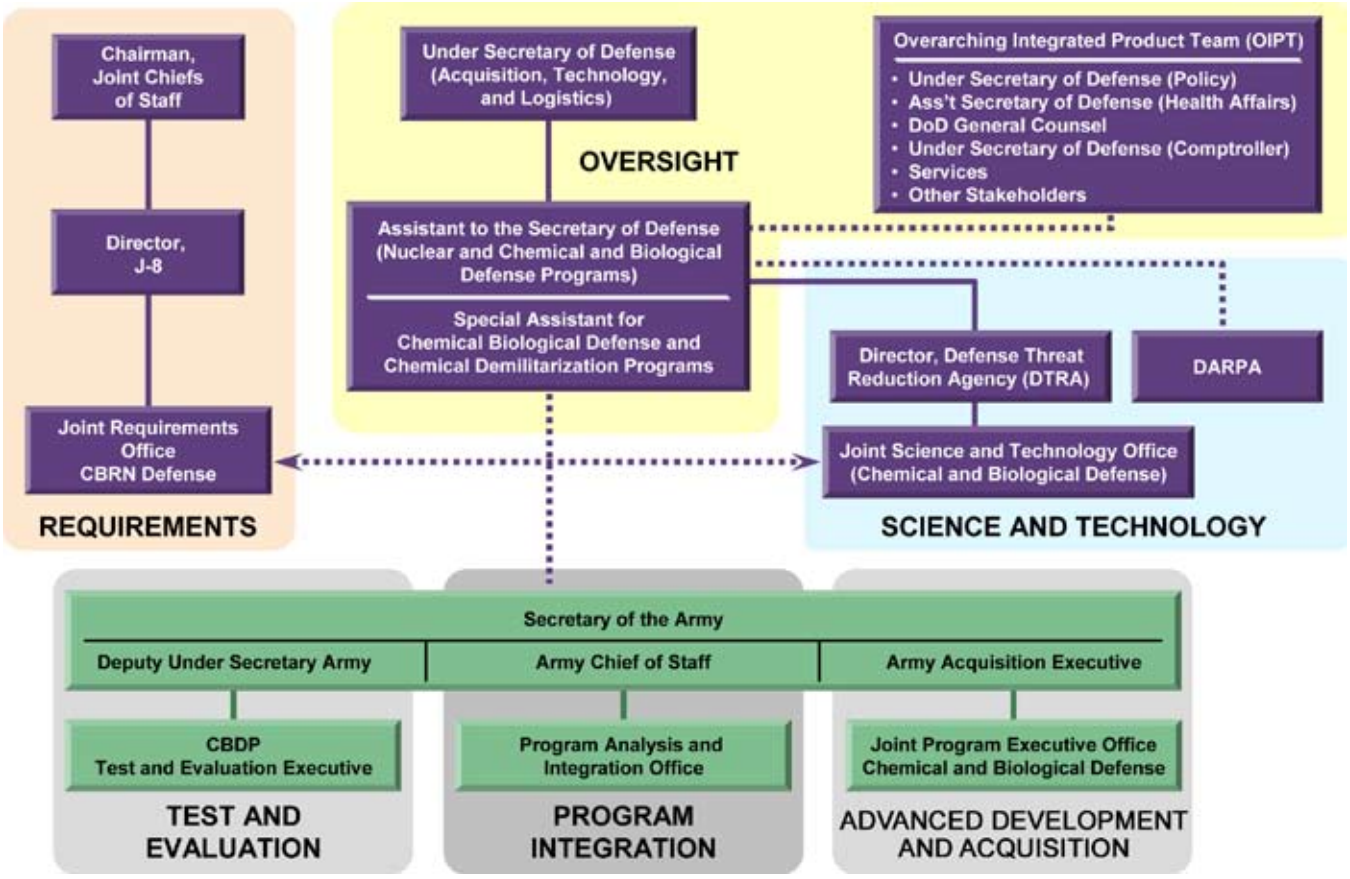


Figure 1-1. CBDP Management & Oversight Structure

This section summarizes selected roles and responsibilities of key individuals and organizations within the CBDP. The Joint Requirements Office CBRN Defense (JRO-CBRND) was formally established on October 1, 2002. The JRO-CBRND charter was approved on February 4, 2003. The establishment of a JPEO-CBD that reports through the Army Acquisition Executive (AAE) was directed on September 19, 2002.

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, DoD 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 AND 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 MDA for the overall program. The USD(AT&L) delegates this authority to the AAE, 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 the Overarching CBDP Strategic Plan, (2) establishing a CBDP OIPT within the OSD, (3) chairing DAE Oversight Reviews of the CBDP, and (4) approving the associated Program Objective Memorandum (POM) submission to the Secretary of Defense.

1.3.3 ASSISTANT TO THE SECRETARY OF DEFENSE FOR NUCLEAR AND 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 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 Assistant 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. On July 10, 2006, the USD (AT&L) revised sections of the Implementation Plan to provide detailed instructions for a new review process for the CBDP and added an Advanced Development WIPT to the OIPT/WIPT process. The OIPT oversees the following WIPTs:

- *Joint Requirements*—Chaired by the JRO-CBRND
- *Science and Technology*—Chaired by the Joint Science and Technology Office for CB Defense (JSTO-CBD)
- *Advanced Development*—Chaired by JPEO-CBD
- *Test and Evaluation*—Chaired by the CBDP Test and Evaluation (T&E) Executive
- *Education and Training Integration*—Chaired by the Director for CBRN Integration within the Office of the Special Assistant for Chemical Biological Defense and Chemical Demilitarization Programs, OSA(CBD&CDP)

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 are 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.

Within the office of the ATSD (NCB) the SA(CBD&CDP) is the principal deputy 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. This Directorate will synchronize capability baseline assessments by identifying successful education, training and exercise initiatives and by exploring ways to alleviate any training gaps, misalignments or redundancies. The integrated approach to CBRN defense education and training will provide warfighters, commanders, senior leaders, and decision makers with the critical skills to ensure appropriate strategic, tactical, and/or operational awareness and understanding of CBRN defense capabilities that maximize continuity of operations and survivability.

The first phase of this strategy established an Education and Training Integration Council (ETIC) with representatives from across the DoD. The first ETIC conference was held in March 2006, with the next conference scheduled for March 2007. In early 2007, this office launched a web site (https://etic.jscbis.apgea.army.mil) and database to capture CBRN defense education and training across DoD.

1.3.4 JOINT REQUIREMENTS OFFICE FOR CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR DEFENSE (JRO-CBRND)

The JRO-CBRND began official duties on October 1, 2002. The official charter was approved on February 4, 2003. The JRO-CBRND coordinates with the combatant commands and Services to develop joint CBRN requirements, an overarching CBRN defense architecture and a joint capabilities roadmap. The JRO-CBRND defines 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-CBRND is a single office within the DoD under the Chairman of the Joint Chiefs of Staff that is responsible for planning, coordination, and approval of joint CBRN defense operational requirements and that serve 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-CBRND leads the development of the DoD CBDP POM with JPEO-CBD, JSTO-CBD, and CBDP T&E Executive support in accordance with Section Six 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 capability documents using the guidance set forth in the Joint CBRN Defense Modernization Plan. Where new materiel requirements are identified, submit capability documents to the JRO-CBRND and recommend for inclusion into the Modernization Plan.
- Include the participation of the JRO-CBRND 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-CBRND during development of the DoD CBDP 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.
- Support Joint Programs as assigned by the JPEO-CBD. ***Figure 1-2*** illustrates current key Service personnel joint duty assignments in support of joint programs.

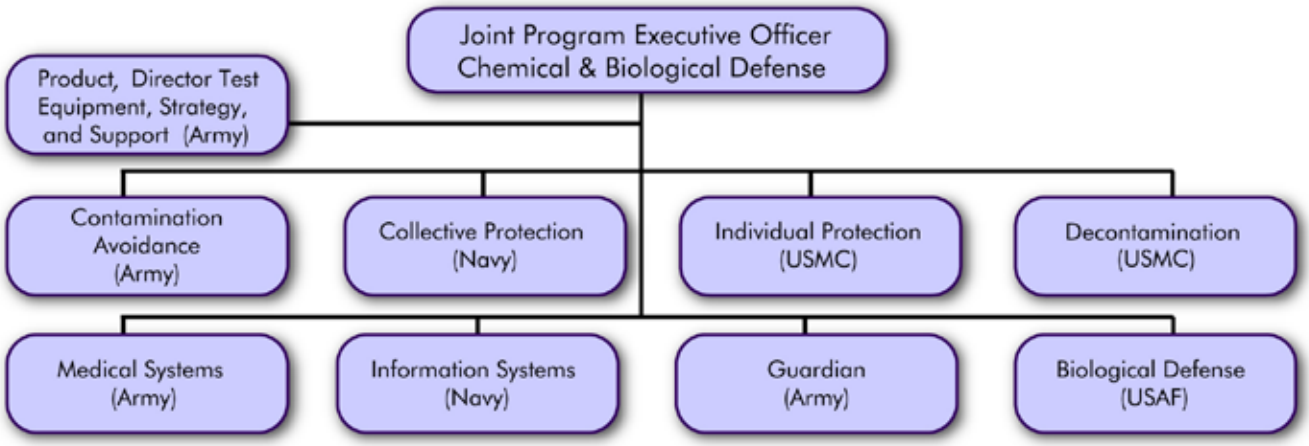


Figure 1-2. Service Responsibilities for Joint Program Management within the JPEO-CBD

The military departments play a critical role in the execution of all phases of RDA. 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 2 of this report is a detailed description and assessment of the military's CBD T&E infrastructure and the supporting laboratory infrastructure. These include capabilities for handling live CB agents and conducting a variety of tests. Selected key military facilities, for which more detail is provided in Chapter 2 (Section 2.9), include the following:

- U.S. Army Edgewood Chemical Biological Center (ECBC)
- U.S. Army Dugway Proving Ground (DPG)
- 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)
- Air Force Institute of Occupational Health (AFIOH)

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, T&E, 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 AAE. Following are selected key responsibilities of the Army as the Executive Agent:

- Review all funding for the CBDP.
- Review and recommend approval of the CBDP POM.
- Serve as the 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 CBDP, 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 Material Developer to coordinate and integrate acquisition for the CBDP through the JPEO-CBD.
- Provide Program, Analysis and Integration functions for the CBDP.
- Provide the CBDP T&E Executive for the CBDP.
- Serve as the Joint Combat Developer for the CBDP through the JRO-CBRND.

1.3.6.1 Joint Program Executive Office–Chemical and 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 nonmedical and medical CBD programs. Following are selected key responsibilities of the JPEO-CBD.

- Serve as the CBDP MDA for all CBDP 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 the POM, the Budget Estimate Submission, the President's Budget, and other required documentation. Support development of the annual RDA. Plan in coordination with the JSTO-CBD 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-CBRND.
- Establish Technology Readiness Levels (TRLs) and conduct reviews, in conjunction with JSTO-CBD to identify opportunities for transition of CB S&T programs to acquisition.
- Ensure interagency cooperation and timely transition of technologies to advanced development programs 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 nonmedical programs. For medical programs, ensure integration with related DoD materiel programs required for force health protection.
- Execute 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-CBRND, JPEO-CBD, and JSTO-CBD. 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-CBRND 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 T&E Executive

The Army T&E Executive, under the Deputy Under Secretary of the Army (DUSA), is designated as the CBDP T&E Executive. The CBDP T&E Executive chairs the T&E WIPT, which includes membership from each Service T&E Executive and principals from JRO-CBRND, JPEO-CBD; JSTO-CBD, Service Operational Test Agencies (OTAs); the Director, Operational Test and Evaluation (DOT&E) and the Director, Test Resource Management Center (TRMC). This WIPT assists the CBDP T&E Executive to resolve major T&E and related issues at the highest level. Such issues often impact the associated TEMPs and test plans and may require approval by the director of OT&E. The T&E Executive is also responsible for oversight of CBDP T&E infrastructure to ensure that adequate T&E is conducted for the CBDP systems. The T&E Executive also has responsible for establishing the 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 multiservice experiments used to validate the Joint Integrating Concept for CBRN defense by systematically exploring new and innovative combinations of medical and nonmedical 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 CBRN defense 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 S&T and Advanced Development efforts managed by the JSTO-CBDand 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 (USACMLS) provides myriad resources suited for CBRN defense experimentation, the JCD-CBRND leverages personnel,

equipment, and facilities available through each of the Services and other government organizations to reduce costs, shorten timelines, and improve experimental designs.

1.3.7 DEFENSE THREAT REDUCTION AGENCY (DTRA)

DTRA serves two key roles in support of the DoD CBDP—*Funds Manager* and *Joint S&T Manager*. These roles are filled by DTRA's CB Defense Directorate, DTRA(CB), also designated as the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD). The DTRA provides funds management functions under the oversight of the ATSD(NCB). The JSTO-CBD manages and integrates CB defense science and technology S&T base programs, which are coordinated with service S&T principals. S&T management responsibilities include the development and integration of S&T programs in response to OSD and JRO-CBRND guidance. The JSTO-CBD provides the necessary programming, planning, and budgeting documentation for CB 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 the Defense Advanced Research projects Agency [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 Advanced Concept Technology Demonstrations (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 National Security Council 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) DARPA, (2) the Counter-proliferation Program Review Committee (CPRC), (3) TSWG, (4) the Department of Homeland Security (DHS) Science and Technology Directorate, and (5) the Department of Health and Human Services (DHHS).

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 CB 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 over forty organizations, including the SA(CBD&CDP) and JSTO-CBD and by participation in the Technology Area Review and Assessment (TARA) process. A panel of CBD 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 Sensors Group, which provides government coordination outside of the DoD and works closely with the Military Services to ensure that technologies are effectively transitioned into the hands of the user community. In addition to coordinating with external agencies, DARPA produces an internal

Chemical and Biological Defense Technologies Review of all its current programs in the CB warfare arena.

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 (CJCS), 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 that Department of Energy (DOE) programs are integrated with the 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 CBRN WMD (including their means of delivery) and CBRN 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 the DoD, specifically the 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, Israel, Australia, and Singapore. The TSWG also has an effective outreach program so that state and local agencies can benefit from new technology developments and facilitate interoperability between DoD elements and other federal, state, and local agencies. TSWG co-chairs the S&T Subgroup of the Interagency Board (IAB) for Equipment Standardization and Interoperability.

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 11 subgroups. One of the subgroups is the Chemical, Biological, Radiological, and Nuclear Countermeasures (CBRNC) subgroup, which is co-chaired by representatives from the DoD and the FDA. The CBRNC subgroup identifies and prioritizes interagency CBRN 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 (DHS) Science & Technology (S&T) Directorate

The DHS 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 WMD. 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 the DHS are currently developing a Memorandum of Agreement (MOA) to ensure effective cooperation on the S&T and related initiatives being pursued by both agencies. During 2006, there were several areas of cooperation, including DHS participation in DoD technology area reviews, DoD participation in DHS science reviews, and information exchanges regarding technology research, development, and procurement initiatives.

1.4.1.5 Department of Health and Human Services (DHHS)

DoD and DHHS collaborate on numerous medical CB defense initiatives in support of national and homeland security strategies. These strategies include the research, development and procurement of safe and effective medical countermeasures (MCMs). The DoD and the DHHS aim to cooperate to leverage MCM programs of mutual interest and to ensure there is no redundancy.

The DHHS family of agencies includes the NIH, the Centers for Disease Control and Prevention (CDC), and the FDA. Staff members from the NIH (specifically, the National Institute of Allergy and Infectious Diseases, NIAID) and CDC meet regularly with staff at the USAMRIID (Fort Detrick, Maryland) and the staff of the Armed Forces Radiobiology Research Institute (AFRRI) to discuss development of drugs, vaccines, and diagnostic tests for military personnel. Regulatory issues are addressed with the FDA through the Joint Program Office for Chemical Biological Medical Systems within the JPEO-CBD. NIAID personnel also meet periodically with DTRA and DARPA.

In addition to these informal avenues of collaboration, there are also formal agreements between the DoD and DHHS concerning the development of MCMs. In accordance with the Interagency Agreement between DoD and the DHHS for the joint development of MCMs, both Departments agree to pursue specific MCMs of mutual interest selected by an Interagency Working Group (IWG). Implementation plans for each specific MCM are identified in sub-agreements under this interagency agreement. Implementation plans are developed and managed by product-specific Integrated Product Development Teams (IPDT) with oversight from the IWG.

Both Departments participate in an interagency process that employs IPDTs to manage the development of mutually selected MCMs. The ultimate goal for each MCM is licensure or approval by the FDA. Under this agreement, both Departments agree to share information on intramural and extramural programs in basic research and early development work for MCMs. The Departments cooperate for coordinating translational, advanced development research designed to ensure successful product transition, including advanced animal model development and MCM preclinical assessment. The Departments also cooperate in coordinating demonstration and product validation work, including manufacturing development, and procurement. The degree of coordination for specific candidate products is defined under separate subordinate interagency agreements.

A critical aspect of interagency coordination is DoD support for Project BioShield. The Project BioShield Act of 2004 was initiated as a result of the attacks of September and October of 2001. The National Defense Authorization Act of 2004 (P.L. 108-136) includes provisions for how the DoD interacts with the DHHS with respect to Project BioShield. The DoD's role in BioShield allows it to leverage DHHS resources for research, development, and procurement activities to achieve DoD requirements for MCMs, particularly when DHHS and DoD requirements overlap.

The first DoD product under consideration for transition to DHHS for advanced development under Project BioShield is the plasma-derived bioscavenger, human butyrylcholinesterase (pBuChE). pBuChE is intended to be an effective pretreatment against classic and nontraditional chemical agents. It will be developed through Phase I clinical safety trials by the DoD and then transitioned to the DHHS for potential licensure. More detailed information on this effort is available in Annex F. Another Project BioShield candidate involving interagency collaboration is a next-generation smallpox vaccine that the DHHS is developing and DoD intends to procure upon successful FDA licensure.

DHHS is developing some MCMs for the Strategic National Stockpile that have their technology basis in programs that originated in the DoD. Examples include the next generation anthrax vaccine and the cell culture-derived smallpox vaccine. DoD and DHHS also coordinate regarding licensed products. The anthrax vaccine adsorbed (AVA) and Dryvax™ (smallpox vaccine) are procured by the DoD from Emergent BioSolutions (Bioport) and DHHS, respectively. More detailed information on these programs is available in Annex F.

The DoD will continue to partner with the DHHS and its related agencies to ensure military and civilian populations are protected from the potentially catastrophic effects of both man-made and naturally occurring threats.

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 Department of Justice's Office of Domestic Preparedness to purchase equipment in support of Justice's grant program
- The White House Office of Science and Technology Policy chaired WMD Program, Research and Development Subgroup
- The National Security Council
- U.S. Department of Agriculture
- Department of Justice
- Environmental Protection Agency

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. The CBDP effectively leverages international programs to gain unique access to foreign technology and infrastructure, mitigate risk in the R&D process, and establish multinational standardized test procedures and common data.

A range of international agreements and programs provide the legal and procedural framework for international cooperation in CBD. These include the Information Exchange Program, International Cooperative RDA programs, the Foreign Comparative Testing Program, personnel exchanges and assignments, and foreign military sales. ***Table 1-1*** lists examples of international cooperative efforts. (Cooperative efforts in doctrine and training are codified in standardization agreements, which are described in Section 4.2 of this report.)

The DoD's international program efforts play an essential role in integrating the CBDP into the global CB defense community. Partnerships typically begin with an exchange of technical information through an information exchange annex, of which more than 50 currently exist. When synergies are identified, these exchanges may lead to the development of a Memorandum of Understanding or Program Agreement, which support more extensive international collaborative activities.

In FY06, the CBDP broadened its international reach by establishing several important new relationships and strengthening existing ones. In September of 2006, the DoD's premier international cooperative CBD program—the Chemical, Biological and Radiological Memorandum of Understanding (CBR MOU) with Canada and the United Kingdom—was amended to add Australia to its membership. This addition will serve to expand and rejuvenate an ongoing multilateral partnership of more than twenty-five years. It will also bolster the United States—Australia CBD relationship and offer valuable insight from a partner with a geopolitically unique perspective on the global threat of weapons of mass destruction.

The DoD's network of international cooperative CBD programs and agreements now extends to more than 20 different nations. The CBDP continues to identify and leverage global capabilities that address program gaps. Such cooperation is critical to ensure access to the best CBD technologies available worldwide and to maintain seamless integration of equipment and procedures with our nation's allies.

Table 1-1. International Cooperative Efforts in CB Defense

• CB Warfare Agent Challenge Levels	• MCMs to Chemical and Biological Agents
• Battlespace Information Systems Development	• Toxic Industrial Chemicals
• Detection and Diagnostic Reagents Development	• Collective Protection Systems
• Biological Surface Monitoring	• Fate and Effect of Chemical Agents
• Analytical Methods for the Determination of CW Agents	• Plague Vaccine Development
• Venezuelan Equine Encephalitis Vaccine Research	• Human Science and Biomedical Studies
• Standoff Biological Detection System Development	• Protective Suit Development and Evaluation

CHAPTER 2

CHEMICAL AND BIOLOGICAL DEFENSE REQUIREMENTS AND RESEARCH, DEVELOPMENT, AND ACQUISITION PROGRAM STATUS

2.1 INTRODUCTION

This chapter describes Joint Service CB defense (CBD) requirements and research, development, and acquisition (RDA) programs and the status of these programs—from the science and technology (S&T) base through procurement. This chapter is organized within the framework of the seven operationally oriented commodity areas outlined in a Capabilities-Based Assessment prepared by the Joint Requirements Office for Chemical, Biological, Radiological and Nuclear Defense (JRO-CBRND). These commodity areas (and the corresponding sections within this chapter) as follows

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

In addition, specific activities related to CBD defense, homeland security, and force protection are addressed in Section 2.8. Test and evaluation (T&E) activities for program-specific activities are provided in each of the sections, while overall T&E infrastructure activities are detailed in Section 2.9.

The Joint Staff JRO-CBRND completed a CBA of joint CBRN defense warfighting operational capabilities during 2005. This 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. The focus of the CBA 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. CBAs are updated every three years.) Joint warfighter CBRN defense capability requirements are divided into four functional concept areas—Sense, Shape, Shield, and Sustain, as described in ***Figure 2-1***. These functional areas represent an integrated network of capabilities to support the warfighter. 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 pretreatments, and sustain includes decontamination, restoration, and postexposure medical capabilities (i.e., therapeutics and diagnostics).

When a valid operational need has been identified, the services first examine the range of *nonmateriel solutions*—doctrine, organization, training, leadership, personnel, force structure—to provide the most effective capability for operating in a CBRN environment. If it is determined that none of the nonmateriel options fully meet the required need, equipment or *materiel solutions* are pursued through the acquisition process. The R&D modernization process identifies technological approaches that may result in a new operational capability or an upgrade to an existing operational capability.

The FY08 President's Budget Submission integrates S&T investments, acquisition programs, and the T&E capabilities to execute these programs. Schedules and

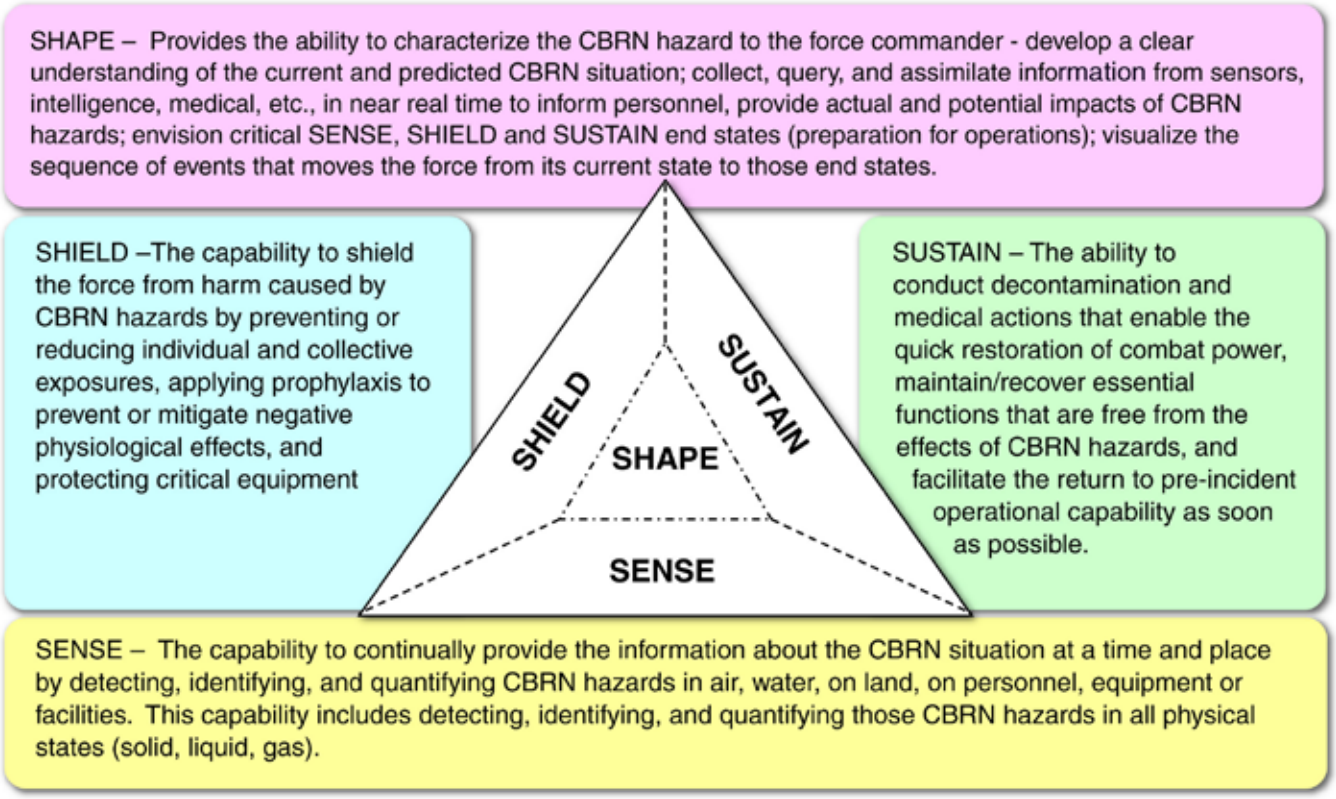


Figure 2-1. Joint CBRN Defense Enabling Concept and Supporting Core Capabilities

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 also 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 missions requiring operations in a contaminated environment (including fixed sites), reconnaissance, detection, and identification are critical to ensure the continuation and accomplishment of the mission. These capabilities ensure that forces can assume the optimal protective posture and rapidly identify and (if possible or necessary) decontaminate affected personnel, equipment, and areas. Sensors for the individual warfighter, as well as systems capable of detecting multiple agents, characterizing chemical, biological, and radiological toxic industrial materials (TIMs), and new warfare agents are being developed. Technological advances in the areas of CB standoff detection, early-warning detection, miniaturization, and interconnectivity are being pursued. Enhancements in detection sensitivity, interferents rejection, logistics supportability, and affordability are also being addressed. The increased lethality and heightened operational tempo of future battle spaces demand early responsive detection and warning capabilities to reduce the 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 S&T efforts, modernization strategy, and joint service programs.

Table 2-1. Detection S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Signatures in the THz region of the electromagnetic (EM) spectrum for exploitation • Improve algorithms and sources to increase range and reduce false positives • Materials usable in Surface Enhanced Raman Scattering (SERS) application for BW detection • Leverage GHz efforts by other government agencies • Increase understanding of biological variability • Detection of NTAs • Feasibility of single pathogen nucleic acid sequencing • Validate feasibility for classification in biostandoff • Feasibility of inexpensive solid-state source for deep ultraviolet	• Lab prototype of point detector using GHz and THz regions of the EM spectrum for the detection of CB warfare agents • Investigate new spectral ranges for signatures that increase discrimination from background and reduce false positives • Portable point detector for chemical contamination in potable water • Lab prototype based on SERS or Resonance Raman for the detection • Lab prototype for detection of contaminants on surfaces for validation of decontamination • Lab prototype for single molecule nucleic acid sequencing	• Nanoscale detector for CB warfare agents • Room temperature materials for optical detector elements • High-power excitation sources based on semiconductor materials • Foldable materials for high-performance optics • Exploit existing emitter sources (cell towers, radar, etc) for passive signatures in GHz/THz domain • Expendable-free detection/ identification of BW agents • Identification of all threats delivered to detector

2.2.1 DETECTION SCIENCE AND TECHNOLOGY (S&T) BASE EFFORTS

Detection S&T efforts are jointly managed, and 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 S&T efforts include standoff detection, point identification, and T&E sciences.

2.2.1.1 Goals and Timeframes

The goal of the detection 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 TIM and nontraditional agents (NTAs) (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 efforts will be completed in the near-term as part of this effort. One effort, StandOff 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. Another effort, 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 chemical warfare (CW) threats in an airborne reconnaissance application. A third effort—Lightweight Integrated CB Detection—tested three competing technology concepts and selected from among them the Rapid Aerosol Agent Detection (RAAD) concept, which uses a combination of multiwavelength 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). A fourth effort, Chemical/Biological Agent Water Monitor demonstrated an advanced prototype that will transition to meet the biological detection requirements of Increment I of the Joint Chemical Biological Radiological Agent Water Monitor, (JCBRAWM) program.

- Technology transition from DARPA with Semiconductor Ultraviolet Optical Sources (SUVOS) technology to develop a low cost biological aerosol detector in collaboration between the CBDP and the Department of Homeland Security (DHS).
- The developmental of new test methodologies to support Developmental / Operational and Evaluation requirements of the CBDP.

b. MidTerm. Midterm technologies focus on developments to improve tactical detection and identification capabilities for both CB warfare agents. To this end, work on a first-generation prototype based on millimeter wave spectroscopy for biodetection is being continued along with ultraviolet (UV) Resonant Raman (UVRR) spectroscopy for the detection and identification of biological materials. Efforts to develop technologies, which will detect surface residuals for postdecontamination, 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 CB warfare materials and processes.

c. Far Term. Far term S&T efforts focus on multiagent sensors for CBRN agent detection and remote/early warning CBRN detection. These far-term objective technologies seek to integrate CB point and remote/early warning detection modules into a single system. R&D 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. The CUGR Advanced Concept Technology Demonstration (ACTD) 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 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, interferents (i.e., false positive and negative alarms), and ambient biological background rejection. Among other technical challenges for detection are 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 the following: 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 and simulation required to fully characterize the detector system performance under battlefield conditions.

Two critical challenges to current biological agent detection technologies are the need for a *high level of logistical support* and *limitations of standoff detection systems to discriminate biological agents against the background*. 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 physical and spectral properties of BW and the correlation of these data with clinical and health effects, (2) range limitations due to atmospheric absorption, and (3) natural background interference.

2.2.2 CONTAMINATION AVOIDANCE MODERNIZATION STRATEGY

The increased lethality and heightened operational tempo of future battlespaces demand responsive detection and warning capabilities to reduce the 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 term through the 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, as well as developmental programs that are planned to be available in the midterm 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 midterm to far term primarily address joint requirements.

Early detection and warning are keys to avoiding CBRN hazards. As a result, the 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 term to midterm, though investment efforts are focused on reducing detection times. The near term to midterm 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 (OFW) Program), 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 CBDP, service contamination avoidance needs are addressed by fully coordinated joint projects.[1] ***Table 2-2*** highlights joint programs; service-unique programs are italicized. Program descriptions are provided in ***Annex A***. The joint programs are as follows:

- 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)

[1] 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.

Table 2-2. Contamination Avoidance Modernization 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)/(Ship 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 Increment 1)	• Increased sensitivity to detect extremely low levels of toxic compounds (JCAD Increment 2)	• Improved surface contamination monitor • Detection of CBR contamination in water (Joint Chemical Biological Radiological Agent Water Monitor, (JCBRAWM)
CBRN Reconnaissance and CB Remote and Stand-off Detection	• Improved CBRN Reconnaissance Vehicle with remote/early warning and data fusion capabilities and survivability upgrades (M93A1)	• Lightweight passive standoff detection for chemical agent vapors (JSLSCAD Increment I) • Light reconnaissance vehicle (JSLNBCRS) • Integrated CBRN detection (point/ standoff)/ identification/ sampling /Stryker NBCRV)	• Add biological detection and identification capabilities (JSNBCRS P3I) • Lightweight passive stand-off detection for chemical agent vapors • Joint CBRN Dismounted Recon System (JCDRS) – Spiral 1 dismounted reconnaissance capability	• Chemical Agent Standoff 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 (Stryker NBCRV) • Future Combat System (FCS) – CBRN Manned Recon and Unattended CBRN Sensors • JCDRS Spiral 2 modularized, networked dismounted reconnaissance capability
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-Multi-function RADIAC • Army -Compact, digital whole body radiation measurement (AN/UDR-13)	• Radiation detection in water (JCBRAWM)		• Standoff radiation detection and measurement • Portable radiation meter

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

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 the following:

- 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 to improve field simulant operational tests of CB detection performance
- Development of simulants and agent-to-simulant performance correlations for detection systems
- Testing of CB detection systems with NTAs
- Real-time test-data collection capabilities
- Development and fielding of a synthetic test environment for robust testing of CB detection systems

2.3 BIOLOGICAL DEFENSE PROGRAMS

Within the CBDP, 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. T&E infrastructure to support biodefense programs is included in paragraph 2.2.4 above. Program descriptions are provided in ***Annex B***. The joint programs follow:

- Joint Biological Point Detection System (JBPDS)
- Joint Biological Standoff Detection System (JBSDS)
- Joint Portal Shield (JPS)
- 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 Detection Systems	• Automatic/mobile biodetection to warn, detect, and identify bioagents (Joint Biological Point Detection System [JBPDS]) • Navy- Ship-based automatic point detection of biological agent capabilities (JBPDS) • Army- Biological Identification System (BIDS)/(JBPDS) • Joint Portal Shield Network Sensor System • Dry Filter Units (DFUs)	• Field Joint Biological Standoff Detection System to provide early warning of biological threats (JBSDS Increment I) • Complete Milestone A, down-select technologies, and transition development of lightweight and portable automatic biological agent detection for Joint Biological Tactical Detection System (JBTDS)	• Spiral Upgrade of JBPDS – increase number of agents detected and identified with increased sensitivity, lower false-positive rates; with increased reliability • Automated biological remote detection and early warning capabilities (JBSDS Increment II)	• Build III, JBPDS will exploit interoperability of disparate sensors for a detect-to-warn capability. Decreased size, weight and power will enable installation on all military platforms. Plug-and-Play modules allow greater density and a confirmatory identification (ID) capability to expedite countermeasures for high value assets • Automated biological remote detection and early warning at decreased size, weight, and power for unmanned vehicle applications with improved discrimination (JBSDS Increment III)

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 C4I, surveillance and reconnaissance (C4ISR) 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 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 TIM hazard information to affected personnel. Providing this information to the warfighter effectively 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 addressed 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 postattack situation.

Information systems also provide 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 to perform hazard analyses, operational effects analyses, and accurate training. Modeling and simulation (M&S) capabilities are used to provide situational awareness, to provide hazard-warning and prediction, and for planning or modification of operations. In the future, M&S 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, M&S aids in the assessment of joint and multi-service doctrine, training, materiel development and equipment design (i.e., simulation-based acquisition). M&S is also used to support warfighter training and the training of battle staffs using larger conflict simulations. In the latter aspect, M&S 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 S&T efforts, modernization strategy, and joint service programs, all of which support the information systems area.

2.4.1 INFORMATION SYSTEMS S&T EFFORTS

The information systems S&T efforts include four subareas: network architectures; hazard and environmental modeling; simulation, analysis, and planning; and system performance modeling. Information Systems technologies are addressing battlespace management, an S&T data backbone, rapid assimilation of sensor information research, and medical surveillance systems. 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 decision support and medical effects modeling. The technology base efforts also leverage information on weapons effects, medical and larger DoD M&S communities to address source term and toxicology, interoperability, and architectural issues.

2.4.1.1 Goals and Timeframes

The goals of CBRN defense information systems S&T efforts are to

- support the warfighter directly through existing C4ISR networks and information systems,
- support operational and National Command Authorities with CBRN defense environment decision systems, and
- support DoD-level theater and warfare simulation efforts.

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.

b. Midterm. The next generation transport and diffusion (T&D) methodologies will provide a multifidelity capability, which will afford 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 JEM that address high altitude intercepts, urban, littoral, and coastal environments, and interior contamination scenarios.

c. Far Term. The far-term capabilities will include a near-real-time operational hazard prediction capability. Integrated conflict simulation capabilities are also envisioned to meet theater and strategic simulation requirements.

Table 2-4 shows specific efforts supporting these goals.

Table 2-4. Information Systems S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Transition Common Operational Picture (COP) to JOEF/JWARN • Evaluate integration of medical syndromic surveillance • Inauguration of Sensor Data Fusion (SDF) related technologies • Conduct field trial for verification and validation (V&V) of developmental SDF algorithms • New/enhanced dispersion codes for new environments • Improved atmospheric boundary layer modeling • Aerial Port of Debarkation (APOD) impact model transition to JOEF • Chemical, biological, and radiological (CBR) effects integrated into selected tactical maneuver model • Integrate capabilities from Consequence Assessment Tool Set (CATS) into JOEF • Evaluate epidemiological modeling for insertion into JOEF and JEM • Development of multivariate decision support tool for CB investment portfolio • Development of overarching models for PMs • Determine scope of effort, begin to identify CBRN data backbone structure • Determine method for permanently capturing/retrieving data to backbone • Transition NBC Crest/AMedP8 to JOEF • Medical automation and support tools	• Develop and transition next generation technologies and net-centric enterprise integration • Integrate SDF technologies into CB network • Transition validated source determination tool • Transition validated sensor placement tool • Initial high altitude modeling capability in JEM • Comprehensive Secondary Effects Module (Agent Fate) transitioned • T&D modeling uncertainty quantification • CBR effects integrated into theater and campaign-level models/ simulations • Continue development and transition of T&E models • Full assessment of virtual prototyping capabilities • Completion of CB library • Gather data and populate backbone • Determine data to be collected and areas of future research • Provide models for syndromic surveillance, disease epidemiology, casualty estimation, and prediction of human performance in hazard environments	• High speed data acquisition supporting full spectrum decision support for CB • Develop capability to continuously refine and update contamination footprint through assimilation of limited and disparate information into meteorological and T&D models • Capability to rapidly and accurately model T&D, at high resolution and in a multitude of environments • Coupled meteorological, T&D and CB modeling capability for hazard prediction • Federate fully integrated data backbone • Development of comprehensive medical T&E model • Full immersive CB virtual environment to support test and training • Use data for experimentation, and training, T&E, model development • Investigate genomic and proteomic modeling within the human body to investigate agent pathology • Perform modeling to enable predictive pharmacology and toxicology for therapeutic purposes

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 improved information systems include the following:

- Commanders and battle staffs that are better trained and able to analyze alternate courses of action with advanced simulations.
- Less confusion and more consistent decision making as a result of using a federation of analytical and real-time CBD situational awareness tools.
- CBRN defense systems and operational concepts match requirements more closely because warfighter feedback is captured earlier in the development cycle under the tenets of simulation-based acquisition.
- 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.

The DoD anticipates over thirty technology transitions by FY09, 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. These changes will add the following capabilities to the JEM, JOEF, and JWARN programs:

- Simulation of 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
- Use of internal building models
- Models of chemical IED effects on mobile forces
- Other methodologies for improving situational awareness

By 2013, the military force will have significantly improved information systems technologies to support information sharing and situational awareness of CBRN hazards in the battlespace, supporting the net-centric future focus of the department.

2.4.1.3 Major Technical Challenges

Major technical challenges for information systems include the following:

- Characterizing CBRN hazards on complex, urban terrain and fixed sites
- Characterizing human effects, small unit behaviors and low-level/long-term exposures in CB environment
- Rapidly assimilating CBRN-related data to support tactical and T&E applications
- Developing engineering-level models of CBRN defense equipment
- Developing engineering-level models of DoD defense equipment in CBRN hazard scenarios
- Obtaining CB warfare relevant data to facilitate M&S and IT development that facilitates decision superiority
- Integrating CBRN-related IT with other emerging technology initiatives (i.e., TMTI-and TCTI-related requirements)

Information system 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 midterm.

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) M&S systems. ***Table 2-5*** shows the roadmap of DoD requirements for both warning and

Table 2-5. Information Systems Modernization Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Warning and Reporting Systems	• JWARN Block IF – Urgent Needs Statement (UNS)	• Automatically collect and consolidate sensor information • Transport sensor-derived information through the JWARN component interface device (JCID) network to the host C2 platform • Generate hazard area plot ATP-45 and JEM • Display hazard warning area on Common Operational Picture (COP) • Generate warning and de-warning (NBC) messages to affected forces • Integration with full spectrum of command and control (C2) and C4ISR systems and interoperability across the joint battlespace	• Full Global Information Grid (GIG) Compliance • Wireless sensors and connectivity to C2 and C4ISR systems • Cross-domain security solution for sensor network reporting and management from unclassified to classified DoD networks • Integration of new sensors.	• Integration of new sensors
Hazards Analysis	• Transition Hazard Prediction and Assessment Capability (HPAC) • Vapor Liquid Solid Tracking (VLSTRACK) - UNS • D2PUFF - UNS	• Fully integrated web-based JEM that which includes the best of breed of: a. Transition HPAC - UNS b. VLSTRACK - UNS c. D2PUFF (UNS) • Integrated with the JWARN • Interoperability with authoritative DoD meteorological data systems: Virtual Natural Environment Net-Centric Services (VNE-NCS), Meteorological and Oceanographic (METOC) Data Service (MDS), Integrated Meteorological System (IMETS), Joint Weather Impact System (JWIS), etc.	• Urban, littoral, and coastal effects modeling • High altitude missile intercept effects modeling • Weather effects above 20 km and precipitation • Improved transport and diffusion methodology • Minimum 10% improvement in accuracy and speed • Estimate the source location(s) and source term • Estimate human effects from a 5,000 weapon worldwide strike • Predict fatalities and incapacitation, both initial and delayed (up to 180 days), by country (metropolitan area) • Accommodate population moves including area evacuations or sheltering in place	• Waterborne hazards • Complex structures, building interiors • Human performance degradation • Contagious/infectious diseases • Effects on aircraft at various altitudes/ ships underway

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Operational Effects Analysis	• No current fielded capability. Tools exist and are utilized such as STAFFS and NBC CREST, but no integrated program of record capabilities exist.	• Strategic Deliberate Planning in a C4ISR Environment (Common Operating Environment/ Command and Control Personal Computer, COE/C2PC) • Operational deliberate planning in a C4ISR environment (COE / C2PC) • Operational crisis planning in a C4ISR environment (COE / C2PC)	• Strategic deliberate planning in a C4ISR Environment (stand-alone) • Operational Deliberate Planning in a C4ISR Environment (Standalone) • Tactical deliberate planning in a C4ISR environment (COE/ C2PC and stand-alone) • Strategic crisis planning in a C4ISR environment (COE/ C2PC and stand-alone) • Operational crisis planning in a C4ISR environment (stand-alone) • Tactical crisis planning in a C4ISR environment (COE/ C2PC and stand-alone)	• Full spectrum of military incident response and consequence management at military installations/sites and in C4ISR environments (COE and stand-alone) • Full spectrum of civilian incident response and consequence management at civilian sites and in C4ISR environments (COE and stand-alone)
Training Simulation Systems	• None	• Warning and reporting capabilities (supports training and planning) • Hazard analysis capabilities (supports training and planning) • Operational effects analysis capabilities (supports training and planning)	• Warning and reporting capabilities (supports training and planning) • Hazard Aanalysis capabilities (supports training and planning) • Operational effects analysis capabilities (supports training and planning) • Optimization of placement of decontamination personnel, materials, and equipment to speed the decontamination process, restore operational tempo and minimize exposure of personnel to hazards	• Warning and reporting capabilities (supports training and planning) • Hazard analysis capabilities (supports training and planning) • Operational effects analysis capabilities (supports training and planning) • Sensor placement optimization.

reporting and M&S, and highlights capabilities being developed and procured and the near term and developmental programs that are planned to be available in the midterm to far term. Legacy systems that are still maintained by the services are not addressed 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 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.

The CBD M&S program includes efforts from technology base through full-scale system development and demonstration. The 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 a T&E master plan.

The 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 a 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, the 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 simulation-based acquisition (SBA) will be prepared to transition to full-scale development programs. In the midterm, 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 2008. 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 (JPMIS), 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 the following:

- Development of high-speed ground-truth and test-environment monitoring capabilities to improve operational testing and the ability to compare model predictions to measured field-simulant cloud behavior
- 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 S&T efforts, modernization strategy, and joint service programs.

2.5.1 DECONTAMINATION S&T EFFORTS

The S&T 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 S&T 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 noncorrosive, 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. The program has focused on technologies to address transition milestones for the Joint Materiel Decontamination System (JMDS), Joint Portable Decontamination System (JPDS), and the Human Remains Decontamination System (HRDS). For JMDS the program is focusing upon the development of a gaseous system based on hydrogen peroxide with ammonia as an additive to achieve broad-spectrum reactivity. Also, reactive fabric-based solvent wipes are being developed as part of the tool kit for the JMDS. For the JPDS, the program is evaluating a number of approaches involving chemistry solutions and technologies. The desired products are liquid-based systems for a one-liter spray device or a 5-gallon backpack-type unit. These products are for use in operational decontamination scenarios. Several approaches based on liquid chlorine dioxide-based solutions are being studied. Other candidates for this application are peroxide-based systems with nucleophiles. Enzymatic generation of reactive components is also being studied. In support of the HRDS, the program is investigating reactive nanoparticle-based reactive sorbents and impregnated fabrics for the containment system.

b. Midterm. This covers the FY 09–FY13 period. In light of the changing manner in which the future force will be operating, the decontamination program strategy is shifting emphasis from requirements-pull to technology-push. The program is incorporating a new vision to look at decontamination at the systems-of-systems level, and is looking to evolve technologies to allow personnel the capability to perform immediate, thorough decontamination of skin and personal equipment items. In terms of the tactical decontamination of equipment, the aim is the same for both platform interiors and exterior surfaces. Similarly, in area decontamination we plan to achieve the same results in the longer term.

Table 2-6. Decontamination S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Broader involvement of academic and industrial research • Analytical and predictive decontamination modeling • Wide-area solutions • Alternative scientific process methodologies to maximize efficacy • Process application/dispersion methodology(ies) to maximize decontamination efficacy	• Robust Decontamination Knowledge Base – Agent-surface interaction – Identification and selection of candidate decontaminants – Efficacy of candidate decontaminants – Decontaminant effects on sensitive and "durable" materials • New Generation/Alternative Science Decontaminants and Decontamination Systems – Demonstrated efficacy against all agents – Includes the full spectrum of chemical agents, biological agents, TIM, and other novel agents and materials – Environmentally benign – Effective on numerous surfaces	• Create a dramatic technological change that transforms existing doctrinal decontamination practices • Improved capabilities allow for thorough decontamination of skin and personal equipment by the individual within immediate decontamination time requirements • Improved capabilities for thorough decontamination of crew-served systems allow for thorough decontamination of equipment by the crew within operational decontamination time requirements

Technologies under consideration include evolutionary approaches and revolutionary approaches. The program is looking at alternative processes based upon applicator systems to achieve this goal. For liquid decontamination, we are examining mixed formulations and novel enzymatic materials. Also under investigation are a number of approaches using reactive nanoparticles in a variety of matrices. Coating systems are slated to be studied possibly as early as FY08 depending on the outcome of current DARPA efforts in this area.

c. Far Term. A number of technology options can be pursued, all consistent with the TCTI vision as a system of systems. Planned research areas intend to push the edge of current technologies. A number of concepts in the coatings area point to some intriguing possibilities. The most intriguing involves a "smart systems" approach. The concept is to evolve technologies that can encapsulate and react with agents or possibly act as both sensor and active decontaminant. Nanotubes and nanoclusters of various compositions may afford this capability.

2.5.1.2 Potential Payoffs and Transition Opportunities

The payoff from enhanced decontaminants and decontamination systems will be new noncorrosive, nontoxic, 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 TIM contamination and implications to domestic scenarios, are being exploited.

2.5.1.3 Major Technical Challenges

There are a range of technical challenges associated with CB decontamination. Warfighters need decontaminants that are reactive, nonaqueous, noncorrosive, safe for use on sensitive equipment, able to decontaminate a broad spectrum of CB agents, environmentally safe, and pose no unacceptable health hazards. Additionally, warfighters need 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 community has 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 the DoD, and highlights capabilities being developed and procured in the near term, as well as developmental programs that are planned to be available in the midterm to far term. Legacy systems that are still maintained by the services are not addressed 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. R&D of noncorrosive, all-agent multi-purpose 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.

Table 2-7. Decontamination Modernization Strategy

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Personal Equipment Decontaminants	• M291 Skin Decontaminating Kit • M295 Decontaminating Kit Individual Equipment	• Joint Service Personnel/Skin Decontamination System (JSPDS) Increment I	• Noncaustic, noncorrosive decontaminant for personnel and equipment	• JSPDS Increment II
Bulk Decontaminants	• High Test Hypochlorite (HTH) • Supertropical Bleach (STB)	• Noncaustic, noncorrosive, 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 decontaminant applicator systems for immediate and operational decontamination (Joint Portable Decontamination System Increment I)	• 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)

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Deliberate Delivery Systems	• M17 Lightweight Decontamination System • M12A1 Power Driven Decontamination Apparatus • Army –Rebuild M12A 1 Power Driven Decontamination Apparatus; Replace M17 Lightweight Decontamination System Multipurpose Decontamination System • Commercial lightweight decontamination system (interim replacement/supplement for the M17 LDS (Fixed Site) • 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	• 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) • Nonaqueous 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 multiservice, unless indicated as a service-unique effort (italicized text).
2. Where applicable, systems that meet requirements are listed following the entry.

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 for 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 Laboratories–developed DF-200 was fielded to address the urgent need for an environmentally friendly decontaminant.

In the near term and midterm, the DoD continues to research new multipurpose 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 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 nonaqueous 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 nontoxic and noncorrosive, 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 that 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 the following:

- Development of hazard-assessment models for decontamination
- Expanded CW agent decontamination system capabilities
- Development of capabilities to assess the effects of decontamination on battlefield performance
- Development of capabilities to test decontamination procedures under battlefield-relevant conditions including development of reactive simulants for use in operational testing
- Development of decontamination test methodologies for NTAs
- Development of updated methods to assess the degradative effects of the decontaminating process on equipment and systems.

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 three areas—individual protection, collective protection, and test methodology development. Because of the similarities of many of the technologies, the JSTO-CBD manages the S&T program as an integrated portion of the protection capability area. However, JPEO-CBD manages individual and collective protection systems separately.

- ***Individual protection*** programs develop new ensembles worn by the individual warfighter to provide protection against CB agents. Individual protection taxonomy follows potential routes of entry, including: respiratory, ocular, and percutaneous. Technologies, once mature, are then transitioned to the Joint Program Manager (JPM) – individual protection for incorporation into acquisition programs. 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 subareas 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, and materials technologies for mask lenses and face pieces. Protective gloves are being developed that will have greater durability, tactility, and dexterity and that 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*** programs develop systems that provide shelters, buildings, and platforms (vehicles, vessels, and aircraft) with a toxic-free environment to support mission continuity without impacting the operations tempo. Technologies, once mature, are then transitioned to the JPM – Collective Protection for incorporation into acquisition programs. The collective protection program is driven by capability gaps identified as "Expeditionary Collective Protection." There are two subareas 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.

- ***Test methodology development*** supports the transition of new technologies by developing and validating new test methods that are transitioned into test range capabilities. Methodologies, once mature, are transitioned from JSTO-CBD to the Program Director for Test Equipment Strategy and Support (PD-TESS) at the JPEO-CBD for validation of the range capability.

2.6.1 PROTECTION S&T EFFORTS

User issues with current protective systems focus on factors such as burden, costs, duration of performance, and effectiveness against a full range of agents. From an S&T standpoint, these operational challenges translate to the development of materials and systems that capture, block, or destroy agents more effectively than the current systems without increasing material weight or costs, while reducing burden and lessening the impact on mission performance, S&T efforts also address the general technology areas (themes) of air purification, materials science, human performance and systems science.

2.6.1.1 Protection Goals and Timeframes

Protection research projects support joint acquisition programs as the means of getting technology to the warfighter. The timing and goals of the protection S&T program are aligned with acquisition programs. See ***Table 2-8*** for the timeframes associated with the protection S&T strategy. The Joint Expeditionary Collective Protection (JECP) system has near-term milestones and drives most of the near-term objectives. A future individual protective ensemble, tentatively titled the Joint Chemical Ensemble (JCE), will drive the majority of midterm technology transitions. Additional technology drivers include support to Major Defense Acquisition Programs (MDAPs) that are outside the CBDP. MDAPs supported may include the Ground Soldier System (GSS), a component of the Army's Future Combat System (FCS) for individual dismounted soldiers, and support for MDAP vehicles and platforms that have specific collective-protection requirements.

Valid and applicable methodologies are essential to support technology transition and provide a means for end-item qualification for fielding. Test methods that address individual components, subsystems and whole systems are developed concurrently with the applicable technology. Timeframes generally reflect the timeframe of the specific technology.

a. Near term. The focus of the near term is to transition specific technologies that support the JECP program and associated MDAP vehicles and other platforms. Goals of these programs align with capability gaps in "Expeditionary Collective Protection" and "Fixed Site Collective Protection." Specific goals are to (1) reduce the weight, size, and power requirements of collective protection (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 TIM, and (4) improve the ability of transportable shelter systems to be deployed. To achieve these goals, improvements to system components are being investigated along with improvements to the current vapor and particulate filtration media. Regenerative vapor and particulate

Table 2-8. Protection S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Regenerative and Reactive Air Purification • Improved Single-Pass Filtration • Shelter Materials, Coatings, and Treatments • Advanced Air Purification (AAP) model • Test and Evaluation Methodologies	• Integrated Protective Fabric • Novel Respiratory/Ocular Protection • Human Performance-based Design Studies • Novel sorbents • High-Efficiency Nanofiber filters • Alternative ColPro System Technologies	• Network-centric Protective Technologies • Embedded Sensors • Intelligent Materials • Reactive Hybrid Approaches • Nano-Closure Systems • Self-Detoxifying Surfaces/Materials

filtration materials processes are being investigated to eliminate the need for filter change and improve the capability against any battlespace CBRN hazards. Specific technologies are as follows:

1) *Regenerative and Reactive Air Purification*. Complete development and validation of technologies that have emerged over the previous 3 to 10 years to replace activated carbon, single-pass filtration technologies. This includes evaluation of electro-thermal swing adsorption (ESA) technologies and fabricates a high-fidelity prototype for transition during FY08. Pressure/temperature swing adsorption (P/TSA) regenerative air purification and catalytic oxidation (CATOX) efforts continue to be funded through the Chemical and Biological Defense Initiative Fund (CBDIF).

2) *Improved Single-Pass Filtration*. Develop a residual life indicator (RLI) system and examine chemical vapor pulse probes to assess the remaining capacity for chemical agents. This technology will provide an on-line capability of assessing collective protection filter systems. Additionally, a high-fidelity prototype filter will be fabricated and tested. This will culminate research in sorbent technologies and includes novel, optimized particulate and sorbent media that provides broader protection against chemical warfare agents (CWA) and TIMs at a lower encumbrance as compared to currently fielded end-items. Both technologies are candidates for retrofits in fielded systems.

3) *Shelter Materials, Coatings and Treatments*. Complete work on a new lightweight barrier material that is suitable as an exterior tentage material. This material will incorporate n-chloramines into the interior face of the fabric and will be assessed against spore-forming biological agents, HD, and selected NTAs. Additionally, work will be completed on the assessment coatings that can rapidly prepare existing structures for expedient collective protection shelters.

4) *Advanced Air Purification (AAP) model*. Complete work on a trade study tool for the sizing, optimization, sensitivity analysis, and assessment of advanced air purification systems. Initial modeling capabilities will be for improved single pass, CATOX , P/TSA, and ESA.

5) *T&E Methodologies*. Complete development of component-and system -test methodologies to support JECP development timelines. Work includes the development of an integrated and real-time swatch test methodology, air purification component, subsystem, full-system test methodologies, and whole-system chamber and field test methodologies. Methodology and referee equipment development will be transitioned to the PD-TESS.

b. Midterm. The focus of midterm technology transitions will support initiation of an integrated ensemble program of record and address the user's desire of developing a novel approach to individual protection. The primary goal of individual protection is to address capability gaps identified in "Respiratory & Ocular Protection," and "Percutaneous Protection." The burden and degradation of mission performance are the warfighters' primary issue with currently fielded individual protection systems. Additionally, individual protective systems must address the inhalation, ocular and percutaneous threat of aerosolized agents, NTAs, and emerging threats. Physical solutions are focused on the development of novel materials that can provide an increased level of protection while reducing the physiological and logistical burdens associated with prolonged use of the items. Approaches include the development of strong, lightweight, and tactile barrier materials; agent-resistant, selective permeable materials, and aerosol and vapor-resistant breathable materials. The addition of a self-detoxification component is also being pursued to enhance the protection (and lighten) protective materials, increase service-life, and reduce the secondary transfer and re-aerosolized threat during doffing procedures. Individual air purification physical solutions are focused on the development of novel materials for advanced adsorbents and aerosol/particulate filtration with the aim of reducing the size, weight, profile, and breathing resistance of the filter while increasing performance across a broader range of potential threats that include TIMs. An integrated ensemble, designed to reduce burden and enhance mission performance, will become the platform for these new technologies. Burden and mission degradation are based on a multitude of both cognitive and physiological factors. These factors and being identified and will form the bases of design heuristics and early assessment techniques.

Additional technology transitions will provide fundamental advances in collective protection by providing whole-system approaches rather than current component approach. Studies are being conducted that build on the lessons learned from DARPA's Immune Building program that uses a computer model called the Immune Building Toolkit for analysis of alternate system and technology approaches. These studies will identify alternate collective protection technologies that will be developed and transitioned in the midterm.

c. Far Term. As warfighters become increasingly connected to the network, protective technologies should integrate with this emerging capability. Integrated and automated information linkages can reduce the overall burden to the warfighter by automatically responding to increase protection when hazards are imminent, and reducing protection (and burden) when hazards have passed. Additionally, intelligent materials could report exposed personnel and initiate decontamination and/or therapeutics.

Efforts in collective protection will seek novel, low-cost, and scaleable approaches that allow seamless incorporation into all building and vehicle designs and support rapid (field) conversion of fixed facilities. System approaches will be developed that allow less dependence on overpressure techniques and depend more heavily on network integration and rapid response. Technologies that include strippable coatings, self-detoxifying surfaces, and responsive (switchable) surfaces will be developed to support collective protection configurations that can rapidly mitigate fugitive internal contamination transfers.

2.6.1.2 Overview of DARPA Protection Programs

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 initial phase will demonstrate approaches applicable to military vehicle exteriors as well as coatings that are compatible with sensitive electronics.

2.6.1.3 Major Technical Challenges

User issues with current protective systems focus on factors such as burden, costs, duration of performance, and effectiveness against a full range of agents. From an S&T standpoint, these operational challenges translate to the development of materials and systems that capture, block, or destroy agents more effectively than the current systems without increasing material weight or costs, while reducing burden and lessening the impact on mission performance. Specific challenges are subdivided below in the technology theme areas of air purification, material science, human performance, and systems engineering.

a. Air Purification.

1) *Removal of hazardous low-molecular weight chemical vapors*. Chemically impregnated activated carbon (ASZM-TEDA) has limited the service life and effectiveness against acid-gas agents and low-molecular weight chemical TIMs. Technologies are needed that increase adsorption/removal effectiveness, extend service life, and decrease size and weight. New sorbents based on novel materials (e.g., nanotechnology) show the potential to have significantly higher capacities and agent uptake rates to reduce the pressure drop and lower filter profile, and can be tailored to low-molecular weight compounds.

2) *Energy efficient non-adsorptive processes*. Reactive processes such as catalytic oxidation of chemical agents or heat destruction of biological agents require too much power for economical use in situations where waste energy is not available. New-technologies or innovative applications or current technologies are needed to significantly reduce the power consumption and achieve the required agent destruction.

3) *Highly efficient low resistance sub-micron particulate removal*. Current high-efficiency particulate (HEPA) technologies create significant pressure barriers (pressure drop) to airflow and have poor performance for particles below 0.3 microns. Techniques that decrease pressure drop by increasing surface area through pleating increase the size of the filter bed. Technologies are needed to significantly decrease pressure drop (per unit area) and increase efficiencies for submicron particulate removal. Additionally, efficient (size, weight, power) technologies are needed for regenerable and/or medialess particulate removal technologies.

4) *Residual life indicators (RLIs)*. Protective systems such as filters and protective garments have finite service lives stipulated on the label or technical manual. However, service life is often strongly dependent on environmental factors such as temperature, relative humidity, and environmental contaminant loading. This can lead to equipment/material being discarded when significant service-life remains, or remaining in service without sufficient capacity remaining. Technologies are needed to continually apprise the user of the residual life of the item, without taking the item out of service. RLIs must be broad-spectrum and directly correlate to residual capacity of the media and not be specific to targeted contaminants or agents.

b. Material Science.

1) *Stable, selectively reactive, self-detoxifying materials*. Self-detoxifying materials are seen as a means of increasing service life and performance, while simultaneously decreasing thermal burden. Additional benefits also include reducing secondary contact hazards and re-aerosolized hazards during the doffing process. These materials need to be safe, shelf-stable, and effective against a broad spectrum of potential agents.

2) *High efficiency selectively permeable materials (SPMs) and breathable high-efficiency aerosol/particulate barriers.* Selectively permeable barriers provide a means of keeping agents (liquids, aerosols, and vapors) out while allowing water vapor out and thus reducing the thermal burden. The currently (limited) fielded SPM protective ensembles have similar thermal burden characteristics to air-permeable, adsorptive protective ensembles, but provide the advantage of a lower-packed volume and weight and increase the protection against finely aerosolized agents. To decrease the thermal burden to users, new SPMs, not currently available on the market, are needed that increase water vapor permeability and increase liquid agent barrier performance. Additionally, there is the development of elastomeric SPMs, which are a new class of barrier materials that can be used in form-fitting closures or replace impermeable barrier materials in certain applications. Breathable, high-efficiency aerosol/particle barriers can be used in conjunction with adsorptive or self-detoxifying technologies to capture aerosolized agents. Potential approaches, such as the use of nanofiber meshes, have the potential to be highly effective and breathable, but issues such as robustness and manufacturability must be addressed before this technology becomes a viable option.

3) *Ultrathin, high-strength, and flexible/tactile barrier materials*. Classical and nontraditional agents penetrate many polymeric barrier materials. To achieve the required protection levels, current materials used for gloves, boots, and shelter systems are often thick and stiff. This results in reduced tactility, degraded performance of fine-motor tasks, and increased the thermal burden. New materials are needed to allow the construction of thin and strong chemical agent barriers for low-weight CB shelters, and thin and tactile CB protective gloves and boots.

4) *Lightweight/low-power or passive microclimate cooling*. CB protective ensembles significantly increase the heat burden on the warfighter. Materials are needed that can reduce thermal burden by a combination of increasing water vapor permeation and air permeation, and reducing thermal resistance (R value), or by other means of exploiting natural cooling processes– all of which can be incorporated into protective ensembles. Active power-demand technologies are desired if they accentuate passive cooling processes and operate on 30 watts of power or less, and provide 150 watts or more of cooling effect.

5) *Intelligent, controllable, switchable, and selective permeation materials*. As warfighters become increasingly connected to the network, protective technologies should integrate with this emerging capability. Integrated and automated information linkages can reduce the overall burden to the warfighter by automatically responding to increase protection when hazards are imminent, and reducing protection (and burden) when hazards have passed. Additionally, intelligent materials could report exposed personnel and initiate decontamination and/or therapeutics.

6) *Human Performance*. Cognitive and physiological parameters related to "comfort" and performance. The burden and degradation of mission performance is the warfighters' primary issue with currently fielded individual protection systems. Burden and mission degradation are based on a multitude of both

the cognitive and physiological factors. Some factors such as heat burden are well quantified, but others such as cognitive effects of encapsulation are not. Multivariant analysis is needed to provide trade-off models to advise and optimize design of individual protection ensembles for cost, performance, and burden.

7) *Systems engineering.* Alternative protection system studies. Currently fielded and developmental individual and collective protection still use a variation of a basic design derived shortly after World War I. Whole-system analysis is needed to determine the value of new and emerging technologies that may allow a revolutionary systems approach to individual and collective protection (CB).

2.6.2 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 term 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-term, midterm, 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), will require enhanced compatibility with life support equipment and tactical systems. They will also require the capability to protect against NTAs and TIMs, 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 a 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 Solution/Integrated Footwear System (AFSs/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 the following:

(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 CP 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.

Protection efforts are in place to support major weapons systems developments, such as the U.S. Army's FCS; the 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.

2.6.3 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 composed 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 semipermeable membranes are being tested to determine the R&D potential and for possible consideration in next-generation suit technology.

The Joint Project Manager for Individual Protection (JPM IP) is pursuing an 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 (CPFCs), 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. The IFS will fulfill the JSLIST and Joint Service Protective Aircrew Ensemble (JPACE) requirement for a launderable CB protective sock for wear under service footwear. The 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 the IFS in conjunction with their service foot wear.

The JB2GU will provide hand protection against liquid, vapor, and aerosol CBRN agents, semipermeable 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 (POLs) or field contaminants. The JB2GU system will meet all service requirements for NBC protective gloves for both JSLIST and JPACE. The block 2 glove effort will improve upon the block 1 glove by incorporating more robust testing, and it will provide a glove solution that satisfies a broader set of user requirements, i.e., JSLIST operations requirements document (ORD) 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 Combat vehicle Crewmen (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 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 fixed-wing aviators and aircrew and USN, USMC, USA, and USSOCOM rotary -wing aviators and aircrew. JPACE will provide aviators with a modern capability that replaces the impregnated undergarment and CWU-66/77P, using proven JSLIST technology. As noted above, the JC3 is being developed 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 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-hour mission and be flame retardant. Block 2 will address the Rotor-wash Protection Key Performance Parameter (KPP) requirement.

Surface Respiratory Protection. DoD is developing 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 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 noncombat 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 six hours.

Aviation Respiratory Protection. The 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 applications and one for fixed wing—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 a 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

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 which provides resistance to liquid and vapor agents and allows expansion of a protection area, 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:

- Army–Chemically Protected Deployable Medical System (CP DEPMEDS),
- Air Force–Collectively Protected Expeditionary Medical Support (CP EMEDS), and
- Navy–Chemically Protected Expeditionary Medical Facility (CP EMF).

The CPFH will integrate environmentally controlled collective protection into already fielded Army, Air Force, and Navy field hospitals to sustain medical operations in a CBRN-contaminated environment for 72 hours.

The 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. The 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 up to 6,500. The CP EMEDS provides a contamination-free environment where medical treatment can be rendered to personnel without the encumbrance of IPE (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–500-bed hospital or a 20-to-116 bed Expeditionary Medical Facility (EMF). The EMF may be 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 nondivisional, forward area medical treatment facilities. The system is self-contained/self-sustaining. It is permanently integrated with a mobile dedicated platform 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 subsystem 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. The office of the Joint Project Manager for Collective Protection (JPM-CP) executed the TRE, which consists of four separate focus areas, each having unique testing requirements and in most cases requiring different subject-matter experts to manage the technical assessments. These focus areas included air purification processes, CB barrier material and quick CP erect technologies, CP support equipment, and whole CP systems. The CP TRE identified mature, applicable CP technologies to the

JPM-CP. The JPM-CP is, in turn, using the TRE findings to transition the best CP technologies to the warfighter. A number of the acquisition programs that benefit from the CP TRE include the JECP, JCPE, Marine Corps EFV, the Army FCS and Navy LCS.

Other near-term to midterm CP efforts, such as the JCPE, will use the latest technologies in air purification, environmental controls, and power generation to improve and/or standardize current CPE so that it is lighter, more efficient, more affordable and less logistically burdensome. The JECP will be the next-generation lightweight, modular, easily transportable, self-supporting CP system that will provide relief from psychological and physiological stresses during sustained operations in a contaminated environment. Additionally, redesign and concept trade-off assistance regarding advanced filtration technologies, such as pressure swing adsorption (PSA) and catalytic oxidation (CatOx) have been provided to the United States Marine Corps (USMC) EFV and to the U.S. Army advanced-vehicle efforts. The United States Air Force (USAF) is currently undergoing a major upgrade to its mobile and fixed-site CP capabilities.

2.6.4 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 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 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 materiel 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 the 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 the 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.

2.6.5 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 CP 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 TIMs that are related to hazard estimates
- Development of next-generation materials tests that provide expanded threat and operational conditions and quantitative data relevant to toxicological values
- Improved dynamic system simulant tests that provide near-real-time sampling data and a wider range of simulated agent challenge types

Table 2-9. Protection Modernization Strategy

		Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Protection Ensembles	Surface	• Joint Service Lightweight Suit Technology • Black Vinyl Overboot • Joint Block 1 Glove Upgrade	• Joint Block 2 Glove Upgrade • Alternative Footwear Solutions • Integrated Footwear System • Joint Coverall for Combat Vehicle Crewmen	• Joint Chemical Ensemble	
	Aviation	• Joint Protective Aircrew Ensemble			
Respiratory Protection	Surface	• M40 Series Mask • M42 Series Mask • M45 Series Mask • M53 Series Mask	• Joint Service General Purpose Mask • Joint Service Chemical Environment Survivability Mask		
	Aviation	• *Aircrew Eye Respiratory Protection*	• Joint Service Aircrew Mask for Rotary Wing Pilots	• Joint Service Aircrew Mask for Fixed Wing Pilots • Joint Service Aircrew Mask for the Joint Strike Fighter	
Universal/ Common IPE		• Joint Service Mask Leakage Tester • M41 PATS			
Collective Protection		• Chemical and Biological Protective Shelter* • *Chemically Protected Deployable Medical System** • *Collectively Protected Expeditionary Medical Support** • *Shipboard Collective Protection System - Backfit** • M20A1 Shelter*		• Joint Expeditionary Collective Protection	

1. All programs shown are joint or multiservice. 2. Where applicable, systems that meet requirements are listed following the entry. 3. Blank cells indicate new programs pending definition of new requirements and/or technological breakthrough identified through S&T investment.

* Continuing procurement in the near term

2.6.6 SUPPORTING SCIENCES AND NEW INITIATIVES

The Threat Agent Sciences (TAS) capability area develops S&T data to support the physical S&T capability areas, special topics, and policy issues. TAS executes science that supports the other physical S&T capability areas as well as T&E methodologies. The data generated in this capability area are also directly incorporated into combatant commands' tactics, techniques, and procedures (TTPs) and other manuals. TAS maintains research in traditional threats as well as nontraditional and emerging threats. TAS concentrates on defining threats in scientific terms that are useful in the development of technologies that protect against them. The physical S&T division of JSTO-CBD has initiated an effort to develop revolutionary and integrated technologies that will be delivered to the FCS and potentially other mission areas. This effort is called the Transformational Countermeasures Technologies Initiative (TCTI). While this effort is in the process of developing a budget and program plan, the concept is being initiated within the FY07 S&T program.

2.6.6.1. TAS Efforts

The S&T efforts in this area are grouped into the four thrust areas: (1) agent characterization and stimulant development, (2) computational chemistry and predictive modeling, (3) environmental fate of agents on militarily relevant surfaces, and (4) physiological response to low-level agent exposure. TAS identifies and addresses gaps in the understanding of CB threats, including the physical and chemical properties of agents, environmental stability and transport, and toxicological properties. Addressing these gaps is critical to facilitate development of detection, protection, decontamination, and information systems. It also improves warfighter decision-support tools and provides a sound scientific basis for doctrine and policy development. While there are substantial (but not complete) data on the health effects of traditional CW threats and TIMs, there are fundamental data gaps for determining quantitative infectious/toxic levels of concern for biological agents. However, even with the necessary data to substantiate a set of health-based criteria for minimum required detection and decontamination levels, a lack of consensus has hindered previous efforts to establish effective DoD criteria. Efforts are under way to ensure new criteria are approved through medical channels. Such criteria will be defensible, consistent, and relate to an appropriate and beneficial level of operational risk reduction.

2.6.6.1.2 Goals and Timeframes

The goal of TAS is to develop technologies on the scientific characterization of threats that provide the starting material for all other commodities and their technology development efforts (see ***Table 2-10***).

Table 2-10. TAS S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Transition data gained in DTO CB.42, Environmental Fate of Traditional CWA, to JEM and JOEF. • Transition data gained in DTO CB.51, Low-level CWA Exposure, to TTPs, manuals, and appropriate models. • Initiate efforts on the Environmental Fate of Chemical Nontraditional Agents. • Initiate efforts on the Physiologic Response to Low-level Chemical Nontraditional Agent Exposure. • Transition Aerosol Production Methodologies to the T&E community. • Begin leveraging computational technologies to aid in simulant development, physiological response, and environmental fate of agents.	• Finish efforts in environmental fate of NTAs. • Finish effort in physiologic response to NTAs. • Continue development of *in silico* tools for molecular modeling of environmental fate and physiologic response. • Continue agent-simulant correlations for NTAs. • Leverage computational chemistry techniques (molecular modeling, QSAR, etc.) to enhance simulant development efforts.	• Develop a systems approach for CB defense with an integral component being TAS. • Begin developing *in silico* approaches for predicting agent characteristics, physiologic response, and environmental fate.

This work also directly supports key concerns and requirements as described in the Joint Priority List and Capabilities Baseline Analysis for the four CBRN defense operational elements outlined in the Joint CBRN Defense Modernization Plan.

a. Near Term. Identify and map the scope of effort required for characterization of new threats to include NTA synthesis and characterization, agent fate studies for NTA and surfaces of interest, and operational toxicology studies for NTAs.

- Develop agent (CWA, BWA and NTA) simulants to support T&E applications and define operational envelopes in which simulants may be used for developmental testing (DT) and operational testing (OT).
- Provide data for predictive modeling of thickened CWA. Complete interim policy to address DoD "how clean is safe" issues.
- Improve JSTO S&T investment strategy by developing and implementing a methodology for assessing risk in CBRN defense.
- Develop an empirically based, biological dose-response for hazard assessment.
- Establish standards for BWA characterization standards, preparation techniques, transition of non-pathogenic simulants, sampling methods, and agent – simulant correlation studies.
- Compare/contrast MNF SOP resource plans to DoD CBRN defense programs.
- Identify and fill potential gaps in JSTO S&T program.
- Leverage research in computational techniques.

b. Midterm. During this timeframe, TAS will execute programs on the environmental fate of, and physiological response, to low-level exposure to chemical NTAs. Another aim is to accurately describe CWA and NTA environmental and physiological interactions at the atomic and molecular level using molecular dynamics, quantum chemical methods, and quantitative structure-activity relationship (QSAR) computational tools. The area also plans to expand simulant development and correlation efforts for the evolving NTA threat. Finally, TAS plans to leverage multidisciplinary work in nanotechnologies, information technologies and computational chemistry.

c. Far Term. Integrate TAS into a systems approach to chemical-biological defense. Develop *in silico*-based approaches for predicting agent fate, physiological response, agent characteristics, and simulant development.

2.6.6.1.3 Potential Payoffs and Transition Opportunities

TAS has a number of near-term transition opportunities, including simulants to support T&E applications for traditional CBW agents and NTAs; definitions of operational envelopes in which simulants may be used for DT and OT; aerosol production technology to the CBDP T&E community; data for predictive modeling for thickened CWA; interim policy to address DoD "how clean is safe" issues; and Multinational Force SOPs for CBRN (including TIM) defense and consequence management to DoD.

2.6.6.1.4 Major Technical Challenges

TAS faces a variety of technical challenges. For instance, there are already known threats that were developed to evade protection, detection, and medical treatment capabilities; and others may emerge via natural or technological evolution that accomplish the same end. Little is known about their chemical, physical and toxicological properties or their exact mechanisms of action within the human physiological environment.

It is also extremely important, as well as extremely challenging, to meet the needs of the T&E community. It is necessary to ensure that the infrastructure and methodologies provided by the S&T community are validated and verified and that appropriate simulants with the physicochemical properties of CB agents relevant to the specific application (e.g., testing) and interactions (e.g., environmental, material) are identified. As a subfactor, there may not be a single simulant for an individual agent or class of agents that is the "perfect simulant"; rather, a suite of simulants may be required.

Describing the environmental fate of agents and their interactions with operationally relevant surfaces, equipment and materiel, as well as understanding how agents interact within the human body to include mechanism of action, target organ/cell/molecule, long-term effects, etc.) present significant challenges. Not the least of these is the requirement for investment in costly, hazardous live-agent testing (on the lab bench, in

field tests, and in long-term animal experimentation) for extrapolating to real-world needs. Identifying alternatives to such expensive and hazardous testing is both necessary and challenging.

Exploiting advances in computational chemistry and biology may help identify such alternatives, increase the payoff of experimental work, and enhance the understanding of fundamental phenomena. Yet such exploitation will require a significant investment to ensure the fidelity of the tools employed prior to their use as well as a rigorous validation postdevelopment. It may be possible to decrease the cost of this investment by leveraging efforts from the pharmaceutical and chemical industry.

Finally, TAS faces the challenge of facilitating rapid, readily-employed dissemination of scientific data with significant operational impact from within the JSTO-CB RDT&E projects to the RDT&E community and the warfighters.

2.6.6.2 Transformational Countermeasures Technologies Initiative (TCTI)

In response to the OSD Program Strategy Guidance for the FY08–13 POM, the JSTO-CBD has proposed a new initiative that will capitalize on recent and future advances in the areas of nanotechnology, biotechnology, information technology, and cognitive sciences. The e TCTI will use the emerging field of nanotechnology, biotechnology, information technology, and cognitive sciences (NBIC) convergence as the cornerstone for a new paradigm on CBD S&T planning and execution. The initiative reflects a goal of understanding and capitalizing on the transformational technological changes that are taking place. A revolutionary (vs. evolutionary), interdisciplinary (vs. stove-piped), and science-based (vs. needs-based) strategy must be developed to achieve this goal. This initiative will require a collaborative effort between the organizations charged with developing the tactics, requirements, S&T, and acquisition of military equipment and its employment. In a break from the current approach, S&T will lead the development of new combating WMD technologies to make a rational assessment of what kinds and levels of transformation are possible within the existing fiscal constrains.

The JSTO-CBD advocates the development of an advanced integrated combat garment for the future warfighter. Such a system would integrate equipment- bearing ballistic protection, internal environmental controls, and full CBRN defense capabilities. To develop this system, the JSTO-CBD has made investments in advanced fabrics, masks, filters, gloves, boots, etc. However, the next-generation protective ensemble must take advantage of novel materials and technologies such as nanofibers, nanopore filtration media, reactive chemistry, CB agent-sensing fibers, power generation from solar/kinetic/thermal sources, embedded radio frequency (RF) sensing and transmission, and many others. The convergence of these transformational technologies will provide the most-advanced protective and operational capabilities ever imagined and make the 21st Century warfighter a more effective asset in all future combat environments.

This integrated system will be capable of sensing the presence of adverse substances of CBR origin, initiate physical/medical countermeasures, and provide battlefield awareness to the wearer as well as to the command nodes in real time. These same technological advances will directly apply to force protection and consequence management requirements for structures, facilities, and installations as well as critical defense systems being developed by the major defense acquisition programs (MDAPs). The expected transition of these revolutionary technologies, based upon current planned funding, is not expected until the 2015–2020 timeframe. The project's strategy will initially focus on a significant investment in basic research early in the process to identify, exploit, and expand innovative NBIC research. Applied technology projects will not be numerous until 2010–2013, since there are no mature NBIC technologies at this time. As the TCTI project identifies and nurtures basic research efforts, NBIC technologies will be available for maturation in the latter parts of the FY10–13 timeframe.

2.7 MEDICAL DEFENSE

2.7.1 INTRODUCTION

Along with individual and CP, medical systems form the third area associated with the CBRN 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 CBRN defense requirements. Technology and development advances are being pursued in the creation and manufacturing of vaccines and pharmaceuticals that prevent the lethal or incapacitating effects of CB 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. These medical countermeasures (MCMs) are developed while incorporating best practices from both industry and government.

Within the CBDP, medical 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, and diagnostics. For advanced development and procurement programs, the JPEO-CBD manages these capabilities under the Joint Project Manager for Chemical Biological Medical Systems (JPM-CBMS). The JPM-CBMS is composed 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 2-11*** 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 midterm to far-term.

The medical CBD 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 CBD R&D 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 CBD medical readiness include the following:

- 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 FDA for application of the Animal Efficacy Rule[2], 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 CB threat agents, including species and strain identification.
- Studies to elucidate the toxicity and mechanism of action of NTAs, and to determine the effectiveness of current MCMs.
- Studies to evaluate the effects of exposure to low levels of 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 MCMs under the FDA Emergency Use Authorization authority enacted by Section 1603 of the National Defense Authorization Act for Fiscal Year 2004, Section 1603: Authorization for medical products for use in emergencies.

[2] 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.

Table 2-11. Medical CBDP 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) • Licensed Anthrax Vaccine Adsorbed (AVA) • Licensed Smallpox vaccine (Dryvax)	• Increment I bioscavenger (pBioscavenger) clinical trial; potential transition to the DHHS for advanced development • Initiate Increment II Bioscavenger nerve agent prophylaxis effort • Procurement of improved smallpox vaccine from DHHS/BioShield • Continue advanced development of plague and recombinant botulinum (A/B) neurotoxin vaccines • R&D of multiagent vaccine platforms.	• Develop Increment II Bioscavenger • Vesicant agent prophylaxis candidate • Development of recombinant botulinum neurotoxin vaccine (A/B) • Potential reduced dose schedule for AVA • Plague vaccine candidate in advanced development • Continued development of multiagent vaccine platforms	• Licensure of nerve agent "bioscavenger" (human butyrylcholinesterase) pretreatment • Development of Increment III nerve agent catalytic bioscavenger pretreatment • Licensure of improved SERPACWA (aTSP) • Licensure of vesicant agent prophylaxis • Licensure of vaccines botulinum neurotoxins (A, B) and plague • Licensure of filovirus vaccines (Marburg and Ebola) • Alternative delivery methods for vaccines and immunogens • Development and licensure of vaccines for Venezuelan, Eastern, and Western equine encephalitis viruses (VEE, EEE and WEE) and ricin • Development and licensure of filovirus vaccines (Marburg and Ebola) • Transition opportunities for ricin, filovirus, and equine encephalitis virus vaccines • Development and licensure of multiagent vaccines against multiple BW threats to advanced development.
Therapeutics	• Licensed Reactive Skin Decontamination Lotion (RSDL) • Licensed ATNAA (Antidote Treatment Nerve Agent Autoinjector)	• Procurement of vaccinia immune globulin for smallpox vaccine complications • Demonstration of immunotherapies for filoviruses, bacteria, and toxins • Development of siRNA and asRNA as therapeutics against filovirus • Improved oxime in advanced development • Licensure of intravenous therapeutic for smallpox • Advanced development of two oral therapeutics for smallpox	• Licensure of advanced anticonvulsant • Licensure of advanced vesicant therapeutics and wound decontamination products • Licensure of two oral therapeutics for smallpox • Licensure of an antisepsis drug for treatment of shock associated with filovirus infection • Advanced development of a monoclonal antibody for filovirus infection • Advanced development of a botulinum toxin small molecule therapy	• Licensure of novel therapies using antisense or similar strategies • Development of receptor-targeted therapeutics • Advanced therapeutics for blister agents • Development of next-generation (non-oxime) acetylcholinesterase reactivators

continued on next page

	Fielded Capabilities	Near (FY07-08)	Mid (FY09-13)	Far (FY14-23)
Diagnostics	• FDA-approved Joint Biological Agent Identification and Detection System (JBAIDS), Block I assay to detect anthrax in blood and blood cultures • JBAIDS Block I enhancement: manual nucleic acid sample prep kit • Transition of standardized immuno-diagnostics to Critical Reagents Program (CRP)	• Transition of eight additional candidate JBAIDS, Block I assays to advanced development • Transition of eight additional standardized immunodiagnostics assays/reagents to CRP • JBAIDS Block I enhancement: automated nucleic acid sample prep system and kit • Continued Fielding of JBAIDS Block I • Establishment of systems evaluation testbed/decision matrix methodology • Establishment of rapid resequencing center • Validation of Cholinesterase assay • Validation of GB, GD, and VX assays	• Continue assay development support for Next Generation Diagnostics with a focus in gaining FDA approval • Advanced development of candidate Next Generation Diagnostics System (NGDS) • Advanced development of integrated sample preparation module • Advanced development of multiplexed nucleic acid module • Advanced development of multiplexed immunoassay module • Advanced development of data fusion module • Validation of presymptomatic biomarker signatures	• Licensed chemical exposure medical diagnostic devices • NGDS system enhancements • Advanced development of presymptomatic biomarker signatures • Evaluation of reagent-less diagnostics technologies • Research of noninvasive diagnostic technologies • Evaluation of portable rapid resequencing capabilities
Medical Radiological	• Prussian Blue • Potassium iodide • Hematopoietic growth factors	• Complete dose reduction factor (DRF) and toxicity studies of 6 promising candidates • Assess LD90/30 survival assays of at least 6 promising candidates • Estimate peripheral blood profile of at least 2 promising candidates • Evaluate cytokine expression for next 2 most promising candidates	• Complete toxicity, pharmacodynamic, and immunogenic properties of at least two anti-apoptotic, anti-inflammatory agents that protect against acute radiation syndrome and demonstrate both early and late radiation injuries • Develop efficacy of radiological prophylactic agents that protects both the hematopoietic system and gastrointestinal (GI) tract from acute radiation injury • Advance at least two medical radiological countermeasures through FDA licensure; others rapidly following as funds become available	• FDA-licensed military radiological defense (MRD) agents in hand to mitigate hematopoietic syndrome, gastrointestinal (GI) syndrome, and respiratory pneumonitis/fibrosis from acute radiation injury • Fully integrated rapid development and cGMP production procedures for combination of MCMs
TMTI	• (n/a – research initiative started in FY06)	• One or more drugs to counter hemorrhagic fever viruses or intracellular bacteria developed to the Investigational New Drug (IND) submission stage. Other drug candidates developed as funds permit • Platform technologies initiated; standard operating procedures under development; target pathways identified	• At least one drug advanced through FDA licensure; others rapidly following as funds permit • Platform technologies developed and under test; standard operating procedures in place; effectiveness of a range of model drug candidates developed using this system under investigation	• FDA licensed therapeutics in hand to counter hemorrhagic fever and intracellular bacterial diseases • Fully integrated rapid development and production procedures to identify and counter genetically modified threats and emerging diseases

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 the selection of several DARPA research efforts in the Pathogen Countermeasures Program for transition to joint medical biological defense research efforts within the CBDP technology base. The selected programs include the following:

- 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 ribonucleic acid (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) deoxyribonucleic acid (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).
- Development of a broad-spectrum antibiotic against all Ciproflaxcin-resistant organisms.
- Novel techniques including random homozygous knockouts to identify therapeutic targets even for infections of unknown etiology.
- Development of a siRNA platform technology that has preliminary efficacy against avian influenza and hemorrhagic fever.

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 the DTRA (JSTO-CBD) and DARPA signed a MOA to facilitate transfer of promising technologies and research, and committing both parties to the development of technology transfer standards and procedures.

2.7.2 REDUCING RELIANCE ON THE USE OF ANIMALS AS SUBJECTS OF RESEARCH

Joint medical CB 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 that 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. For example, DARPA's Rapid Vaccine Assessment Program seeks to eliminate preclinical animal testing by creating an artificial human immune system on a chip. 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[3] that specify the use of nonhuman primates (NHPs) 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

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

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." 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.

2.7.3 PRETREATMENTS S&T EFFORTS

2.7.3.1 Goals and Timeframes

The goal of the pretreatments capability area is to conduct basic research 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 multiagent vaccines, molecular vaccines, new vaccine platforms and adjuvants, and alternate (needle-free) delivery methods. There are four subareas within the pretreatments capability area:

- *Multiagent Vaccine Development:* This subarea's objective is the 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 the 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 twofold. 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 multiagent biodefense vaccines. Developed under the sub-thrust 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 enhancement of innate immunity, which could provide nonspecific and broad-spectrum protection against biothreat agents.
- *CWA Pretreatments:* This portfolio addresses the requirement for effective pretreatments against CW agents. One objective is to field a bioscavenger, an advanced pretreatment that is effective against classic and nontraditional agents based on physiological scavengers such as the human butyrylcholinesterase (HuBuChE) 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, HuBuChE 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. Both a plasma-derived human butyrylcholinesterase enzyme (pBuChE)

and a recombinant butyrylcholinesterase (rBuChE) enzyme have passed Milestone A. The pBuChE will be developed through Phase I clinical trials by the DoD and transitioned to the DHHS for potential licensure. The rBuChE is being developed through MITS. The S&T emphasis in this area is on developing recombinant and catalytic bioscavengers that will protect against both organophosphate nerve agents and NTAs.

Current prophylactic measures do not adequately address the full spectrum of CB weapon (CBW) threats. In the chemical pretreatments subarea, Soman Nerve Agent Pretreatment Pyridostigmine (SNAPP) was approved under the very first demonstration of the FDA's Animal Efficacy Rule, and a barrier skin paste, SERPACWA, has been approved and fielded for protection against percutaneous exposure to CW agents. In biological pretreatments, two licensed vaccines exist for protection against biological warfare (BW) agents (anthrax and Smallpox). In addition, a plague vaccine, a vaccine against botulinum toxin (subtypes A and B), and an improved anthrax vaccine have transitioned to advanced development. The improved anthrax vaccine is being developed by the DHHS under Project Bioshield. 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 the FDA, use of pretreatments in IND status (as well as other products in IND status) is limited in accordance with procedures defined in Department of Defense Directive (DoDD) 6200.2, *Subject: Use of Investigational New Drugs for Force Health Protection*, dated August 1, 2000, which establishes policy and assigns responsibility for compliance with 10 USC 980, 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 the 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. Midterm opportunities include the development of the Increment II Bioscavenger. Long-term targets include the licensure of the 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, near-term biological pretreatments include the continued advanced development of bacterial (plague) 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. Midterm opportunities include continued development of plague and Botulinum A/B vaccines as well as potential transitions to; advanced development of filovirus (Ebola and Marburg) vaccines, Venezuelan, Western, and Eastern Equine Encephalitis virus vaccines, and ricin, toxin vaccines. In the current POM (FY08-13), funding for the advanced development of filovirus, ricin and Equine Encephalitis virus vaccines was eliminated. Therefore, these transition opportunities may be delayed until the far term. Far-term targets include licensure of all near-term and midterm vaccine candidates in advanced development (see ***Table 2-12***). Additional basic research leading to new vaccine approaches for the intracellular bacterial threats (Tularemia, Brucella, and Burkholderia) is being funded, potentially focusing on the critical host-pathogen interface within the cell. Furthermore, the program has concluded a DTO (defense technology objective) evaluating several alternatives to hypodermic needles for administration of multiagent and recombinant protein vaccines. The results of this research, which 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 the development of effective protective immunity. 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 2-12. Pretreatments S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Block I bioscavenger (pBioscavenger) clinical trial; potential transition to the DHHS • Block II nerve agent recombinant bioscavenger candidate in advanced development • Plague vaccine candidate in advanced development • Recombinant botulinum neurotoxin vaccine (A/B) in advanced development • Research and development of multiagent vaccine platforms	• Block II nerve agent recombinant bioscavenger candidate in advanced development • Plague vaccine candidate in advanced development • Recombinant botulinum neurotoxin vaccine (A/B) in advanced development • Continued development of multiagent vaccine platforms	• Licensed nerve agent "bioscavenger" (human butyrylcholinesterase) pretreatment • Development of Block III nerve agent catalytic bioscavenger pretreatment • Licensure of vaccines for botulinum neurotoxins (A, B) and plague • Development and licensure of vaccines for Venezuelan, Eastern and Western, equine encephalitis viruses (VEE, EEE, and WEE), and ricin • Development and licensure of filovirus vaccines (Marburg and Ebola) • Transition opportunities for ricin, filovirus and equine encephalitis virus vaccines • Development and licensure of multiagent vaccines against multiple BW threats to advanced development

2.7.3.2 Potential Payoffs and Transition Opportunities

Investment in pretreatments that provide protection against CB agents will yield significant gains in force health protection capability while preserving maximal operational flexibility in CB 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 available. 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 under way to develop superior protection against threat agents. The Rapid Vaccine Assessment (RVA) Program aims to develop reliable methodologies that will accelerate the S&T base necessary to achieve three-dimensional (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. In FY06, the experimentally verified utility of the system was demonstrated for the tetanus toxoid vaccine. In FY07, there will be a testing schedule to validate all current and previously-fielded vaccines on a panel of civilian and military personnel.

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 is both unethical and prohibited.

2.7.4 THERAPEUTICS S&T 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 CBD 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, TIMs, 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 the 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 six 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 the identification of new therapeutic targets to be employed in the 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 the identification of new molecular therapeutic targets that will be employed in the 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, CW 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 the identification of new molecular therapeutic targets to be employed in the

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, NTAs); 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 the identification of new therapeutic targets that will be employed in the development of advanced or next-generation treatments for intoxication by CWAs.
- *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 CWAs, with specific emphasis on biochemical, toxicological, and behavioral effects, and to determine the efficacy of extant MCMs 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.
- *Nontraditional 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 MCMs 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 NTAs-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.

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 the FDA, use of therapeutics in IND status (as well as other products in IND status) is 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.

Midterm 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 NTAs, with licensure projected in the midterm. 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 2-13***).

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 2-13***).

Table 2-13. Therapeutics S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Advanced development of oxime candidates • Licensure of intravenous therapeutic for smallpox • Advanced development of two oral therapeutics for smallpox	• Licensure of advanced anticonvulsant • Licensure of oxime candidates • Licensure of advanced vesicant therapeutics and wound-decontamination products • Licensure of two oral therapeutics for smallpox • Licensure of an antisepsis drug for treatment of shock associated with filovirus infection • Advanced development of a monoclonal antibody for filovirus infection • Advanced development of a botulinum toxin small molecule therapy	• Licensure of novel therapies using antisense or similar strategies • Development of receptor-targeted therapeutics • Advanced therapeutics for blister agents • Development of next-generation (non-oxime) acetylcholinesterase reactivators

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 presymptomatic time points, effective therapeutics will lead to rapid return to duty, and are critical capabilities for sustaining the force in CB environments. Additionally, treatment in the presymptomatic 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 BW defense. DARPA has an effort under way 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. In addition, DARPA's Accelerated Manufacture of Pharmaceuticals Program attempts to create an extremely rapid, flexible, and cost-effective manufacturing system with a goal to produce 3 million doses of protein vaccines and protein-based therapeutics within 12 weeks. This revolutionary manufacturing platform promises extraordinary flexibility, allowing for the manufacturing of vaccines to protect against a wide range of viral, protozoan, fungal, bacterial, and toxin antigens to meet the needs of the warfighter. The resulting

platforms will deliver a rapid, flexible, inexpensive, and highly effective MCMs capability against both established and emergency threats.

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, and 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. The DTRA is preparing for an expanded role in facilitating the 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 the 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 S&T 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 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 the 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 subthrust areas and has two ongoing DTOs:

- *Technology Assessment.* This subthrust 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 and protein microarrays, multiplexed and orthogonally complex assays, whole genome amplification, and mass-spectral/bioinformatic approaches. This subthrust area directly supports the JBAIDS, Block I and Next Generation Diagnostics System (NGDS).
- *Assay Development.* This subthrust 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 subthrust area directly supports the JBAIDS Block I and NGDs.
- *Identification of Novel Biomarkers.* This subthrust 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 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 subthrust area leverages work performed in the other subthrust areas by employing *in vivo* animal model systems for diagnostic assay validation testing and testing platforms and assays under field conditions. T&E results are used in concept of operations (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.
- *Genetically Engineered Threats.* A new DTO was approved in FY05 to support this area of research (DTO CB.64) 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. This also 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.

The chemical diagnostics area seeks to develop screening procedures and definitive analytical methods testing biomedical sample for individual exposure to CWAs (see ***Table 2-14***, below).

Table 2-14. Diagnostics S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Continuing support for JBAIDS Blocks I and NGDS transition of eight additional candidate JBAIDS, Block I assays to advanced development • Transition of eight additional standardized immunodiagnostics assays/reagents to Critical Reagents Program (CRP) • JBAIDS Block I enhancement: automated nucleic acid sample prep system and kit • Establishment of systems evaluation test bed/ decision matrix methodology. • Establishment of rapid resequencing center. • Validation of cholinesterase assay • Validation of GB, GD, and VX assays	• Evaluate and recommend technologies suitable for NGDS, an integrated hand-held diagnostic device incorporating sample preparation, BWA, and toxin detection into one instrument • Advanced development of integrated sample preparation module • Advanced development of multiplexed nucleic acid module • Advanced development of multiplexed immunoassay module • Advanced development of data fusion module • Validation of presymptomatic biomarker signatures	• NGDS system enhancements • Advanced development of presymptomatic biomarker signatures • Evaluation of reagent-less diagnostics technologies • Research of noninvasive diagnostic technologies • Evaluation of portable rapid resequencing capabilities

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 MCMs, 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 presymptomatic host responses (early biomarkers) and translating that information into diagnostic assays to detect chemical and biological warfare (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 MEDICAL RADIOLOGICAL DEFENSE

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 the 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, the ASD(HA). A comprehensive strategy and program for medical radiological defense is under development by ASD(HA). In FY06, the CBDP initiated a medical radiological defense S&T effort, which is managed by the JSTO-CBD. Following is a description of the CBDP-funded medical radiological defense efforts.

2.7.6.1 Goals and Timeframes

The medical radiological defense (MRD) capability area within the CBDP conducts and manages applied and advanced research to develop lead candidates for MCMs against radiological and nuclear exposure, which are essential components to treat warfighters exposed to the damaging effects of acute radiation syndrome (see ***Table 2-15***).

Table 2-15. Medical Radiological S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• Complete dose reduction factor (DRF) and toxicity studies of 6 promising candidates • Assess LD90/30 survival assays of at least 6 promising candidates • Estimate peripheral blood profile of at least two promising candidates • Evaluate cytokine expression for next two most promising candidates	• Complete toxicity, pharmacodynamic and immunogenic properties of at least two anti-apoptotic, anti-inflammatory agents that protect against acute radiation syndrome and demonstrate both early and late radiation injuries • Develop efficacy of radiological prophylactic agents that protects both the hematopoietic system and GI tract from acute radiation injury • Advance at least two medical radiological countermeasures through FDA licensure; others rapidly following as funds become available	• FDA-licensed MRD agents in hand to mitigate hematopoietic syndrome, GI syndrome, and respiratory pneumonitis/ fibrosis from acute radiation injury • Fully integrated rapid development and Good Manufacturing Practices (cGMP) production procedures for combination of medical countermeasures

Unlike chemical exposure where MOPP (mission-oriented protective posture) protection and medical chemical antidotes can provide a sufficient level of protection and reduction in morbidity, the weaponized use of ionizing radiation on the battlefield will result in unavoidable casualties. MOPP cannot protect against penetrating rays of gamma particles, some high-energy beta, particles and neutron particles, so pre-exposure protection will also be limited. Therefore, safe and effective MCMs are necessary to prevent or minimize the damaging effects of radiation to the body. They must also be able to be administered in a field-expedient manner. Because potential MCMs appear to have different mechanisms of action, they could very well be used in combination in the treatment of casualties following acute radiation exposure. They may also have useful applications for noncombatants who are minimally exposed to ionizing radiation. To meet this challenge, medical radiological defense R&D is directly tied to warfighter capability requirements. Categories addressed in this capability area include three subareas: radioprotectants, postradiation therapeutics, and diagnostic biodosimetry biomarkers. Emphasis is placed on three subareas within the MRD capability area for technologies and approaches leading to the development of syndrome-specific radiation-induced injuries, i.e., hematopoietic, pneumonitis/respiratory fibrosis, and gastrointestinal syndromes. All subareas within the MRD capability area will depend on the development of validated animal models and surrogate indicators of human efficacy (necessary preconditions for FDA approval):

- *Hematopoietic Syndrome:* For treating approximately 1-6 Gy irradiation, studies in this area use cytokines, growth factors, and steroid hormones to stimulate production of leukocytes and thrombocytes; and antioxidants and free radical scavengers to reduce the oxidative effects of ionizing radiation.
- *Pneumonitis and Respiratory Fibrosis:* This thrust area has two goals: mitigation of the onset of pneumonitis soon after irradiation and the long-term development of respiratory fibrosis by administration of combined therapeutics such as anti-inflammatory agents, free radical scavengers, antioxidants, antimicrobial agents, and other promising MCMs.
- *Gastrointestinal Syndrome:* For treating approximately 5-9 Gy irradiation, projects target underlying mechanisms of therapeutics action on the mucosal lining of gastrointestinal tract. The research effort will be to develop a combination of treatment, including antiapoptotic, anti-inflammatory agents, antioxidants, steroid hormones, cytokines/growth factors, free-radical scavengers, somatostatin analogues, and antimicrobial agents.

2.7.6.2 Potential Payoffs and Transition Opportunities

In FY06, the JSTO-CBD began a medical radiological defense S&T effort under the CBDP with a minimal investment (less than $300,000), which was used as seed money to screen the efficacy of four to five steroid hormone, antioxidants, and free-radical scavengers in rodents. For FY07, after a market survey and extensive literature search, the JSTO-CBD evaluated 15 medical radiological countermeasures candidates for Milestone-A designation. During FY07, the advanced developer, the Chemical Biological Medical Systems Joint Project Management Office, will evaluate these and other candidate compounds and initiate advanced development activities on one candidate leading to eventual FDA approval.

2.7.6.3 Major Technical Challenges

The medical treatment to respond to a radiological and nuclear event is based upon the type of event. Some interventions are specific for the ingestion or inhalation of a particular radionuclide, for example, potassium iodide for radioactive iodine or DTPA for transuranic metals. The medical response for radiation doses in excess of approximately 2 Gy will be guided primarily by the radiation dose, organs exposed, and the presence of combined injury and underlying medical conditions. For this reason, the medical approach is organ- and syndrome-related so that available countermeasures will be considered in context with the overall acute radiation syndrome (ARS) and the delayed effects of acute radiation exposure (DEAR), which can occur months, years or decades after exposure. For doses above 2 Gy, hematopoietic syndrome leading to bone marrow suppression and immunosuppression are critical. For certain organs doses above ~4-8 Gy, late organ dysfunction may occur months or years later. Coupled with other illnesses or environmental exposures over a lifetime, subclinical radiation-induced injury may become clinically important so that the mitigation of subclinical

radiation injury may be of significance to warfighters and veterans. For doses less than 2 Gy, the long-term effects of carcinogenesis would be the only major radiation-related issue. Current major technical challenge in developing MCMs against radiological and nuclear threats include the ability to develop radioprotectants that are less toxic because the current FDA-approved therapeutic drugs that could be used in the treatment of acute radiation exposure are not practical for battlefield use, due to potential off-label use requirements associated with administration, of such drugs, the intravenous mode of administration and the close medical monitoring required during and following administration.

2.7.7 TRANSFORMATIONAL MEDICAL TECHNOLOGIES INITIATIVE (TMTI)

2.7.7.1 Goals and Timeframes

The mission of the TMTI is to develop broad-spectrum therapeutic countermeasures to protect the warfighter from conventional or genetically engineered biological threats, known or emergent. The use of novel technology platforms and an innovative management approach to achieve seamless integration between discovery and development will accelerate countermeasure development. The Initiative will accelerate the development of new medicines by establishing alliances with academia and the pharmaceutical and biotechnology industries, through which applicable drug candidates will be identified and incorporated into the program. Directed development through targeted solicitations will be initiated to broaden the scope of therapies for consideration. Additionally, the selection of drug candidates that are already in an advanced stage of development will significantly reduce the time to FDA approval. The JSTO and the JPEO-CBD will establish a joint program manager for the TMTI (JPM TMTI) to exercise day-to-day management of the ongoing execution of the projects under the TMTI. The JPM will manage contracting and the funds to be obligated under contracts. The JPM will also develop and implement the detailed acquisition strategies needed to transition mature technologies to products.

The initial TMTI therapeutic development programs address warfighter requirements to counter hemorrhagic viruses and intracellular bacteria (see ***Table 2-16***). Technology platforms are being developed to identify novel and genetically modified biological agents and to facilitate the preparation of therapeutic agents to counter these threats. In FY06, 26 multiyear contracts were awarded across these four thrust areas for research established within the TMTI:

- *Innate Immunity and Cytokines:* Selective manipulation of the hereditary components that provide an immediate "first-line" of defense to continuously ward off pathogens (innate immune response) is identified as having the potential to provide effective defense. The immediacy of the innate immune response contrasts with adaptive (or acquired) immunity that takes longer to develop. Understanding of the consequential action of cytokines, which mediate the immune response in a variety of modes, is also essential. The general goal in this area is to identify the best-candidate innate immune potentiator platforms for development as broadly protective therapeutics against weaponized pathogens, thus departing the "one bug: one drug" model. Balancing near-term needs (first-generation compounds) with long-term success is critical.

Table 2-16. TMTI S&T Strategy

Near (by FY08)	Mid (by FY13)	Far (by FY23)
• One or more drugs to counter hemorrhagic fever viruses or intracellular bacteria developed to the IND submission stage. Other drug candidates developed as funds permit • Platform technologies initiated; standard operating procedures under development; target pathways identified	• At least one drug advanced into FDA-licensure process; others rapidly following as funds permit • Platform technologies developed and under test; standard operating procedures in place; effectiveness of a range of model drug candidates developed using this system under investigation	• FDA licensed therapeutics in hand to counter hemorrhagic fever and intracellular bacterial diseases • Fully integrated rapid development and production procedures to identify and counter genetically modified threats and emerging diseases

- *Genomics:* The study of all the genes in a person or organism and their functions, includes the molecular interactions of those genes with each other and with the environment (for instance, in such a way as to cause disease). This area also seeks to understand the structure of the genome, including the mapping of genes and the sequencing of DNA. An understanding of the genome can characterize host-pathogen relationships, explain the molecular basis for pathogenesis, provide a means of identifying pathogens, and enable advanced vaccine development.
- *Proteomics and Small Molecules:* The study of the proteome includes the complete set of proteins produced by an organism, their properties and activities: how they are produced and modified, when and how they are expressed, how they are involved in metabolic pathways, and how they interact with one another. Analysis of pathogen proteome can lead to vaccine development, detection and diagnostic systems, and treatments. Small molecules can also stimulate (or block) an immune response when they are attached to a carrier protein. Analysis of the proteome is much more difficult than the genome because proteins are more complex relative to the nucleic acids that constitute the genome.
- *Metabolomics:* The analysis of metabolites, the small molecules (such as sugars and fats) generated in the process of metabolism. These metabolic products are studied as signatures of an organism's condition. They can be markers of the progress of a disease and can, for instance, be used to identify the action of a pathogen and/or a treatment. Metabolites can also be analyzed to determine the effect of a genetic alteration (as in "functional genomics") or change in environment on an organism. As a less-mature state of technology, metabolomics is considered a mid-to-long range S&T investment target, where early success would be best achieved if coupled with proteomics and genomics.

2.7.7.2 Potential Payoffs and Transition Opportunities

The direct payoff from investment in the TMTI is a new paradigm for developing therapeutic countermeasures against BW agents. Coupled with the development of new platform technologies and methodologies for quickly identifying genetically modified and/or emerging diseases, the efforts of the TMTI will lead to the discovery and production of therapeutics that will either prevent the warfighter from being susceptible to a biological attack or will assist the warfighter in maintaining an operational capability following such an attack.

2.7.7.3 Major Technical Challenges

Major technical challenges include the ability to identify appropriate drug candidates in midstage to late-stage development that are effective against the agents of interest; the ability to identify common infectivity pathways; the ability to find therapeutic agents that block such pathways without toxicity to the host; assuring that such pathways, once blocked, will not impair the warfighter's ability to operate. Additional technological challenges involve the ability to develop procedures to rapidly identify and produce countermeasures to new BW agents.

2.7.7.4 TMTI Strategy and Issues

The TMTI mission is to produce broad-spectrum therapeutics that are effective against BW agents of interest and to develop procedures for rapidly identifying and counteracting BW agents that have not as yet been encountered. TMTI is "transformational" in generating products and in its approach to managing R&D. These approaches will do the following:

- Encourage the full and open exchange of information between entities performing biodefense-related R&D through coordination and cooperative efforts among the DoD and other government agencies already in biodefense including the DHHS (including its agencies – NIH, CDC, and FDA), industry, and academia.
- Identify and advance drug candidates that are further along in the development process, thereby shortening the time to FDA licensure.
- Establish the JPM, with personnel to manage drug candidates from discovery through FDA licensure. Projects will be managed throughout their full lifecycle by the JPM rather than undergoing the traditional transition from the JSTO to JPEO. This maintains an end-to-end view of the development process, enables dynamic portfolio management, and enhances the coordination of performer activities to ensure timely product outputs.

- Establish technology platforms to identify and counter genetically engineered or other novel biological agents.

2.8 CHEMICAL BIOLOGICAL DEFENSE HOMELAND SECURITY PROGRAMS

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

The CBRN-defense homeland security and force protection area seeks to provide urgently needed protection and response capabilities to 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 57 National Guard Bureau Weapons of Mass Destruction Civil Support Teams (NGB WMD-CSTs), USAR reconnaissance and decontamination elements, other DoD CBR response units and to continental United States (CONUS) and outside continental United States (OCONUS) 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 Consequence Management (CM) program offices meet these missions using a spiral acquisition strategy to expedite the procurement and fielding of emerging capabilities. At this time, efforts are focused on effectively fielding government and commercial-off-the-shelf technologies and products (GOTS/COTS) to meet the urgent needs of CBR response units and installation commanders. 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 (SBA) tools and processes so that optimized use can be made of available resources.

2.8.1 CBRN DEFENSE HOMELAND SECURITY AND FORCE PROTECTION S&T EFFORTS

The CBRN-defense homeland security area leverages 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 this 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 subsystem S&T will meet the vast majority of the area requirements.

2.8.1.1 Goals and Timeframes

The goals of CBRND homeland security are to support the establishment and equipping of 57 WMD-CSTs; fielding and equipping the 20th SUPCOM, USAR reconnaissance and decontamination units; and providing integrated CBRN protection, information management, and response capabilities to DoD installations. All equipment for 55 teams has been purchased, certified, and fielded. Two additional teams were authorized in 2006 and will be fielded in 2008. The IPP has been reshaped based on the results of the QDR (Quadrennial Defense Review) and sustained a decrement of $535M in procurement funds.

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 versus 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 the 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 operationally oriented commodity areas previously described in this chapter. As these commodity areas complete development of emerging capabilities, each product or system will be evaluated for its applicability in meeting the needs of the ongoing CBRN-defense homeland security efforts. Thus, the modernization strategy for this area does not rest on the development of new capabilities, but rather focuses on the integration of existing and developing capabilities into an integrated and effective system of systems.

2.8.3 INSTALLATION PROTECTION PROGRAM (IPP)

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 protection and response capability to reduce casualties, maintain critical missions, and effectively restore essential operations. The JPM guardian has an assigned mission to do the following:

- 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 (FoS) package is fielded as a single, integrated system designed to meet the specific needs of the installation. The design stresses flexibility and the capability for future technology insertion.

The IPP is in a period of evolutionary transition. Over the past three years, the scope and resources to support the IPP changed significantly. Initially, the program was scoped and funded to support a complex, integrated family of systems consisting of CB fixed sensors, individual and CP, first responder capability, information management, a robust decision support system, mass notification, and medical surveillance and protection. With the funding decrement in FY05, the program was revised to focus on the first responder, a limited incident management system, mass notification, and a telephonic notification system. In June 2006, the OSD completed a study validating the need to continue with the IPP program and identified both material and nonmaterial gaps affecting CBRN installation protection. The study recommended the establishment of a tiered program structure that enhances protection at all installations but provides additional resources to preserve mission capability at priority bases.

The IPP consists of a tiered FoS that includes detection, identification, warning, incident management, individual and CP, medical surveillance, protection, response, and initial recovery. The baseline tier consists of nonmaterial solutions to include training materials, military and civilian CONOPS and mission area analysis (MAA) templates, and exercise plans and scenarios. Tier 1 adds to the baseline tier by providing material

solutions to include enhanced first responder capability to include individual protection and chemical, biological and radiological portable handheld detection and identification systems; mass notification and telephonic alerting systems and an incident management system. Tier 2 consists of the baseline and Tier 1 capabilities, and adds collective protection, fixed chemical and biological point detection systems, and a more robust decision support system. This FoS package is fielded as a single integrated system designed to meet the specific needs of the installation. This approach is flexible enough to accommodate the needs of specific installations and accommodate technology insertion while standardizing major system elements to provide cost-effective solutions.

In addition to the IPP, the PM IPP also manages the Army's Emergency First Responder Program (AEFRP) which complements the IPP support to the Army. The AEFRP provides enhanced emergency-response capability to select Army installations. This program provided upgraded first responder capability to 20 Army installations in FY05 and an additional 15 installations in FY06. For FY07, 16 Army CONUS installations, 6 OCONUS installations and 10 USARG installations are in progress. Capabilities include improved personnel protection, CBR detection and survey systems, individual decontamination as well as improved CONOPS and tactics, techniques, and procedures. This program is executed in concert with the IPP ensuring system interoperability and compatibility across Army installations.

The JPEO-CBD/JPM Guardian IPP constitutes the DoD's effort to field a full spectrum of NBC installation protection capabilities designed as a FoS to military installations and DoD-owned or leased facilities. The JPM Guardian procures GOTS/COTS systems designed to meet the operational requirements as identified in the URCD, October 14, 2003, and revalidated August 19, 2005.

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. Coordination has included the following Programs and initiatives within DoD: Immune Building Program (DARPA), Unconventional Nuclear Warfare Defense (UNWD) Program (DTRA/DOE), BioNet (DoD/DHS), the CBDP S&T Program (DTRA), CASPOD ACTD (DTRA), and The Defense of Cities Study (DOE).

2.9 CHEMICAL AND BIOLOGICAL T&E ACTIVITIES

This section provides a description of T&E 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 CBD equipment and MCMs 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 CBD R&D 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 CBDP 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 began in FY06. In FY04, the CBDP aligned the T&E requirements with the appropriate S&T and/or acquisition development programs. This alignment formed the basis of the Enhanced Planning Process (EPP), which was approved in the first quarter of FY05. The approved EPP resulted in an overall increase of $444 million, to the total T&E infrastructure (over the already existing $322 million)

beginning in FY06 and continuing through FY11. Of the total T&E infrastructure budget, approximately $256 million was planned to be available for improvements in T&E capabilities. An amount of $350 million within the T&E infrastructure budget will be used to support the CBDP Major Range and Test Facility Base (MRTFB) operations and sustainment in accordance with Public Law 107-314, Section 232.

The JPEO-CBD established the Product Director, Test Equipment, Strategy, and Support (PD TESS) in the second quarter of FY05 to support the CBDP T&E Executive in matters of test infrastructure development. The PD TESS is chartered to execute the $256 million allocated to 6.4 (Advanced Component Development and Prototype) and 6.5 (System Development and Demonstration) efforts. The PD TESS is also chartered to coordinate efforts with the $100 million allocated to the JSTO-CBD for the execution of 6.3 (Advanced Technology Development) test methodology efforts. This overall increase in the 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 FY05, PD TESS and the CBDP T&E Executive hosted the Test Capability Requirements Meeting with participation from the Joint Project Managers, JPEO-CBD, the 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 that 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 infrastructure investment strategy. The strategy focuses on incremental improvements in T&E capabilities over the POM, based on multiyear development programs phased to support acquisition program timelines.

2.9.2 DESCRIPTION OF EXISTING T&E FACILITIES

Following is a description of existing facilities for research, development, and T&E.

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

i. *U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)*: The 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)*: The USAMRICD provides extensive, world-renowned research capabilities to support the identification, development, and fielding of MCMs against chemical and toxin agents.

iii. *Navy Medical Research Center (NMRC)*: The Biological Defense Directorate at the 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. *Air Force Institute for Operational Health (AFIOH)*: The AFIOH protects health through operational and environmental surveillance, analytic laboratories, ongoing risk analysis, and supporting consultation. Partnerships with domestic and international civilian and governmental entities enhance AFIOH capabilities. A new function under the AFIOH, the Applied Technology Center (ATC), provides continual and rapid (< 1 yr) evaluation, validation and transition assistance of new off-the-shelf

technologies, and identifies emerging technologies ("technology discovery") to fill critical gaps in force protection, rapid diagnostics, epidemiology, and preventive medicine, including CBRN identification, to meet both Air Force and Joint Community requirements. The ATC has over 10,000 square feet of dedicated molecular testing laboratories including an ultraclean lab space with high-throughput nucleic acid sequencing, mammalian cell culture, protein purification and characterization and a CDC-certified BSL-3 suite. The ATC also performs analytical, in-lab assessment of fielded technologies such as PCR-based (JBAIDS) testing and immuno-magnetic electrochemiluminescence (ECL), among others.

v. *Armed Forces Radiobiology Research Institute (AFRRI)*: AFRRI conducts research in the field of radiobiology and related matters essential to the operational and medical support of the DoD and the Military Services. AFRRI is a joint entity of the military departments and is subject to the authority and direction of the president of the Uniformed Services University of the Health Sciences (USUHS), under the Assistant Secretary Of Defense for Health Affairs and the Under Secretary of Defense for Personnel and Readiness. As stated in the *NIH Strategic Plan and Research Agenda for Medical Countermeasures Against Radiological and Nuclear Threats*, June 2005, the current cadre of investigators conducting research into MCMs for radiological injury is small, the infrastructure to support such research is inadequate, and only a few small training programs in the radiological health sciences exist. Moreover, the physical infrastructure and other support (e.g., biostatistical services good laboratory practices (GLP)-certified facilities) are limited for high-quality basic and translational research and are particularly lacking for the development and licensure of experimental dosimetry and radiological countermeasures.

vi. Other government and extramural facilities that exist outside of the Department, but which are leveraged by the CBDP, to include the National Institute of Allergies and Infectious Diseases (NIAID) and the CDC. Medical testing is conducted in compliance with the rules, regulations, and requirements established by the FDA (21 CFR).

b. Nonmedical 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 cubic feet) 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 square feet of experimental aerodynamic facilities that include four wind tunnels for component and materials tests; and 5 mph Breeze Tunnel, which primarily supports early R&D phases (research on acute and subacute 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)*: The DPG is DoD's Major Range and Test Facility Base (MRTFB) range for providing CBD, both developmental and operational testing to support milestone, system production, and fielding decisions. DPG facilities consist of the Combined Chemical Test Facility (CCTF) (35,000 square feet) with 35 test suites supporting live-chemical-agent liquid, vapor, and aerosol testing; the Life Sciences Test Facility (LSTF) with multiple live-biological-agent test chambers at the BSL-3 level with aerosolization capability, comprising 32,000 square feet of which 3,500 square feet 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 feet; test grids, and instrumentation for CB simulant field and chamber tests; the Ambient Breeze Tunnel for biological stimulant system tests. The DPG has a limited capability for transportable instrumentation to support simulant tests and operational tests in off-site environments.

iii. *Air Force Operational Test & Evaluation Center (AFOTEC)*: The AFOTEC utilizes the 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 Laboratory (AFRL) facilities consist of a BSL-3 lab and chemical simulant test chambers.

iv. *Naval Surface Warfare Center (NSWC), Dahlgren*: Provides CB test center for ship systems, with capabilities including BSL-3, 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; CP 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 that exist outside of the CBDP that are leveraged to the fullest extent possible on a case- by-case basis, including the Nevada Test Site (outdoor simulant field tests), the 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 Laboratory (research on biological and radiological defensive systems), MIT Lincoln Labs (laser technology research for defensive biological systems), and Research Triangle Institute (R&D of CBD 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. However, the coordinated efforts in submitting the FY06 CBDP budget have resulted in establishing the funding to provide for these resources, with improvements expected during FY08 and each year beyond. Component and simulant capabilities exist. Current 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 CB 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 T&E Investment Program (CTEIP), has initiated and funded the Contamination Avoidance Detector Test Suite (CADTS). This multiyear project, scheduled to complete in FY08, provides the most immediate needs for testing contamination avoidance equipment. Among the capabilities included in the test suite are the Joint Ambient Breeze Tunnel (JABT) completed in FY06, Active Standoff Facility (ASC) scheduled to complete in FY07, and a near real-time PCR referee system completed in FY06.

The T&E infrastructure in terms of intellectual capital/personnel resources required to support the CBDP is currently not adequate. However, beginning in FY06, the coordinated efforts in preparing the 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 defensewide account, thus the services may not independently support the T&E infrastructure through service research, development, T&E (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 that 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. However, it should be noted that the T&E Infrastructure Investment Strategy is designed with funding in place to address this over the POM, with improvements planned for FY08 and beyond.

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 the 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 the commercial facilities) 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, nonstandardized and nonsustainable tests.

Beginning in FY06, investments were initiated to obtain:

- advanced T&E capabilities to test CBD equipment against NTAs and new collective and individual protection technologies,
- comprehensive M&S to establish T&E parameters and expand systems analyses,
- live-CB-agent full system test chambers,
- expanded simulant range capabilities,
- T&E capabilities to address decontamination efficacy and systems performance postdecontamination operations,
- T&E capabilities for advanced battlespace management (Shape) information systems, and
- T&E capabilities to address individual protection requirements.

2.9.3 INTEGRATED APPROACH TO PLAN FOR T&E INFRASTRUCTURE PLANNING

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 a single integrated approach to planning joint service T&E capability and methodology needs.
- Establish a fully integrated T&E investment strategy.
- Establish a common set of test processes and standards for conducting joint T&E activities.
- Identify T&E capability gaps and intellectual infrastructure required for CB 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 simulant 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. In FY06, among OSD T&E oversight programs, JBAIDS and JSLNBCRS conducted multiservice operational test evaluation, and JCAD conducted an Operational Assessment. These were truly joint tests including the Air Force, the Army, the Navy and the Marines. Other programs, including the JSGPM, also conducted tests using joint test teams. The lead OTAs coordinate producing single evaluation reports reflecting the results of all services' evaluations. These efforts by AFOTEC, the U.S. Navy Operational T&E Force (OPTEVFOR), the Army Test & Evaluation Command (ATEC), and the Marine Corps Operations T&E Activity (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 CB 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 CBDP T&E Executive and the 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, establishment of a WSLAT chamber is required to provide data sufficient for system evaluation. Efforts in FY06 included initiatives 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 United States. and the last outdoor test with live chemical agent was performed, so much of the infrastructure for the field testing of chemical detectors no longer exists or is seriously outdated. The currently budgeted improvements in the T&E infrastructure will greatly enhance both the 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 FY11–12. 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 NTAs, 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 TIM 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 that address decontamination system efficacy, as well as system degradation from decontamination processes. The decontamination pad used at DPG 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. In order to provide test data regarding operator use of the decontamination systems, families of reactive simulants are needed.

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 TIM.

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 the physical properties affecting protection and to understand the interactions among variables that affect protection 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 that 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 CP (currently unfunded) 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. Upgraded test facilities are required to test advanced technologies, which require different test setups, instrumentation, measurement of different parameters, and new analysis methods. Improvements would include several sites (ECBC, Eglin, Dahlgren, DPG). The test procedures across facilities will be standardized to allow for comparability of the data.

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 exist 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, simulant/simulator 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. 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 and emulation of detection systems to simulate threat scenarios without simulant dissemination, and will provide simulated detector inputs to fully characterize detector network systems in unit level tests. These capabilities support detector network tests, testing during operational exercises, and 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 ensure 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 the following:

(a) Designing and building a live-agent biological detection standoff capability at the DPG. Test techniques, methodologies, dissemination hardware, and referee instrumentation will be developed and validated during this effort. Developing 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 necessarily preclude point detectors from testing in the same facility.

(b) The T&E strategy will also upgrade the DPG ASC & 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 CB 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, 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, 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 meets minimal testing requirements, but in most cases is either outdated, incapable of a high degree of reproducibility or precision, underfunded, or otherwise inadequate to meet schedule or quality requirements for operational evaluations or commanders' guidance. Most testing currently performed is not operationally relevant, nor is it based on realistic threat scenarios that warfighters require.

The development of all CBDP materiel—from detectors, to individual protective gear, to decontaminants—requires test validation against actual 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 CWAs, require specialized equipment

found in few areas of the world and also 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 GLP (Good Laboratory Practices) 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 the 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 CBD MCMs, ***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 that were initiated in FY06. These shortfalls primarily comprised needs for tests that do not presently exist, but also include tests that require improvement to provide data adequate for evaluator, decision maker, and combatant-commander information needs. In addition, continued identification and development of CBDPT&E intellectual and capabilities infrastructure is required as a significant investment of the CBDP. As a result of T&E capabilities development efforts over all commodities, repeatable procedures must be demonstrated, validated, and documented. These will be published for standardized use in 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.

T&E needs are organized according to the Joint Enabling Concept/functional area they support, that is, Sense, Shape, Shield, and Sustain. The following sections list specific T&E needs.

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

- Next-generation materials agent tests to provide toxicologically relevant data under wide variety of threat conditions and types of materials.
- Tests to address NTA, TIM, 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.
- A next-generation Man-in-Simulant Test (MIST), which would provide near-real-time sampling technology for material and system tests to better characterize CB performance and provide operationally useful information regarding the 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 state that 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. Additional study by the NAS to determine the feasibility of a biological standoff chamber and levels of agents or agent-like organisms (ALO) that can be tested in a large scale chamber safely.
- 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 the necessity for repeated trials.
- Award NAS feasibility study for biological standoff live agent testing.

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 NTAs.
- Improved and accelerated development of referee systems, sampling and analysis, validation testing, andTOPs. Final studies on the 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.
- Design and build WSLAT chamber; validate with multiple BWAs.
- Projects that validate and expand current 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 a 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.
- Develop fixtures and instrumentation to increase the size of materiel to be decontaminated from exposure to CWA.
- Accepted methods for measuring chemical-agent vapor and contact hazards, and determining the decontaminability of RDA systems exposed to agents of biological origin.

- Tests, models, and standard methods to reliably characterize the 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. This includes sustainment plans and funding for new test capabilities developed under the CTEIP or modernization programs.
- Fund all direct test support requirements at the DPG

2.9.6.7 New T&E Technologies

Much of the T&E technology efforts are targeted to provide scientific source data, especially for M&S, that has not previously been available or has been limited or not representative of current threat environments of concern. Examples of requirements and test conditions for which test technology and data 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. Simulant development is a key area of the S&T effort: developing families of simulants that can be used to predict system agent performance and that can be safely be used by operators in outdoor environments. 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.

CHAPTER 3

CHEMICAL AND BIOLOGICAL DEFENSE LOGISTICS STATUS

3.1 INTRODUCTION

The Chemical and Biological Defense Program (CBDP) continues to make progress towards a common goal of Joint Logistics. This report describes current initiatives plus the progress and the challenges. Joint logistics focuses on ensuring the overall availability of chemical and biological (CB) defense equipment for the Total Force—or its logistical readiness—as one measure of overall readiness. Logistical readiness 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. Generally, such information is time dependent and classified.

As the Materiel Developer for the Chemical and Biological Defense Program (CBDP), the Joint Program Executive Officer, Chemical and Biological Defense (JPEO-CBD) and the Joint Project Managers (JPMs) are responsible for Total Life Cycle Systems Management (TLCSM). The JPMs execute TLCSM and are supported by agencies such as the Defense Logistics Agency (DLA), the Tank-Automotive Armaments Command (TACOM), and many industry partners. These partnerships are central to the effective management of a variety of complex system with various sustainment strategies. TLCSM integrates planning, resourcing, and execution along with logistics, training, industrial base, and readiness improvements. The JPEO-CBD maintains cooperative engagement with the services to ensure integration between the Title 50 responsibilities of the CBDP and the Title 10 responsibilities of the Military Services to train and equip the forces.

The CBDP is preparing for the transition to an end state where the total program is managed as a "Joint Capability Portfolio."The Quadrennial Defense Review (QDR) and the DoD Strategic Planning Guidance emphasized the need to continue building on capability-based planning and management efforts. Joint capability portfolio management provides an approach to manage groups of related capabilities across the enterprise to improve interoperability, minimize capability redundancies and gaps, and maximize capability effectiveness. Joint capability portfolios will allow the Department to shift to an output-focused model that enables progress to be measured from strategy to outcomes. Delivering needed capabilities to the joint warfighter more rapidly and efficiently is the ultimate criterion for success in this effort.

The JPEO-CBD continues to improve the logistical readiness status of the Department of Defense's (DoD's) CB defense equipment in three ways:

(1) Continue and improve upon several Business Process Improvements and institutionalize these improvements across the JPEO-CBD.

(2) Enhance the JPEO-CBD's decision support tools and communications through logistics information technology solutions.

(3) Increase visibility of the CBD industrial base status in support of DoD requirements, and improve understanding of the Homeland Defense/ Homeland Security requirements and the risks to the industrial base from a CB attack on the homeland.

3.2 CBRN LOGISTICS MANAGEMENT

The Services, the Joint Requirements Office-CBRN Defense (JRO-CBRND), the Defense Logistics Agency (DLA), and the JPEO-CBD coordinate and integrate joint CBRN defense logistics. Stakeholders share information to maximize the distribution and use of limited resources, to gain total visibility of CBD materiel, and to ensure a common understanding of requirements for fielding and sustaining equipment for all operational environments, including battlefield operations and homeland defense. Unique commodity characteristics, such as the differences between pharmaceutical products, textile products, and complex chemical or biological detection devices, require a decision-making model that accounts for a diverse range of factors.

The JPEO-CBD is addressing the challenges of TLCSM through the Joint Logistics Advisory Council for Chemical and Biological Defense (JLAC-CBD), which is composed of senior logisticians from the JPEO-CBD, Services, DLA, and other supporting activities (see ***Figure 3-1***). The main purpose of the JLAC-CBD is to recommend Service-wide Business Process Improvements that address best practices for TLCSM. The JLAC-CBD focuses on joint sustainment processes that do the following:

- 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

3.2.1 CBRN BUSINESS PROCESS IMPROVEMENTS

The Services, the DLA, and the JPEO-CBD continue to improve business processes using a number of organizational, procedural, and information system initiatives. Some efforts are unique to CBD, while others capitalize on business process improvements occurring elsewhere in the DoD.

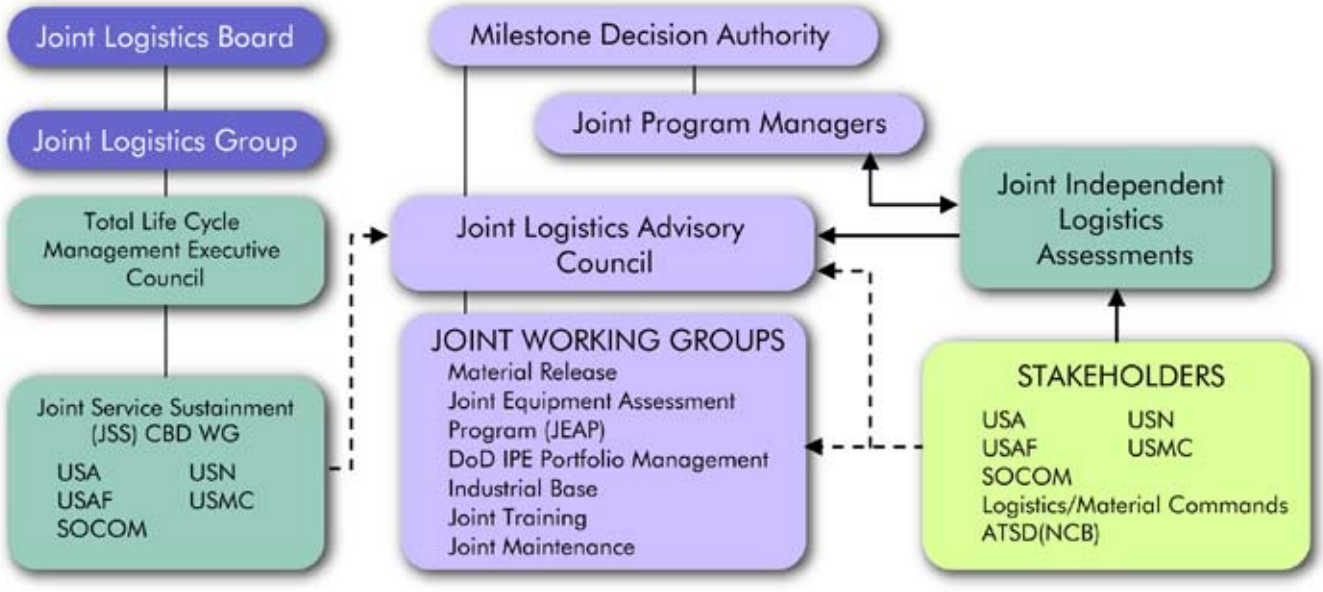


Figure 3-1. Joint Logistics Board, Joint Service Executive, and Joint Logistics Advisory Council for CBRN Defense Logistics and Sustainment Initiatives

3.2.1.1. Joint Logistic Board TLCSM Executive Council

During 2006, the JPEO-CBD made progress toward establishing a TLCSM Executive Council under the authority of the Joint Logistics Board. This initiative is a step towards the implementation of cutting-edge Joint Service logistics management processes. This initiative also is examining the establishment of the Joint Service Sustainment Chemical and Biological Defense Working Group (JSS-CBD).

The JSS-CBD is under development and is intended to serve as the centralized focal point for CBDP logistics planning, policy, guidance, and sustainment initiatives. The group will review or develop recommendations to DoD policy and procedures to do the following:

- Increase readiness
- Reduce total life cycle costs
- Mitigate logistics and supportability risks
- Preserve the industrial base
- Improve TLCSM of DoD CBD systems/equipment

The JSS-CBD is intended to address common Joint CBD sustainment challenges by providing the JPEO-CBD a formal process through which joint sustainment initiatives are properly vetted and staffed through the Joint Services. This group will examine and provide formal Service feedback on all JLCAC-CBD initiatives before they are introduced for consideration or implementation to the Joint Services. The process is depicted in ***Figure 3-1***.

3.2.1.2 Joint Logistics Advisory Council for Chemical and Biological Defense (JLAC-CBD)

The JLAC-CBD is an integrated process team (IPT) tasked to advise and make recommendations to the JPEO-CBD on all CBDP TLCSM issues that are within the JPEO-CBD's authority. The JLAC-CBD is made up of empowered logisticians within the CBDP (see ***Table 3-1***) who represent their respective agency/service on proposed CBD supportability and sustainment issues. The JLAC-CBD Chairperson oversees the management of the council and advises on the recommendations and decisions that go to the JPEO-CBD. ***Figure 3-2*** shows the JLAC-CBD process.

Table 3-1. JLAC-CBD Membership

• JPEO-CBD Chief of Logistics	• TACOM (RIA-ILSC)
• JPM Information Systems	• JPM Chemical Biological Medical Systems
• JPM Individual Protection	• JPM Decontamination
• JPM NBC Contamination Avoidance	• JPM Guardian
• JPM Collective Protection	• JPM Biological Defense
• United States Air Force	• United States Army
• United States Marine Corps	• United States Navy
• United States Special Operations Command	• U.S. Army Medical Research & Materiel Command
• Edgewood Chemical Biological Center	• Joint Equipment Assessment Program
• Defense Logistics Agency	

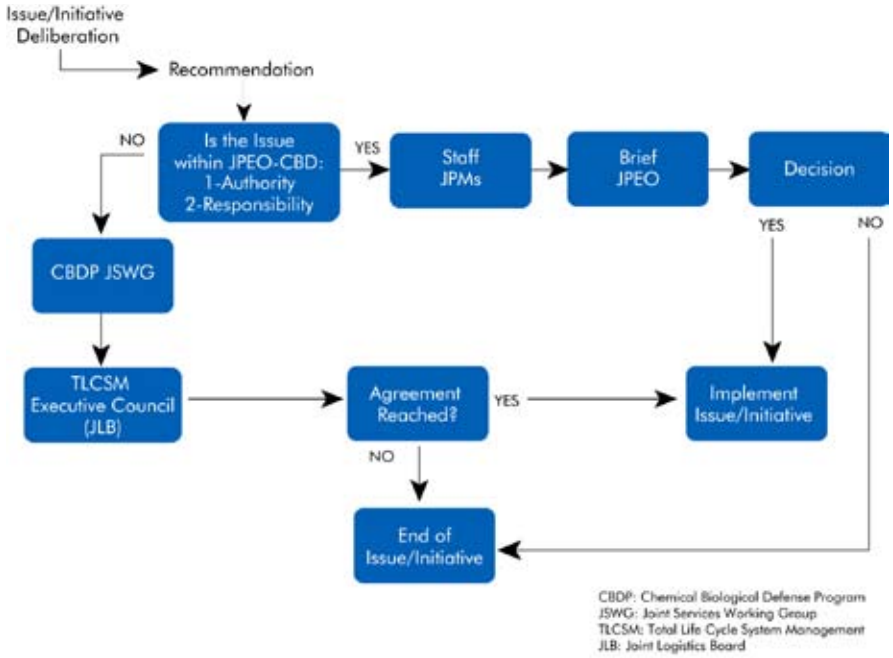


Figure 3-2. JLAC-CBD Process

The JLAC-CBD also includes various working groups that identify, define, develop, staff, and propose recommendations to the JPEO-CBD on their respective TLCSM focus areas. During FY06, JLAC-CBD working groups activities included the following:

- Compiled the Operations and Sustainment (O&S) costs for FY06.
- Standardized New Equipment Training (NET) questions to give the JPEO-CBD a broader sense of the effectiveness of the CBD equipment being fielded.
- Consolidated internet information and response centers into one centrally managed response center on the Joint Acquisition CBRN Knowledge System.

3.2.1.3. Joint Equipment Assessment Program (JEAP)

The Joint Equipment Assessment Program (JEAP) is the single point of contact for surveillance of CBRN defense equipment throughout the DoD. Chartered by the JPEO-CBD in April 2006, the JEAP establishes Joint Service standards for surveillance, assessment and reuse of fielded CBD equipment (see ***Figure 3-3***).

a. Establishing Joint Service standards for surveillance, assessment, and reuse of fielded CBD equipment.

b. Assisting JPMs throughout the systems acquisition process and providing a Joint Service perspective for the planning and inclusion of surveillance, assessments, and proper disposal of equipment.

c. Recommending policies for all surveillance/ cyclic testing requirements through the Joint Service Technical Working Group and the JLAC-CBD.

d. Providing technical assistance as required/ requested by the Services in the performance of their Title 10 responsibilities for operations and sustainment of CBD equipment.

e. Establishing cooperative agreements and operate in conjunction with other organizations from a Joint Service perspective to improve total life-cycle systems acquisition processes.

Figure 3-3. JEAP Charter

The JEAP performs critical functions in support of the JPM's TLCSM responsibilities throughout the systems acquisition process. It is particularly involved in the Operations and Support phase of the equipment's life cycle. The JEAP's operating environment required to achieve its mission are affected by several factors, such as the Service's Title X responsibilities, the JPMs TLCSM responsibilities, and the Primary Inventory Control Activities management responsibilities.

The JEAP operates in three functional areas, as depicted in ***Figure 3-4***. The JEAP shelf-life and surveillance activities prolong the service life of CBD equipment. These activities, minus the JEAP's operating costs, resulted in $16.8 million in cost avoidance to the DoD in FY06. 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.

During the July 26, 2006, Joint Quarterly Readiness Review (JQRR) meeting, the JPEO-CBD requested a proposal from the JEAP to conduct an accelerated aging study on the Joint Service Lightweight Integrated Suit Technology (JSLIST), the M40 Mask, and the Joint Service General Purpose Mask (JSGPM). This study is scheduled to be completed in FY07. The study will conduct an accelerated aging study on JSLIST Suits to determine the maximum storage temperature that will permit a full shelf-life storage term without compromising serviceability. Additionally, it will identify the potential failure modes, exposing samples to extreme, but realistic conditions, and extrapolating the data for shelf-life prediction.

3.2.1.4. 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 JPEO-CBD tasked the Edgewood Chemical Biological Center (ECBC) to establish, coordinate and implement a joint DMSMS Program to identify and mitigate obsolescence issues on CBRN defense systems. This is being accomplished through the DMSMS Joint Services Working Group (JSWG) within the JLAC-CBD. The DMSMS JSWG mission is to develop strategic policies and solutions to address parts obsolescence problems and reduce

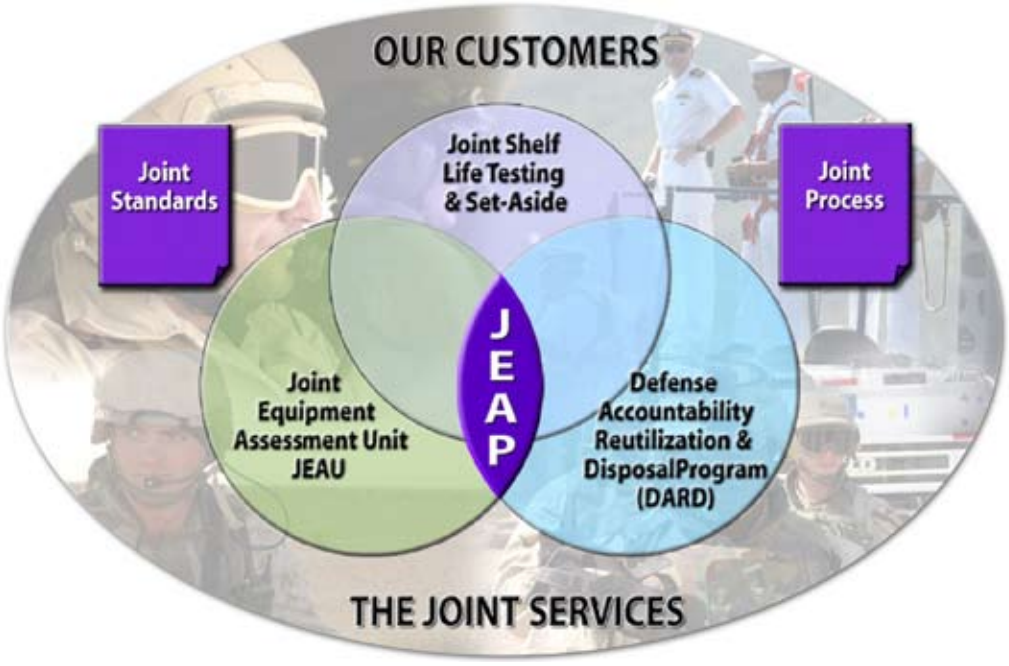


Figure 3-4 JEAP Functional Areas.

the impact of DMSMS on CBRN programs. The goal of the DMSMS JSWG is to provide a comprehensive and coordinated program that supports efficient and effective resolutions of obsolescence/nonavailability/single-source issues thereby addressing the guidance directed by Department of Defense Regulation DoD 4140.1R, Supply Chain Material Management, dated 23 May, 2003. The DMSMS JSWG is chartered to develop team relationships with the JPEO-CBD and its JPMs as well as organizations and agencies that participate in the TLCSM of CBD items. The DMSMS JSWG will serve as an advisory group for the DoD Components and develop close relationships with their DMSMS working groups, Advisory Board Members, the Government Industry Data Exchange Program (GIDEP), and Industry Liaisons.

Significant DMSMS Issues/Projects:

- ASZM-TEDA Carbon. The number of potential suppliers of activated charcoal is currently restricted. Activated charcoal is obtained solely from a single vendor, which meets the current military specification (MIL-DTL-32101). The supply of ASZM-TEDA Carbon will be restricted to the current validated product from a single vendor until additional standards can be defined, which would allow the acquisition of carbon to be fully competitive.
- Diagnostic Test Set (DTS) Connector. The DTS is a test set used for detection systems. The connector portion of the DTS is a single-source item with minimum purchase quantity of 1,500, which is in excess of required quantities. The Joint Project Manager is coordinating with other organizations that use the DTS to purchase the minimum number of connectors or utilize a different configuration.
- M256A1 Chemical Agent Detection Kits. The M256A1 Chemical Agent Detection Kit includes test spots made of standard laboratory filter paper. The filter paper has experienced several DMSMS issues, including a single-source manufacturer for the filter paper solution. The system review and study resulted in the identification of an alternate manufacturer, a review of the current supply support structure, and a business case analysis for this system.
- Joint Protective Aircrew Ensemble (JPACE). Alternate manufacturers for the cut-and-sew shops, active carbon, liner material, and NOMEX fiber for the suit needed to be identified. The resulting review and study discovered alternates for the cut-and-sew shops and liner material. The NOMEX fiber is solely produced by DuPont. While there are other fabrics, they do not meet the CB challenge requirement. An industrial base study is being conducted, which has application for other individual protective equipment items that use some of the same materials and manufacturers.

The DMSMS program objectives for FY07 are as follows:

- Perform DMSMS Awareness Training for Joint Project Managers.
- Increase visibility and participation in JSWG meetings; coordinate with participating organizations Quarterly JSWG Meetings.
- Implement a complete DMSMS infrastructure and process for tracking DMSMS cases and industrial base issues.
- Become the DMSMS Center of Excellence for integrating, maturing, and all emerging technologies for CB defense acquisition programs.

3.2.1.5. CBRN Joint Training Working Group

The CBRN Joint Training Working Group (JTWG) has been formed to facilitate discussions and recommend solutions to identified gaps in Joint training and the training development process within the CBRN Defense Community equipment and systems. The CBRN-JTWG is co-chaired by the JPEO-CBD and the Joint Requirement Office CBRN Defense (JRO-CBRND). Members include representatives from each Service, JPM Offices (JPMOs) under the JPEO-CBD, U.S. Army Chemical School (USACMLS), and other supporting agencies for the CBDP.

The goals for the CBRN-JTWG include the following:

- Facilitate improvements within the training acquisition process
- Identify duplicative efforts by reviewing Joint Training Plans
- Identify and exploit synergies within programs that will provide for integrated training solutions, especially System of Systems (SoS)/Family of Systems (FoS)
- Facilitate the enhancement of training capabilities

for new CBD systems.

The CBRN-JTWG improved the method of receiving customer feedback from the warfighter through the development and use of surveys. One change included standardization of the initial questions and rating scale on all New Equipment Training (NET) and Fielding surveys to provide a common basis for the analysis of customer satisfaction. This change has led to the ability to compare the surveys across JPMOs, allowing the JPEO-CBD to receive feedback from the warfighter quickly. A second change was an upgrade in survey support through automated survey development, data collection, analysis, and reporting. Tools to allow this automation are to be made available to the JPMOs over the next year, providing them the ability to use both web- and paper-scanned surveys with their NET and Fielding Events. Automation will allow for faster and easier use of surveys and provide more complete feedback from the customer—the warfighter. ***Figure 3-5*** provides an example of survey user response.

The CBRN-JTWG presented three specific initiatives to the JLAC-CBD intended to improve the training acquisition process—staffing of the training IPT, provision of a standard guideline about the content of the overall strategic training plan for a system, and identification of joint guidelines for the training developed to ensure completeness without redundancy of the training packages provided to the services. Another improvement accomplished for training has been the emplacement of the training documents for JPEO-CBD products on the military accessible JPEO-CBD web site, to allow access to any military member wishing to review the training to update their knowledge on CBRN systems. The training documents have been transitioned to the Joint Acquisition CBRN Knowledge System (JACKS) to allow easier access and streaming of large files for easier viewing.

3.2.1.6. Individual Protective Equipment Strategic Inventory Management (IPE SIM)

The JPM Office for Individual Protection (JPMO-IP) is sponsoring the Individual Protective Equipment Strategic Inventory Management (SIM) project, in coordination with the Centrally Managed IPE Working Group within

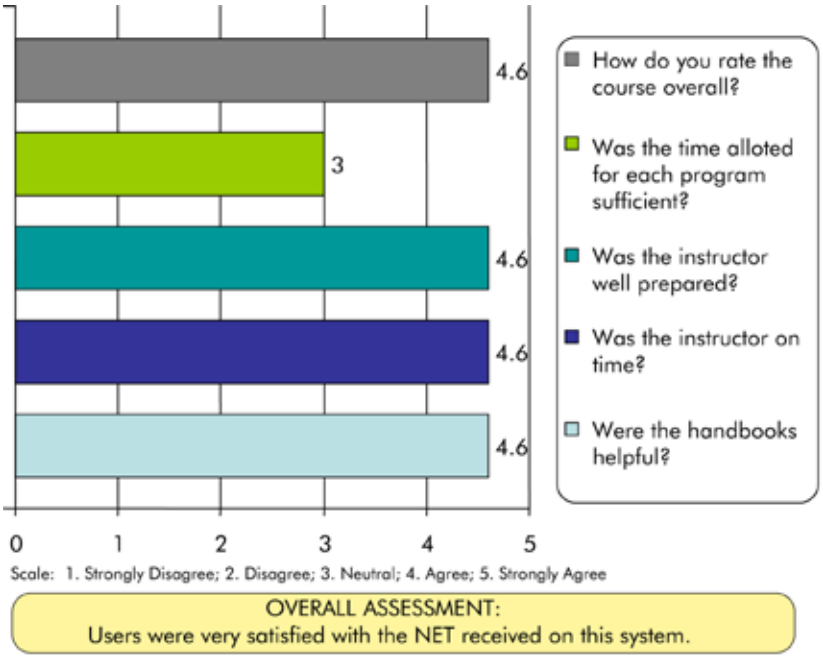


Figure 3-5. Example of NET and Fielding Survey (Responses to JBAIDS Survey Shown)

the JLAC-CBD. This project is exploring methods and concepts designed to improve the management of Individual Protective Equipment (IPE) inventories within the DoD (see ***Figure 3-6***). Equipment consists of Class II (individual equipment) and Class IX (repair parts) expendable items, which are sustained by two entities—the DLA and TACOM—in support of four Service processes. The objective is to facilitate a more effective approach to joint TLCSM while addressing Government Accounting Office (GAO) recommendations made in the report *U.S. Ability to Meet Protective Suit Inventory Requirements Faces Risk*, GAO-03-889C, 1 September 2003.

The objectives of this project are as follows:

- Capitalize on efficiencies and cost avoidance associated with centralized management and streamlined integrated supply chains
- Standardize IPE inventory management across the services
- Mitigate risks associated with IPE management challenges—reduced inventories, tenuous industrial base—through inventory consolidation and centralized management of requirements and priorities
- Enable improved inventory and asset management to improve the readiness and life cycle management

The IPE SIM project is intended to provide numerous positive outcomes, including the following:

- Improve readiness by providing greater accountability and utilization
- Increase operational flexibility
- Stabilize industrial base demand
- Reduce number of requisitions
- Reduce competing requisition priorities
- Improve asset visibility
- Improve requirements projections
- Reduce IPE requirements and associated costs
- Reduce storage locations and inventory and

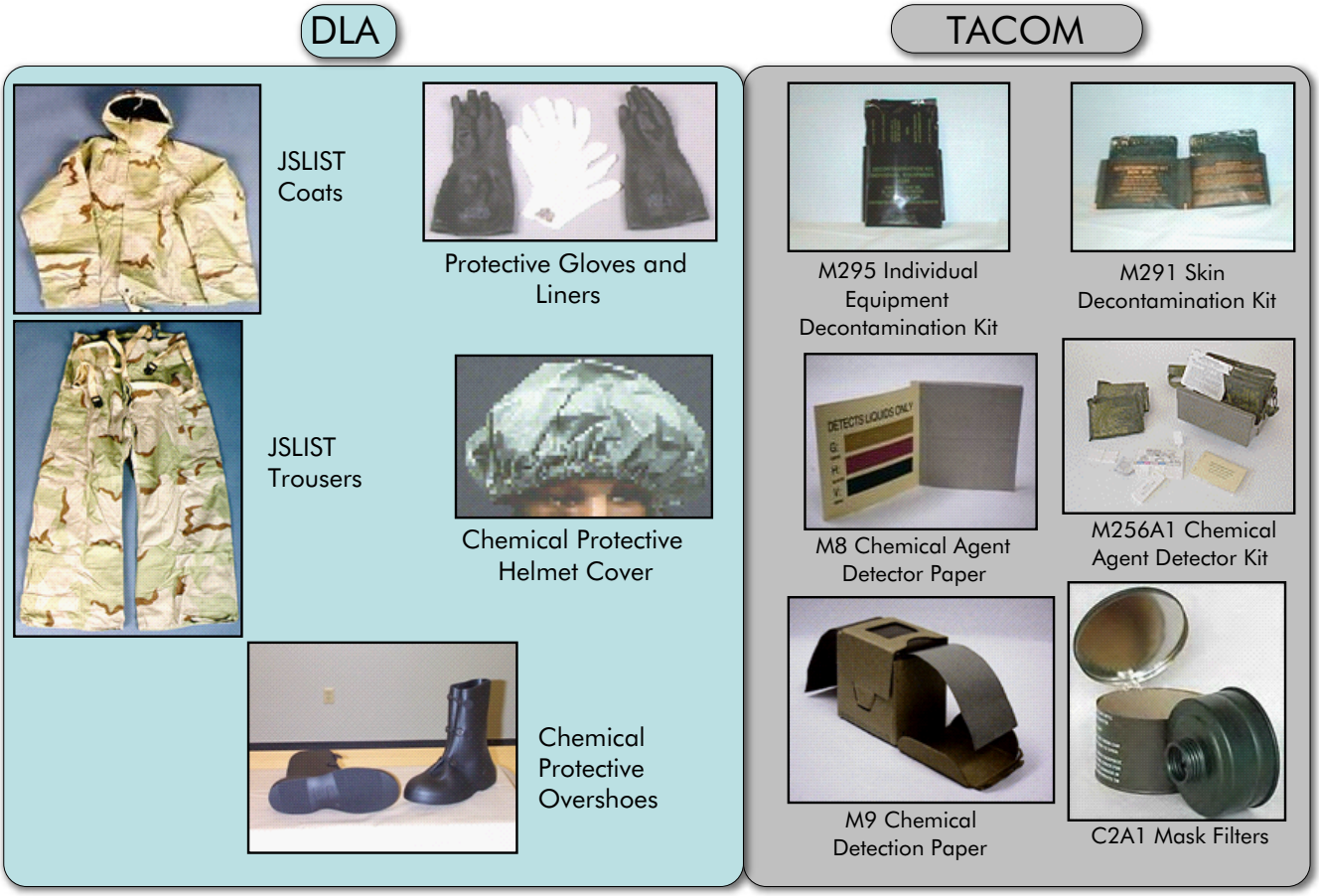


Figure 3-6. Individual Protective Equipment Portfolio

associated management

- Reduce number of automated information systems

The IPE SIM Project capitalizes on improvements in information systems, communications, storage and distribution practices throughout the DoD. It further capitalizes on successful DoD centralized management initiatives associated with other commodities including fuel, ammunition and medical supplies. Additionally, it will leverage on-going service initiatives to centralize IPE storage and management.

By establishing an IPE inventory manager (IPE IM) for the strategic inventory, there will be increased stability in the industrial base and improved support for operational needs. This new IPE management paradigm is expected to avoid the erratic production patterns that were common in the past and are detrimental to maintaining industrial base capacity. The IPE IM will also enhance readiness and operational sustainment through improved visibility and oversight of DoD IPE stocks. For a detailed description of current business practices in this area, see Section 3.2.3, War Reserve Requirements and Planning (below), and for more on the challenges of maintaining a "warm" industrial base see paragraph 3.6.1, also below. The initial feasibility study and business case analysis to determine the preferred management alternative was completed in March 2006. Actions are ongoing to define the next phase, which will include detailed implementation plans and funding strategies.

3.2.1.7. Joint Materiel Release Pilot Program

In an effort to develop a standardized Joint Materiel Release (JMR)/Fielding process, the JPEO-CBD recently initiated a JMR Pilot Program using seven pilot programs. In November 2006, the JPEO-CBD was delegated JMR authority for the pilot programs (see ***Figure 3-7***).

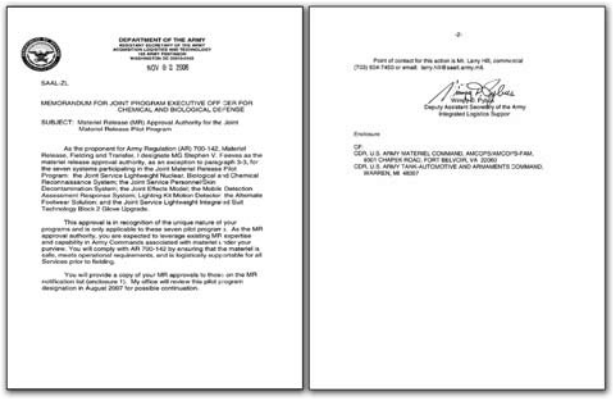


Figure 3-7. Materiel Release Approval Authority Designation for the JPEO-CBD

Joint Materiel Release Pilot Program

This Pilot Program is intended to integrate the separate Service fielding processes into a single JMR process, eliminate redundancy, and streamline acquisition efforts, while ensuring that all Forces continue to receive safe, effective, suitable, and supportable materiel. This single JMR process involves three phases (see ***Table 3-2***).

Table 3-2. Phases of the JMR Pilot Program

Phase I – Implement a JMR Pilot Program	Phase II – Refine the Process	Phase III – Implement the JMR
• Designate a variety of programs to participate • Designate Joint Independent Logistics Assessment (JILA) teams (with Service Representation) • Develop a JMR concept/process (checklist, Standing Operating Procedures (SOPs))	• Document JILA reports and get stakeholder feedback • Continuously refine the process as it evolves • Continue to keep senior leadership and affected agencies informed on the program status • Update JILA checklist and SOP • Request milestone decision authority (MDA) as MRA for Joint Programs	• MDA designated as MRA • Continue to update and improve the process

3.2.1.8. Joint Maintenance Integrated Product Team (IPT)

The Joint Maintenance IPT was formed to transition from multiservice maintenance activities to joint-service maintenance activities for all CBD Programs to more effectively utilize government resources. In order to achieve this long-range goal, the IPT has established short-term goals that provide an incremental approach. This incremental approach began by focusing on JPM contamination avoidance issues to include the Improved Chemical Agent Monitor (ICAM) and the M22 Alarm, Chemical Agent Detection Automatic (ACADA). This has been followed by efforts to define the sustainment for all CBD equipment (both new and legacy systems), in both wartime and peacetime scenarios. To move forward in these goals, the IPT must examine the means of working with different maintenance policies, understand services' maintenance processes, and develop a Joint process for all levels of maintenance.

In May 2006, the team successfully moved forward in identifying a Joint Maintenance Facility for the ICAM. A business case analysis (BCA) was conducted with a recommendation for the Joint Services to establish the Oregon National Guard (ORARNG) as the dedicated central repair facility for the ICAM, providing the services with direct support level maintenance. To date the Army and Navy have started to utilize the ORARNG for ICAM repair. The Air Force is finalizing details to utilize this maintenance facility for repair actions on their ICAMs. The Marine Corps will not immediately establish the ORARNG as their maintenance facility because of a previous contract agreement to repair their ICAMs before the BCA recommendation was finalized.

3.2.1.9. Joint Metrology and Calibration (JMETCAL) Working Group

A comprehensive and coordinated end-to-end "Metrology" program supports the TLCSM within the CBDP. The JLAC-CBD principals recommended and approved the establishment of the JEAP, Joint Chemical and Biological Defense Metrology Support Group to support the Joint Project Managers in the systems acquisition process.

The Chairperson of the CBD Metrology Support Group will provide the Director, Joint Equipment Assessment Program (JEAP), with the following:

- A single focal point of contact for metrology-related JPEO-CBD products
- Multi-Service and governmental coordination with manufacturers
- Coordination with Joint Project Managers and the JPEO staff on matters concerning the material release of CB equipment affected by Metrology and Calibration analysis and recommendations
- Interface with other DoD agencies and offices to provide metrology science–related support of CB detection equipment including the National Institute of Standards and Technology (NIST) and industry

3.2.1.10 Unique Identification (UID)/Radio Frequency Identification (RFID) Working Group

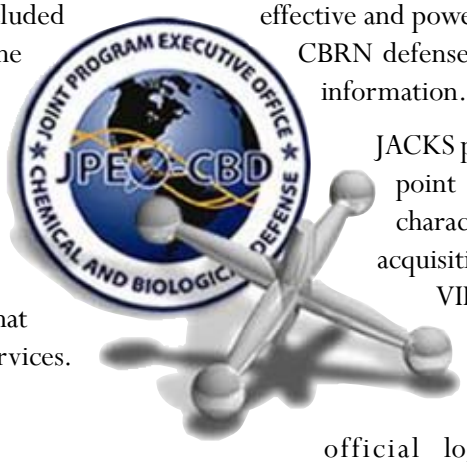
The JPEO-CBD has established a guidance for implementation of DoD unique item identifiers (UIDs) and radio frequency identification (RFID) policy and standards in response to the requirements of the Acting Under Secretary of Defense, Acquisition, Technology and Logistics, USD (AT&L), Memorandum: Policy for Unique Identification of Tangible Items – New Equipment, Major Modifications, and Reprocurements of Equipment and Spares, dated 29 Jul 03 and Radio Frequency Identification (RFID) Policy, dated 30 Jul 04. This Guidance for Implementation outlines the JPEO-CBD approach and provides guidance along with measurable objectives to assist the Chemical and Biological Defense Equipment (CBDE) Joint Project Management Offices (JPMOs) in complying with the aforementioned DoD policies and milestones. Additionally, it provides the overarching the JPEO-CBD guidance in accordance with the DoD Program Manager's Roadmap for Implementation of UID, the DoD Business Rules for Implementation of RFID, and the DoD RFID Supplier's Passive RFID Information Guide.

Legacy program-specific plans submitted by the respective JPMOs are included as annexes to this guidance. JPEO-CBD UID/RFID implementation will be accomplished through centralized JPEO-level management, with decentralized JPMO level execution and reporting. The JPEO-CBD has established a UID/RFID working group within the JLAC-CBD to coordinate related activities. The JPEO-CBD has assigned a UID/RFID Focal Point, and each JPMO has identified representatives responsible for coordinated and comprehensive implementation.

The cost, schedule, and performance of UID/RFID are reported to the JPEO-CBD as each JPMO executes the strategy. This wide-ranging strategy also calls for incorporation of UID/RFID requirements into solicitations and contracts, identification of items requiring marking and tagging, engineering determinations, technical documentation, the marking efforts, registration of identifying information, and utilization determinations.

3.2.1.11 Operations and Sustainment (O&S) Working Group

In 2005, the JPEO-CBD issued its first O&S report to the services to aid in the Program Objective Memorandum (POM) process. In February 2006, the O&S Working Group was established to improve data reporting. This year, data calls were sent to each of the JPMs, and O&S costs were estimated for one system for one year. Costs were analyzed by the JPEO-CBD Logistics Team and a report was drafted for signature by the JPEO-CBD. Each report was tailored to the services and included O&S costs for one system for one year. The Military Services, along with the Program Analysis and Integration Office (PAIO) and U.S. SOCOM will be receiving an O&S report to aid in their upcoming POMs. The JLAC-CBD working group will continue to revise and improve the O&S reporting procedures to ensure that accurate information is reported to the services.



3.2.2 DECISION SUPPORT AND INFORMATION TOOLS

The ability to understand the issues and provide solutions for Joint CBD requirements depends on the availability of key information at specific points in 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 that will be discussed in detail in this section.

Major information technology initiatives already established include JACKS, JACKS Reporting Warehouse (JACKS-RW) (formerly called the Joint Total Asset Visibility Reporting Warehouse (JTAVRW)), the DoD/FDA Shelf-life Extension Program (SLEP), and various Service specific inventory management programs. The GAO report 04-33, *Chemical and Biological Defense: the 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, resulting in the JPEO-CBD developing and implementing JTAVRW.

3.2.2.1 Joint Acquisition CBRN Knowledge System (JACKS)

JACKS is the web-based DoD knowledge management system for information related to the acquisition and support of nonmedical CBRN defense products. JACKS was established by the JPEO-CBD to serve the warfighting and Homeland Security communities as an effective and powerful resource in quickly accessing CBRN defense product acquisition and support information.

JACKS provides an all-service single entry point to CBRN defense equipment characteristics, capabilities, and acquisition information, minus Class VIII (medical) 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 provides 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, national stock number (NSN)/national item identification number (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 FDA imposes its own stringent requirements on medical materiel management. Medical shelf-life data is obtained through the SLEP system.

3.2.2.2 Joint Acquisition CBRN Knowledge System Reporting Warehouse (JACKS-RW)

JACKS-RW, formerly known as the JTAVRW, was established as the central repository for CBD equipment inventory data. As of September 30, 2006, all services and the DLA are reporting the quantities of 11 IPE items into the JACKS-RW. Improvements in 2007 will include the expansion of the inventory items reported by the services based on the memo from the Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs (SA(CBD&CDP)) dated October 2006 (see ***Figure 3-8***). The SA(CBD&CDP) will work with the JLAC-CBD to identify additional critical CBD items to be included in the JACKS-RW. Regardless of the number of CBD items reported to the JACKS-RW by the services, the services will still be able to maintain their own independent CBD inventory and tracking systems. The result of sharing CBD asset information on the JACKS-RW will not only improve fielding but will also improve the sustainment of CBD items in an operational environment.

Figure 3-8. Memorandum for Expansion of Inventory Items Reported by the Services

3.2.2.3 CBRN Information Response Center (CBRN-IRC)

The JPEO-CBD is implementing an initiative designed to build upon the JACKS portal as the single point of CBD materiel information for the warfighter. The CBRN-IRC seamlessly integrates and provides responsive, relevant, and reliable CBRN information in support of warfighters' mission and the joint project managers as total life cycle systems managers for the chem bio defense community.

The IRC's Mission: In Coordination with the JPEO-CBD's Joint Project Managers and Directors, JACKS-IRC will consolidate all CB hotlines, operate on a 24/7 basis, and serve as the single entry point for all information related to CBRN defense equipment (see ***Figure 3-9***). The consolidation of the various "hotlines" will simplify the warfighters search for information and ensure the information received is current and reliable.

Figure 3-9. JACKS CBRN Information Response Center Environment – The One Stop Shop for CBRN Defense Information

3.2.2.4 Industrial Base Decision Support Tool

The Chemical Biological Industrial Base Decision Support Tool (CB IBDST) provides capabilities to assess the Industrial Base for CBRN defense equipment. A contract was awarded in September 2005 to develop the tool, and in May 2006, a prototype web-based information system was delivered to the JPEO-CBD. The process ultimately identifies supply chain chokepoints and the ability of the Industrial Base to address the shortages.

The system is currently populated with data for 200 CBRN defense items. In addition to existing data from the annual Equipment Data Call to the services, data from several information systems will feed IBDST periodic updates. Work is ongoing to establish automated data feeds from the JACKS, the Federal Logistics Information System, the CBRN Shelf-Life Information System, and the CBRN Industrial Base Information System (IBIS). Institutionalization of these data sources will also provide greater breadth and depth of item and supplier information in the system.

The CB IBDST is hosted by Edgewood Chemical Biological Center at Rock Island and can be accessed via the Internet by authenticated users. Output reports are available on a variety of areas in both text and graphical formats. This includes information on monthly and cumulative production capacities, monthly item asset profiles, and peacetime and surge capabilities. Work is under way and will continue throughout 2007 to transition the system from a prototype into a production system. Of primary importance in this transition are the automated data feeds, but inclusion of functional capabilities from other Industrial Base information systems is also planned.

3.2.3 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 surge production to meet required stockage levels. As currently planned, (see ***Figure 3-10***) the Services (except for the Navy) retain "starter stocks" of CBRN defense equipment to support immediate deployments and initial operations. Service doctrine determines sustainment duration for these stocks. Air Force units deploy with 30 days of CBRN defense consumables. Army divisions use a planning factor of 45 days. The Marine Corps Marine Expeditionary Units (MEUs) use a planning factor of 15 days, while 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 (AELs) that are 115% or 215% of the ship's manning level, depending on the equipment type.

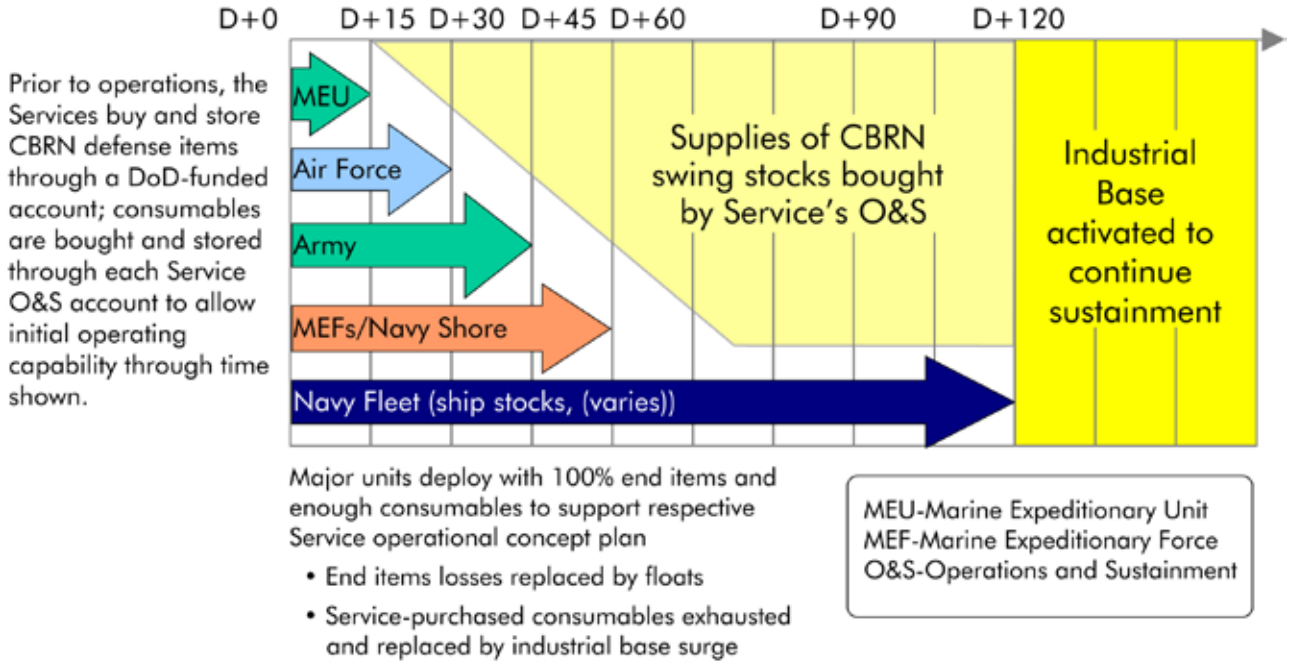


Figure 3-10. War Reserve Requirements and Planning

For CBRN defense materiel, and particularly in the case of 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.

The 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 the AMC for the procurements.

The 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 force structure. Because of a lack of visibility of CBRN defense items, unclear wartime requirements, scarce O&S 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 Joint Chemical and Biological Defense Expendable Equipment Combat Consumption (E2C2) study and the impact of the QDR on the force planning construct will permit the Services and the DLA to more accurately assess their readiness and sustainment status. The E2C2 Study is currently modeling the consumption rates of consumable CB defense assets on the battlefield. The results will provide a foundation for the definition of requirements for a set of critical consumable items, which will aid in readiness assessment and planning.

3.3 LOGISTICS STATUS

During collection of FY06 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 September 30, 2006. 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 subcomponents 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. Training systems 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.

3.4 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 their equipment will provide the necessary protection when used correctly. The two most critical areas of peacetime stocks are IPE 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, with the exception of several special purpose units, such as the WMD Civil Support Teams. These specialized units represent a small fraction of the overall potential requirement, however. 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.

3.5 FUNDING

In accordance with statutory requirements (50 USC 1522), funding of RDT&E and procurement is centralized in a DoD defensewide account. 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 CBDP.

Funding of CB defense items categorized as war reserves secondary items (WRSIs) remains a significant issue. The Services are responsible for developing the requirements and funding items in war reserve stocks. (As noted in section 3.2.3, Navy Afloat Forces do not maintain WRSI). Funding of WRSI comes from congressional appropriations made into the Working Capital Fund from the transfer of Services' O&S funds.

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 procurement, 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.

3.6 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. After 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 further reduced the number of firms participating in defense production.

Over the past decade, 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, the terrorist threat at home and abroad, and DoD's increased emphasis on homeland defense for DoD installations and units. 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 where sources of component materials are limited (see ***Figure 3-11***).

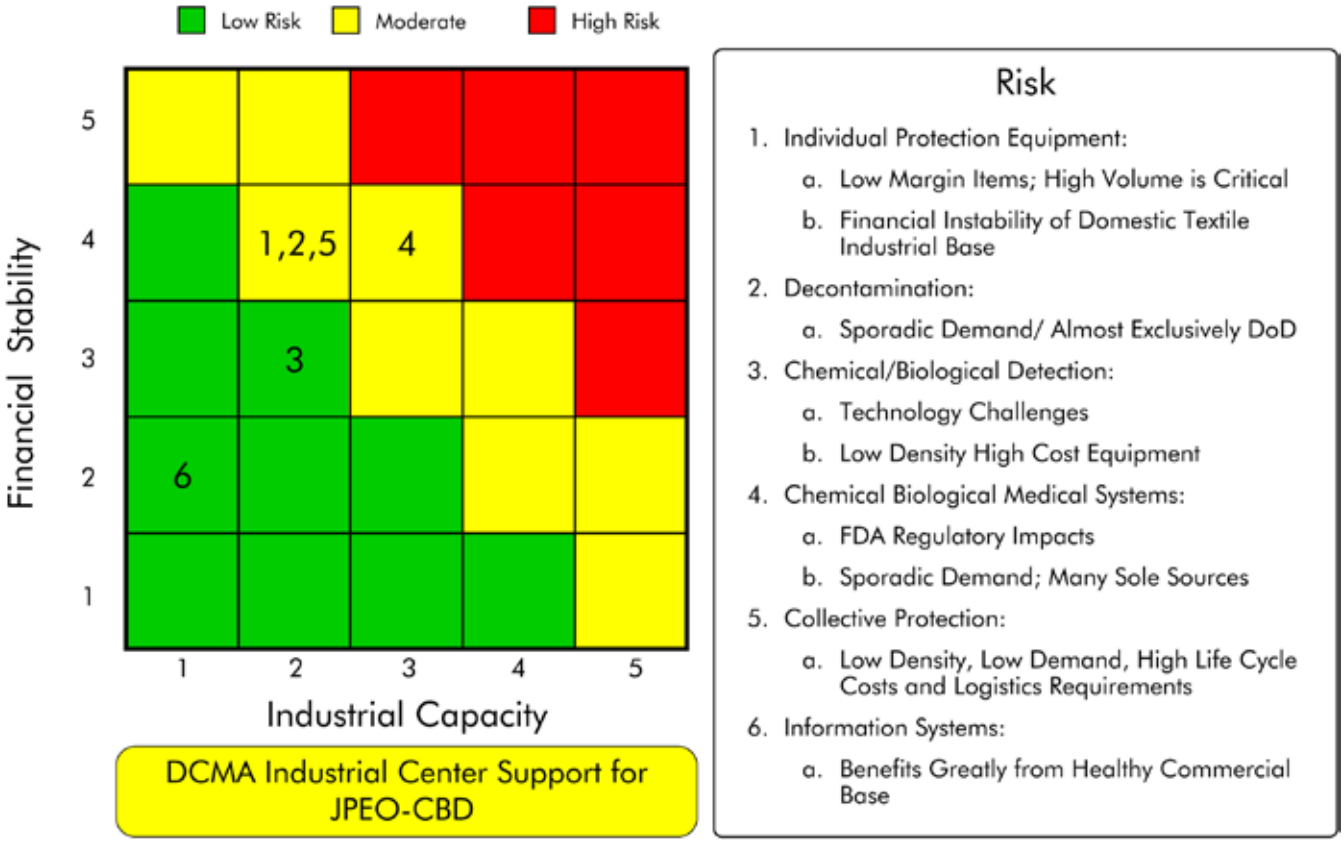


Figure 3-11. Chemical and Biological Defense Industrial Base Assessment

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 military market. Other firms with a long history of producing CB defense items for the DoD are marketing products to local and state governments, foreign military, the DHS, as well as to the commercial sector. The potential markets for DoD, foreign military, the DHS, 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 subsectors 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 subsectors 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.

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 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. Developmental programs for drugs and medical devices have also received multiple responses to requests for information and proposals that indicate a 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 10 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.

3.6.1 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 nonexistent. Once industry surges production to support a period of high demand, the 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.

The 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 source of supply for the go-to-war surge. Among the industrial preparedness measures leveraged by Warstoppers to maintain critical industry capabilities are the following:

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 items. Maintenance contracts may also fund the sustainment of a manufacturing infrastructure to ensure the viability of a production line. Past 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. The utility of this approach was demonstrated this year as the warm base for butyl gloves was maintained such that a recent study has concluded that the current demand is now above the minimum sustaining rate levels for the industry.

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 increases throughput capacity. An industrial base analysis of the JSLIST supply chain is currently being conducted that will assess the effectiveness of these measures or identify the need for further measures.

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 industrial practices that have a positive return on investment and better support the warfighter.

Recent Program Strategy Guidance instructions have included a policy that the CBDP will procure 30 percent of the requirement for new consumable items (includes suits, boots, gloves, skin decontamination kits, etc.), and there is concern that this policy may adversely affect the ability to maintain a warm industrial base for these items. The Joint Requirements Oversight Council (JROC) directed that a study be performed to assess the impact

of this policy and to recommend a "best method" for consumables procurement. The study is currently under way, and results are expected in FY07.

3.6.2 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 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 Federal Business Opportunities (FedBizOpps) web site http://www.fedbizopps.gov/ is the single government source for government procurement opportunities over $25,000. Current listings for many CBDP opportunities may be found on this web site. The following sections provide descriptions of selected mechanisms to leverage the industrial base.

3.6.3 SMALL BUSINESS INNOVATIVE RESEARCH (SBIR)

The CBD SBIR program is used to elicit innovative solutions from the small business community that address CB defense technology gaps confronting the 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; M&S; and threat agent science. Additionally, specific program areas include CB defense medical technologies that address pretreatments, therapeutics, and diagnostics.

The 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 various web sites, including:

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

3.6.4 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 web sites, 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)

3.6.5 TECHNOLOGY TRANSFER

The Secretary of Defense issued a policy memorandum in June 1995 on technology transfer that outlined the scope of DoD technology transfer activities. In DoD, technology transfer activities encompass the following:

- Spin-off activities that demonstrate nondefense 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 nondefense applications.
- Dual-use science and technology activities that develop technologies having both defense and nondefense applications.
- Spin-off promotion activities that demonstrate the national security utility of technologies developed outside the DoD.

A key web site for CBD-related technology transfer opportunities is the DoD Technology Transfer Office (http://www.dtic.mil/techtransit/).

3.6.6 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 in the CB defense community. They keep the community prepared to meet the daily challenges of managing and executing programs. An Advanced Planning Briefing to Industry 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 advance planning briefing for industry (APBI)s that are representative of the major CB defense program commodity areas include the following:

- Environmental Sampling for Biothreat Agents
- T&E Conference
- JPEO-CBD Advance Planning Briefing for Industry (APBI)
- CBDP T&E Executive Capabilities and Process Review
- CP (Collective Protection) Conference and Exhibits
- AUSA Annual Meeting & Exposition
- Chemical Biological Information Systems (CBIS) Conference
- Joint Service Scientific Conference on Chemical & Biological Defense Research
- Lincoln Laboratory Bio-Chem Defense Systems Workshop
- Annual Combatant Commander (COCOM) CBRN Defense Conference
- United States Special Operations Command (USSOCOM) CBRN Conference & Exhibition
- Decontamination Conference
- Joint Conference on Standoff Detection for CB Defense
- AUSA Winter Symposium
- IP (Individual Protection) Conference
- Special Forces Operations APBI
- Joint CBRN Conference & Exhibition
- AUSA Medical Symposium
- Modern Day Marine Exposition

Details of selected APBI and Working Group efforts are as follows:

- The 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) is an 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 COTS technologies.

3.6.7 INDIVIDUAL PROTECTION

Effective protection must be provided 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. The Services have the following processes in place:

ARMY

a. Issuance. The 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 web site. Submitted requirements are validated and approved by the parent major command (MACOM), item manager, and the Agile Development Center (ADC) G-4, and then release by BGAD to the requesting unit.

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

b. Inventory Management. Protective masks are unit property and receive Preventive Maintenance Checks and Services (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 are appropriately requisitioned.

c. Preparation for Deployment. During 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 in the 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 (MCDM) Program. MCDM is used for pretreatment and posttreatment 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 MCDM in deployable force packages, stored in strategic locations throughout the world, and approves all releases of centrally managed MCDM to deploying units. MCDM is issued to all deploying soldiers, and the OTSG continues to sustain this initial issue inventory of consumable MCDM for all forward deployed forces. Additionally, this program procures Pyridostigmine Bromide (PB) for pretreatment against nerve agent (Soman) exposure; Skin Exposure Reduction Paste Against CW Agents (SERPACWA), which, in conjunction with mission-oriented protective posture (MOPP), enhances soldier protection from chemical warfare agents; and six potency and dated items for the unit Medical Equipment Set (MES), Chemical Agent Patient Treatment. OTSG began centralized management of MCDM in 1994.

   MCDM 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, Air Force Emergency Management (EM) Program Planning and Operations establishes basis of issue (BOI) standards for Air Force members stationed in or deployable to chemical, biological, radiological, nuclear, and high-yield explosives (CBRNE) 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 when tasked for deployment to areas outside of the LTA are authorized to be issued a C-1 bag. One half of the BOI (C-1) authorizations will be stored and hand carried by the individual upon deployment or prepositioned in the area of responsibility (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 (MTAs). 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 (HTAs). 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 the unit-level. Upon receipt of deployment orders, each individual is issued IPEs and sized for a protective mask. The quantitative fit test is conducted to ensure that 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.

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 the 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, the Navy will utilize a combination of CBRD Total Asset Visibility Management System (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 is ordered using unit operation funds. Relevant shelf-life data will also be posted to the CBRD Information Web site.

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 predeployment 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.

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 onhand 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 operations and maintenance (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.

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 rather than 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 toward 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 the JPM-IP is critical to maintain the upward momentum.

Table 3-3. Protective Ensemble Inventory Summary

ARMY		
Component	FY06 On-Hand	FY07 (projected)
Suits	907,622	1,057,134
Masks	944,897	997,485
Filters	535,105	2,535,105
Gloves	1,768,701	2,074,200
Boots	823,568	1,100,226
Hoods	597,998	597,998

AIR FORCE		
Component	FY06 On-Hand	FY07 (projected)*
Suits	890,933	890,933
Masks	385,313	385,313
Filters	1,889,931	2,322,604
Gloves	1,881,257	2,395,137
Boots	867,931	965,206
Hoods	1,262,072	1,262,072

NAVY		
Component	FY06 On-Hand	FY07 (projected)*
Suits	443,445	443,445
Masks	130,975	130,975
Filters	527,238	527,238
Gloves	217,434	217,434
Boots	317,183	317,183
Hoods	1,790	1,790

MARINE CORPS		
Component	FY06 On-Hand	FY07 (projected)*
Suits	617,807	617,807
Masks	189,653	283,685
Filters	578,545	578,545
Gloves	847,943	847,943
Boots	859,094	1,116,139
Hoods	0	0

COMBINED SERVICES		
Component	FY06 On-Hand	FY07 (projected)*
Suits	2,859,807	3,009,319
Masks	1,650,838	1,797,458
Filters	3,530,819	5,963,492
Gloves	4,714,885	5,534,264
Boots	2,867,776	3,498,754
Hoods	1,861,860	1,861,860

* Partial data at time of publication

3.7 BIOLOGICAL DEFENSE IMMUNIZATION PROGRAMS

The 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 the DHHS. DryVax™ is a legacy product no longer actively manufactured and there is a finite supply of the product available. The DHHS is developing a next-generation smallpox vaccine that the DoD intends to procure after FDA licensure.

3.7.1 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 December 31, 2006, 5,806,172 doses of the vaccine had been administered to 1,492,366 persons. Also as of this date, 244,781 service members had received six or more doses.

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

3.7.2 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 web site may be found on the Internet at http://www.smallpox.mil/.

As of January 3, 2007, 1,233,693 DoD personnel were screened, and 1,137,045 personnel were vaccinated against smallpox disease.

In addition to the Smallpox Vaccination Program, the 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 the 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. The plan allows for either ring-vaccination or wide-area vaccination as a means of outbreak control.

CHAPTER 4

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR (CBRN) DEFENSE EDUCATION, TRAINING AND DOCTRINE

4.1 INTRODUCTION

This chapter highlights DoD education, training, exercises, and doctrine for CBRN defense. The Services, the Joint Requirements Office for CBRN Defense (JRO-CBRND), and the CBRN Defense Education and Training Integration Directorate (under the ATSD (NCB)) all play major roles in developing or integrating CBRN defense education, training and doctrine. This partnership has expanded to include, but is not limited to, the Under Secretary of Defense (Policy), the Under Secretary of Defense (Personnel & Readiness), and critical DoD CBRN defense education and training providers, including the National Defense University (NDU), the Defense Threat Reduction University (DTRU), and the U.S. Army Chemical School.

During 2006, the OSD CBRN Defense Education and Training Integration Directorate began to integrate CBRN defense education and training throughout the DoD. The directorate is currently developing a web site (https://etic.jscbis.apgea.army.mil) and database that will be a resource for all CBRN defense stakeholders.

The CBRN Defense Education and Training Integration Directorate hosted a conference for all major stakeholders in March 2006. A significant outcome was the establishment of a CBRN Defense Education and Training Integration Council (ETIC), which includes participation by all key stakeholders within DoD. This initial conference provided an overview of CBRN defense education and training efforts and current standards, identified challenges, and discussed potential solutions. The Council continues to evolve with the Strategic Working Group, established under the Council, currently performing as a Working Group Integrated Process Team (WIPT) of the CBDP Overarching Integrated Process Team. The WIPT will oversee the congressional study, HR5122, "Joint Training and Certification for Nuclear, Chemical, and Biological Defense" and follow up on study recommendations. Concurrently, the Council will develop a strategic plan for CBRN defense education, training, and doctrine integration.

4.2 CBRN DEFENSE IN PROFESSIONAL MILITARY EDUCATION

Currently the Professional Military Education (PME) provides only limited CBRN defense considerations and does not adequately address the CBRN threat or U.S. response capability in their curricula, associated wargames, or workshops. The incorporation of combating weapons of mass destruction (CbtWMD) learning areas in the CJCSI 1800.01C Officer Professional Military Education Policy (OPMEP) as well as the CJCSI 1805.01 Enlisted Professional Military Education Policy (EPMEP) shows the increasing priority of this area. 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 handling CBRN issues.

The JRO-CBRND is continuing an initiative to support the services and joint PME systems. In general, the JRO-CBRND provides subject-matter experts (SMEs) to ensure various aspects of CBRN defense are addressed in PME and related activities. Activities may include reviewing and developing course curricula; reviewing wargame scenarios; providing SMEs as guest speakers for classes, workshops, and conferences; providing awareness training for faculty; and participating in various meetings

to stimulate synergy among various institutions. During FY06, the JRO-CBRND provided the following specific support:

- Coordinated and facilitated the JRO-CBRND defense Guest Speaker Program at joint and service PME institutions. This support involved 15 SME lectures at Senior and Intermediate Service Colleges, and joint colleges as well as related activities, addressing in excess of 500 officers and senior civilians.
- Assisted with the development, execution, and assessment of wargaming events at Joint and Service PME institutions. The JRO-CBRND provided assistance to the Army War College's Strategic Crisis Exercise, the Marine Corps Command and Staff College's National Response Exercise, the 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. The JRO-CBRND's efforts have resulted in CbtWMD exercise objectives being added to this premier venue. This support affected over 500 officers and ensured that the appropriate levels and types of CBRN defense events were inserted into these wargames. The Army War College's Strategic Crisis Exercise is being renamed to the Strategic Decision Making Exercise with the JRO-CBRND assisting in the redevelopment effort of that capstone event.
- Coordinated and provided CBRN defense SME technical assistance at joint and service PME institutions to review and improve existing core and elective curriculum. For example, the JRO-CBRND developed and executed a two-day course for the Joint Advanced Warfighting School (JAWS) entitled "*Countering Weapons of Mass Destruction.*" The JRO-CBRND also reviewed and provided recommended CBRN defense-related improvements to both the Marine Corps Command and Staff College and at five senior service and two joint colleges participating in the JLASS exercise.
- Co-sponsored the "Johnny Apple Seed II" conference with the United States Air Force (USAF) Counterproliferation Center. This two-day conference provided CbtWMD subject-matter expertise to curriculum developers and educators at eight joint and service intermediate and senior level colleges, four senior enlisted academies, and three service academies interested in integrating CBRN issues into their curricula.

Throughout 2006, the USAF Counterproliferation Center (CPC) provided specialized weapons of mass destruction (WMD) expertise to PME institutions at Air University (AU), Maxwell AFB, AL, as well as the DoD community at large. With a mission to "counter weapons of mass destruction through education and research," CPC personnel developed and delivered WMD-related electives and also lectured at Air Force (AF) PME schools. In academic year 2006, the CPC sponsored a first ever, "Combating WMD Day" at the Air War College, emphasizing the criticality of this threat to combat air forces. Through a program aptly named "Johnny Appleseed," the CPC conducted intensive one-day courses to "educate the educators," equipping faculty from across the AF and DoD with the tools to properly develop and present WMD curricula within their respective institutions. The CPC was also instrumental in the Air Force's Counter-CBRN Education, Training, and Exercise (ETE) initiative, providing subject-matter and PME expertise to the ETE team. Finally, the CPC published a number of WMD-related monographs and books, taking full advantage of the rich operational experience of resident PME faculty and students, as well as the myriad WMD experts associated with the center.

Figure 4-1. Chemical Defense Training Facility (CDTF)

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 in ***Figure 4-1***. 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

In addition to conducting traditional CBRN defense specialist training, the USACMLS is currently overseeing the training portion of the Army Emergency CBRN Responder Program, a major component of the CBRNE Installation Preparedness Program. Required training is 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 into individual segments covering Installation CBRN Awareness, Operations, and Technician 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, shown in ***Figure 4-2***. This state-of-the-art training facility and ranges will be used to train both Army and multiservice CBRN specialists beginning in FY07.

Figure 4-2. 1LT Terry CBRN Responder Facility

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 threats 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 and 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 (DMRTI)

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

Table 4-1. Summary of Army Medical CBRN Training in FY06

Type of Training	Total Number Trained	Army Trained
AMEDDC&S		
Leader Development (CBRNE)	19,215	19,215
Army Training Support Center (See also Table 4-3)		
Emergency Medical Preparedness & Response Course (EMPRC)	23,209	23,209
AFRRI		
Medical Effects of Ionizing Radiation (MEIR)	574	68
USAMRICD/USAMRIID		
Medical Management of Chemical and Biological Casualties Course (MCBC) in residence	305	152
Field Management of Chemical and Biological Casualties Course (FCBC) in residence	361	162
Hospital Management of CBRNE Incidents (HM-CBRNE)	259	198
On-site to active military	394	240
On-site training – Non military	281	0
MCBC Offsite	191	165
MCBC Computer based Training/Video	4	4

Table 4-2. Summary of Contact Hours Awarded to USAMRIID/USAMRICD
(Course Attendees in FY06)

Type of Training	Physicians	Physician Hours	Nurses	Nurse Hours	EMTs / Paramedic	EMT/ Paramedic Hours
MCBC in residence	102	4,628.25	41	2,300.10	NA	NA
MCBC Offsite	20	410.50	29	652.10	NA	NA
FCBC in residence	NA	NA	NA	NA	112	4,569.60
HM-CBRNE in residence	51	1,541.25	62	2,116.30	19	583.40
HM-CBRNE Offsite	9	108.75	18	341.30	2	31.50

Table 4-3. Detailed Summary of Army Medical EMPRC Trained Emergency Medical Preparedness & Response Course (EMPRC)

EMPRC – Army	Total	Completed	% Complete
Military Personnel			
Enlisted Medical Personnel/Corpsmen	10,513	8,385	79.8%
Non-Medical Personnel (Enlisted & Officer)	1,493	1,234	82.7%
Independent Duty Special Forces Medics	3	2	66.7%
Medical Corps	2,869	1,560	54.4%
Dental Corps	740	649	87.7%
Veterinary Corps	351	304	86.6%
Nurse Corps	2,126	1,507	70.9%
Medical Service Corps - Administration	1,242	953	76.7%
USA – Medical Specialist Corps	444	356	80.2%
Physician Assistant	113	51	45.1%
Total Active Duty Personnel	19,894	15,001	75.4%
DoD Personnel (Civil Service)			
Technicians/Medical Assistants	6,496	5,199	80.0%
Medical Providers	792	580	73.2%
Dentists	58	39	67.2%
Veterinarians	3	2	66.7%
Nurses	4,153	2,773	66.8%
Healthcare Administration	2,038	1,754	86.1%
Med SP Corps Equiv/ Biomedical Specialists/ Technologists	973	765	78.6%
Physician Assistants	280	168	60.0%
Nonmedical/NonSecurity	7,157	5,757	80.4%
Security	215	116	54.0%
Total DoD Civilian Personnel	22,165	17,153	77.4%
TOTALS	42,059	32,154	76.5%

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 ***Table 4-2.*** A summary of Army medical personnel who have completed the Emergency Medical Preparedness & Response Course (EMPRC) Training is at ***Table 4-3***.

4.3.1.3 Army CBRN Specialists Training

U.S. Army CBRN specialist professional training takes place at the USACMLS, Fort Leonard Wood, with the exception of the Technical Escort Course, which is conducted at Redstone Arsenal, Alabama. Training consists of three enlisted/noncommissioned officer courses, two officer courses, and one reclassification course (Reserve Component only). At initial entry level (see ***Table 4-4***), enlisted CBRN specialists, 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 10 weeks of intensive training, culminating in live/toxic agent training in the CDTF. Toxic agent training is an integral, mandatory component of all Chemical Corps CBRN specialist initial entry and professional courses. There are two types of toxic agent training. Basic toxic agent training provides students with personal confidence in protective, detection and decontamination equipment, while advanced toxic agent training, added in FY05, provides Chemical Corps Advanced NCO Course (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 (FY06) at the USACMLS

Type of Training	Training Method	Number of Graduates[1]
Chemical Officer Basic	Initial Entry – Resident	102
Chemical Captain's Career Course	Initial Entry – Resident	55
Chemical Officer Advanced -RC	Resident	38
Chemical Operations Specialist (AIT)	Initial Entry – Resident	1856
Chemical Basic NCO Course	Resident	136
Chemical Advanced NCO Course	Resident	104

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

4.3.1.4 Army CBRN Training

The CBRN specialist remains the centerpiece of our CBRN defense systems and formations and is embedded in virtually every Army organization from company to unit of employment—indispensable to the joint team. Training and leadership development for the CBRN specialist will include instruction, both resident and nonresident, on all manmade environmental hazards including CBRN and HAZMAT. Our instruction is designed to equip the soldier to operate within the full spectrum of hazards and instantaneously provide detection, identification, and response expertise to the commander. CBRN specialists are disciplined, physically and mentally tough; trained and proficient in warrior task and drills; and prepared to engage the enemy in close combat. The CBRN soldier of the 21st Century is well trained, well-equipped, and organized to meet the ever-changing challenges of our new and complex operational environment. Maintaining that high degree of technical competence requires an adaptive institutional training model that includes the most effective up-to-date facilities, comprehensive CBRN instruction and practice, and a commitment to evolve training to meet changing tactical and domestic CBRN threats.

Specialized functional training is conducted in stand-alone 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 (FY06)

Type of Training	Training Duration	Number of Graduates[1]
Nuclear, Biological, Chemical Reconnaissance	6 weeks	97
Master Fox Scout	3 weeks	0
Biological Integrated Detection SYS (BIDS) P3I	4 weeks, 1 day	77
Biological Integrated Detection SYS (BIDS) JBPDS	2 weeks, 3 days	69
Decontamination Procedures (Non-US)	1 week	205
Radiological Safety (Installation Level)	3 weeks	39
Operational Radiation Safety	1 week	85
Analytical Laboratory System Course	5 weeks	20
Unified Command Suite	3 weeks	18
Civil Support Skills Course	8 weeks,	172
Chemical Pre-Command & Div/Corps	1 week	19
Technical Escort	3 weeks, 3 days	405
CBRN Responders Course	2 weeks	19
CBRN Mass Casualty Decontamination Course	1 week 3 days	0

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

4.3.1.5 USACMLS Weapons of Mass Destruction – Civil Support Team (WMD-CST) Program

The USACMLSWMD-Civil Support Team (CST) program has been fully engaged in FY06. The National Guard Bureau (NGB) activated the remaining 11 WMD-CST teams creating a total of 55 teams. This provides each state (50) and territory (4) with one team, with an additional 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 composed of officer and enlisted members from the Army and Air National Guard. Additional CSSC classes were added in FY05 to accommodate the number of soldiers and airmen to be trained in order to meet congressional mandated timelines for the new teams. The Incident Response Training Detachment (IRTD) of the 3d Chemical Training Brigade, Fort Leonard Wood (FLW), trained 172 students through the CSSC in FY06. USACMLS continually analyzes CST training and equipment requirements to adjust the program of instruction (POI) and lesson plans for the CSSC. There are currently three additional sustainment training courses in various stages of development for this program. They are the Unified Command Suite (UCS), the Analytical Laboratory System (ALS) and the CST Operations Course. There are also numerous other civilian course requirements that are coordinated through the NGB.

4.3.1.6 Army Medical Initiatives

CBRN Defense Training. The Principles of Military Preventive Medicine Course prepares future preventive medicine officers to support medical force health protection programs in CBRNE environments. In FY06, 86 students completed the Principles of Military Preventive Medicine Course. This course was revised to incorporate low-level radiological (LLR) training. LLR training was expanded in the Health Physics Specialists' Course and in training provided to the Nuclear Medical Science Officers (NMSOs) during Officers Basic Courses, Captain's Career courses, and Principles of Military Preventive Medicine courses. LLR training enables NMSOs and health physics specialists, with the 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 FY06, 23 students completed the training. In addition, 14 of the Army's NMSOs, Health Physics Technicians, Environmental Science Officers, and Chemical 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 personnel skills in responding to either accidents or terrorist events involving radiological materials. This year, the attendance selection was heavily weighted to favor officers in units scheduled to deploy during FY07.

Chemical, Biological, Radiological, Nuclear, & High Explosive (CBRNE) Sciences Branch Joint Civilian CBRN Training Initiative. The AMEDDC&S continued to support the U.S. Border Patrol and Joint Task Force 8 for the purpose of developing a well-trained civilian Emergency Medical Technician corps to meet surges in health care 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.

CBRNE Sciences Branch Oversight Training Initiative. The Army Medical Command's advanced training in management of chemical and biological (CB) threat agent incidents is conducted through two subordinate commands of the Medical Research and Materiel Command, USAMRICD and 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 (CBW) agents. Although they have a military focus, these courses have become increasingly important in the national and international antiterrorism effort.

USAMRIID and USAMRICD also cooperated this past year to produce a six-part satellite program on advanced topics in the medical management of CBW agents. The program was explicitly constructed to meet both deployed military and homeland defense needs. ***Table 4-2*** clearly demonstrated the utility of the program and also demonstrate the outreach capability of this educational medium.

In addition, USAMRICD is actively engaged in support of 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 Emergency Management Teams (EMATs).

In short, USAMRICD is actively engaged with both military and civilian medical and first-responder communities so 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 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 the DMRTI.

4.3.2 Army Reserve Initiative Training

As part of the ongoing Domestic Response Decontamination and Reconnaissance initiative (begun in 1999), U.S. Army Reserve soldiers have been trained through the U.S. 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, 620 U.S. Army Reserve chemical soldiers have received HAZMAT training through the Pennsylvania State Fire Academy in Lewistown, PA, and at Fort Leonard Wood. Of this number, 200 were trained at these locations in 2006. To assist the Army Reserve, the U.S. Army Chemical School prepared the Chemical, Biological, Radiological, and Nuclear Response course. The pilot course was held in July 2006 and training will begin in the second quarter, FY07. This course will provide HAZMAT technician-level training to Army Reserve soldiers, along with other necessary training. The Fort Dix Joint Interagency Civil Support Training Center continued to train soldiers on mass casualty decontamination. Over 800 soldiers have been trained on this topic so far. To transition the Mass Casualty Decontamination training over to the US Army Chemical School, the school will pilot a Mass Casualty Decontamination course in the third quarter, FY07, and begin training in the fourth quarter, FY07.

4.3.3 Air Force CBRNE Defense Training

Air Force policy is to provide initial CBRNE defense training to military personnel and emergency-essential civilians in, or deployable to, medium- and high-threat CBRNE areas (***Table 4-6***), to provide recurring training every 20 months. CBRNE defense course instructors at base level receive professional training through Air Force apprentice, and advanced courses at the Air Force Civil Engineer Readiness School, Fort Leonard Wood. Selected command, control, and response personnel receive additional home station and/or in-residence training to meet the requirements for HAZMAT 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. This information is updated annually or as needed.

Table 4-6. CBRN Threat Areas

CBRNE Threat	Geographical Location
High Threat Area*	Bahrain, Balkans Region, Diego Garcia, Egypt, Greece, India, 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**	Germany, Italy, Japan, and Yemen
Low Threat Area***	All locations not listed as a High or Medium Threat Area

* CBRN High Threat Area (HTA). Friendly forces in these areas are at high risk for attack with CBRNE weapons by states and nonstate actors, such as terrorists and criminals also known as transnationals. Potential adversaries within the region either possess, or are likely to possess, a substantial stockpile of CBRNE weapons and weapon systems and may have special operations forces capable of conducting sustained attacks on airbases. Actual or potential transnational threats exist during peacetime or wartime. Forces are within immediate strike range of adversary theater missiles, and CBRNE strikes using these weapons are assumed to be likely to occur. Air Force personnel and units in or deployed to these locations will be organized, trained, exercised, and equipped to survive CBRNE attacks and conduct sustained combat operations in CBRNE evironments. (Definition taken from AFI 10-2501, Air Force Emergency Management Program Planning and Operations)

** CBRNE Medium Threat Area (MTA). Friendly forces in these areas are at medium risk for attack with CBRNE weapons by states and nonstate actors, such as terrorists and criminals also known as transnationals. Potential adversaries within the region, either possess, or are likely to possess, CBRNE weapons and weapon systems and may have special operations forces capable of conducting limited attacks on airbases. Actual or potential transnational threats exist during peacetime or wartime. Forces may be within the extended range of adversary theater missiles, but it is assessed that CBRNE strikes using these weapons are less likely to occur. Air Force personnel and units in or deployed to these locations will be organized, trained, exercised, and equipped to survive CBRNE attacks and conduct limited combat operations in CBRNE. (Definition taken from AFI 10-2501, Air Force Emergency Management Program Planning and Operations)

*** CBRNE Low Threat Area (LTA). Friendly forces in these areas are at risk for attack with CBRNE weapons by transnationals. Actual or potential transnational threats exist during peacetime or wartime. Select personnel identified in AFI 10-2501, Air Force Emergency Management Program Planning and Operations, and other personnel identified in the installation Comprehensive Emergency Management Plan (CEMP) 10-2, are organized, trained, and equipped to continue critical missions and restore the primary mission. All other personnel in these locations are trained to survive attacks. (Definition taken from AFI 10-2501, Air Force Emergency Management Program Planning and Operations)

4.3.3.1 Individual and Team (Collective) Training

At the individual level, the Air Force uses a multilevel approach to CBRNE defense-related training. All new enlisted inductees (approximately 45,000 annually) receive initial CBRNE defense training during basic training at Lackland AFB, TX. 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. CBRNE training combines with other combat skills training over the course of a full week, culminating in a full-scale ability to survive and operate exercise.

Additionally, in conjunction with their Air Force Specialty Code awarding courses, enlisted medical personnel receive initial readiness training through the Expeditionary Medical Readiness Course at Sheppard AFB or at Basic Expeditionary Medical Readiness Training at Brooks City Base. 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.

To keep skills current 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 20 months after initial training and every 20 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[1] will evaluate students while they accomplish demonstration-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

[1] Instructors from Civil Engineer readiness flights are the Air Force's CBRN 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.

duty location. During TQT, members perform individual wartime duties while wearing appropriate chemical defensive equipment. Additionly, aircrews are required to conduct TQT flights while wearing chemical defensive equipment.

Finally, each individual's education and training are further refined during mandatory readiness exercises (see ***Table 4-16*** and ***Table 4-17*** later in this chapter) conducted to hone individual skills and unit capabilities and to identify shortfalls in the unit's overall capability while operating in CBRN environments. 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 HAZMAT emergencies including terrorist use of WMD. Specialized team members and personnel in senior or key leadership positions also receive additional information to help them make appropriate risk management decisions and better lead their personnel while ensuring air base operability.

Table 4-7. Major Accident and CBRNE Response Education and Training Requirements

If the person is	whose rank is	and who is assigned to	then, complete local training and
MAJCOM or Installation Commander	General	Response Task Force (RTF)	- Commander and Staff Radiological Accident Response (CASRAR) Workshop or Radiological Accident Command, Control, and Coordination (RAC3) Course - Air Force Incident Management Course (Formerly OSC Course) - FEMA IS-100, Introduction to the Incident Command System - FEMA IS-700, National Incident Management System - FEMA IS-800, National Response Plan (NRP), An Introduction
Emergency Operations Center (EOC) Director and Alternates	Major thru Colonel or equivalent throughColonel and equivalent	Initial Response Base (IRB) or EOC	-Air Force Incident Management Course - FEMA IS-100, -700, and -800
EOC Manager	Any SNCO or Officer	IRB or EOC	-Air Force Incident Management Course - FEMA IS-100, -700, and -800
Officer, Civilian, or NCO	Technical Sergeant (TSgt) through Colonel or equivalent	RTF	- CASRAR or RAC3 Course - FEMA IS-100, -700, and -800
EOD, CE readiness or bioenvironmental personnel	Any Rank	IRB	- AF Incident Management Course - Radiological Emergency Teams Operations (RETOPS) - FEMA IS-100, -700, -800
Senior Fire Officers	Any Rank	IRB	- AF Incident Management Course
Security Forces	TSgt thru Colonel or equivalent	IRB	- AF Incident Management Course
EOC Member	Any Rank	EOC	- FEMA IS-100, -700, and -800
Exercise Evaluation Team EET Chief or IG Evaluator	Any Rank	Major accident response evaluation duties	- Air Force Incident Management Course - FEMA IS-100, -700, and -800

Key: DNWS - Defense Nuclear Weapons School, Kirtland AFB, NM; AU – Air University, Maxwell AFB, AL, EOC- Emergency Operations Center, IRB- Initial Response Base, EET- Exercise Evaluation Team, RTF- Response Task Force, TSgt- Technical Sergeant, OSC- On Scene Commander, CE - Civil Engineer, EOD- Explosive Ordnance Disposal, IG- Inspector General

During 2006, 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 2006. 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 January 9, 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 fifth 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 table top exercise (TTX), Caduceus Endeavor, for 400 personnel. The next seminar is scheduled for June 2007 with a similar format.

Table 4-8. Active Duty Medic Completion

	Personnel Assigned	Personnel Completed	% Completed
Enlisted Medics	15,091	12,405	82%
Med Techs/IDMT*	6,269	5,569	89%
Medical Corps	2,931	2,810	96%
Dental Corps	916	916	100%
Nurse Corps	4,015	4,015	100%
Medical Service Corps	1,223	1,223	100%
Biomed Sciences Corps	2,034	1,716	84%
Physician Asst	322	291	90%
Total Active Duty	32,801	28,945	88%

* IDMT – Independent Duty Medical Technician

4.3.3.2 Contagious Casualty Management (CCM)

During FY04–05, the United States Air Force (USAF), 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 treatment-in-place, the concept of employment, personnel requirements, and allowance standard and field testing for a 25-bed increment to supplement Expeditionary Medical Support (EMEDS) facilities has been accomplished. The aeromedical evacuation capability to transport and treat enroute limited numbers of index contagious casualties will be provided via a patient isolation unit (PIU). An effort led and coordinated by AMC, with Joint involvement, is currently under way to acquire a limited number of individual PIUs for aeromedical evacuation (AE) of contagious casualties. Current plans are to acquire 20 units during FY07 through FY09 and stage them at Pacific Air Forces (PACAF) and U.S. Air Forces Europe (USAFE) locations. A Concept of Employment has been developed. Air Force tactics, techniques, and procedures (AFTTP) for aeromedical evacuation of index cases by AE crews and Critical Care Air Transport Teams (CCATTs), including PPE requirements and procedures, will be developed as part of the fielding process. EMEDS, CCAT, and Flight Nurse Technician 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 offers six 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	Duration	Number of Attendees
Civil Engineer (CE) Readiness Craftsman Course	67 days	235
CE Advanced Readiness Course	5 days	34
CE Readiness Flight Officer Course	20 days	21
CE Cell (Resident) Course	5 days	80

These courses fulfill the differing needs of the total force, including active duty, Air National Guard, Air Force Reserve, and international students. The Readiness Craftsman Course has been expanded from 53 to 67 academic days, effective January 2006, to include more detailed CBRNE defense training and additional emphasis on automated warning and reporting.

4.3.3.4 Air Force C-CBRN Concept of Operation (CONOPS) Documents

Because of the potential need to operate in a CBRN environment, the Air Force has focused a great deal of effort to develop and codify preparatory, response and command and control actions in C-CBRN CONOPS documents for use across the service. Additionally, in recognition of differences in CBRN and high-yield explosive environments, the USAF C-CBRN Council and the USAF Force Protection Steering Group (FPSG) agreed to transfer High-Yield Explosive responsibility to the FPSG.

The Counter–Chemical Warfare (C–CW) Element of the C–CBRN CONOPS. The Air Force achieved initial operational capability in December 2003. Additional research continues to identify and characterize chemical warfare threat vectors, including toxic industrial chemicals and toxic industrial materials (TICs/TIMs). The AMC is working on global airlift requirements in a contaminated environment. A major challenge for unit C-CW capabilities is maintaining the previously high levels of C-CW capabilities at the base level. The high operations tempo and recurring deployments limit the frequency and extent of C-CW CONOPS training at the individual and unit levels.

The Air Force Inspection Agency (AFIA) is currently performing an "Eagle Look" review of the Air Force C-CW CONOPS. Requested by senior Air Force leadership, Eagle Look reviews are independent and objective management reviews of key Air Force–wide programs and processes. The C-CW CONOPS Eagle Look review is primarily focused on how well the Air Force has institutionalized and validated the training and procedures identified in the C-CW CONOPS. The review also seeks to identify gaps and recommend actions to improve enterprise-wide implementation. Final results will be published in early calendar year 2007.

The Counter–Biological Warfare (C–BW) Element of the C–CBRN CONOPS. The goal of the Air Force's C-BW CONOPS development effort is to leverage existing materiel and nonmateriel solutions, while also developing procedural workarounds to overcome both technical and procedural capability gaps, to give Air Force commanders what their installations need to survive, fight, and prevail against BW-armed adversaries.

The Chief of Staff of the Air Force (CSAF) signed the Counter–Biological Warfare Concept of Operations (C-BW CONOPS) on August 18, 2006. The document outlines the Air Force approach for countering biological attacks and naturally occurring disease outbreaks. Its overarching goal is to limit casualties and sustain mission capability at Air Force installations before, during, and after a biological event. The C-BW CONOPS is centered on four main elements: layered biological defense, trigger events, disease containment, and operational risk management.

The Air Force staff developed an implementation plan to deploy the new C-BW CONOPS across the service. A comprehensive CONOPS implementation plan is in development, and approval is expected by early 2007. The implementation plan outlines Air Staff, MAJCOM, and installation responsibilities and lays out a two-year plan to fully integrate the precepts of the CONOPS into Air Force operations. Specific focus areas of the plan include development and publication of the following:

- New Air Force C-BW guidance and updates to existing guidance

- Educational materials for the general Air Force population, medical experts, and key installation leadership
- C-BW Exercise requirements
- Installation planning requirements
- Gaps in C-BW resource requirements
- C-BW operational standards and inspection criteria

An important element of the C-BW CONOPS implementation process will be AFI 10-2604, *Disease Containment Planning Guidance*, scheduled for publication in 2007. This document will provide policy and guidance for disease containment planning, outline roles and responsibilities, and discuss planning considerations. It will also direct all Air Force installations to develop a comprehensive disease containment plan and supporting checklists to prepare for, and respond to, a biological event. When released across the Air Force, the new instruction will be accompanied by a sample Disease Containment Plan to aid installations in the development of their own plans.

Other important guidance includes AFI 10-2603, *Emergency Health Powers on Air Force Installations* (published in December 2005), and AFI 10-2501, *Air Force Emergency Management Program Planning and Operations* (revision scheduled for release in the spring of 2007). Further, guidance is being refined as the result of Air Force involvement with the WMD Installation Training and Exercise Program and the Installation Protection Program (IPP).

The Counter–Radiological Warfare (C–RW), Element of the C–CBRN CONOPS. The Air Force continued work to create a C-RW element of the C-CBRN CONOPS:

The primary objectives of this initiative are as follows:

- Determine the 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 while minimizing personnel exposure.

Work on the C-RW initiative began with the C-RW Concept Study in 2004. That study provided 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. The Air Force followed the C-RW Concept Study with R&D of five baseline studies in 2005. The five studies provided an overview of existing C-RW capabilities across the Air Force and identified a number of capability shortfalls. In addition to the five baseline studies, six major commands (MAJCOMS) and 20 installations participated in a C-RW survey designed to gather information on installation-level C-RW preparedness and response capabilities.

The C-CBRN Council approved the formation of a C-RW Tiger Team. In early 2006, the C-RW Tiger Team, which included C-RW subject-matter experts, convened to assess current C-RW capabilities. The baseline studies and MAJCOM survey were reviewed by the team as part of their assessment. In all, the Tiger Team developed 62 recommendations for improving Air Force C-RW capabilities. These recommendations were included in the C-RW Tiger Team Report, and will serve as the foundation for creating a C-RW CONOPS and an effective C-RW capability.

The USAF C-CBRNE Master Plan. The U.S. Air Force published a C-CBRNE master plan with four implementation roadmaps. This plan coordinates Air Force efforts over a five-year period (2004–2009) to establish, maintain, improve, and evaluate its readiness to accomplish the full suite of Combating WMD missions and to operate in a WMD environment. The master plan outlines the operational capabilities the Air Force needs to counter the WMD 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 and are designed to cover a period of two years. Three of the roadmaps parallel the service's Title X responsibilities to organize, train, and equip; and the fourth covers fundamental research and definition of the problem and potential solutions. The Air Force is currently completing subtasks from the second iteration of roadmaps; the FY06–07 roadmaps. Development of the third and final iteration, the FY08–09 roadmaps, will begin in early FY07.

4.3.3.5 Air Force C-CBRN Air Force Training Initiatives: Air Force C-CBRN Education, Training and Exercise (ETE) Initiative

The Air Force Deputy Chief of Staff, Air, Space & Information Operations, Plans & Requirements (AF/A3/A5), established the Air Force C-CBRN Education, Training and Exercise (ETE) Initiative in December 2003 to institutionalize a cross-functional, end-to-end (accession to separation/retirement) approach to achieve an Air Force-wide C-CBRN operational capability. The AF C-CBRN Council chartered an ETE Working Group co-chaired by Deputy Director for Counterproliferation (AF/A3SC) and HQ Air Education and Training Command Strategic Plans (HQ AETC/A8PX).

The goal of AF C-CBRN ETE is to give individuals the appropriate knowledge, skills, and abilities needed to conduct air and space operations in a CBRN environment. The current focus is on individual airmen and senior leaders. Future efforts will address civilians, contractors, and dependents. The ETE Working Group utilizes a four-part methodology to realize USAF master plan objectives: (1) determine which KSAs are required, (2) investigate what institutional baseline currently exists, (3) identify and assess the gaps, and (4) develop an implementation plan to make the necessary changes.

In 2006, the Air Force made significant strides in reaching goals of the ETE initiative. The Air Force A3/5 has approved competencies for the first four of five Air Force doctrinal pillars: proliferation prevention, active defense, counterforce, and passive defense. Air Force education and training stakeholders compared those competencies with existing curricula and lesson plans to determine a baseline and worked with AETC to identify the gaps. Currently, the stakeholders are assessing these gaps to identify potential solutions.

WMD Incident Response Training (WMD IRT). The Air Force conducts WMD IRT to strengthen capabilities to prevent and manage the consequences of terrorist use of a CBRNE device. The CJCSI 3125.01 further delineates the requirements, and DoDI 2000.18 places the requirements squarely on the services and installations to prepare for, train, organize, and equip to respond to CBRNE WMD use by terrorists.

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 were designed to train installation leadership on terrorist-generated chemical and/or biological agent attacks. Code Silver TTX requirements are being incorporated into WMD IRT and AFI 10-2501, currently in revision and expected to be published in 2007. See section 4.4.2 for more information on the Code Silver TTX. With the Code Silver program completed, the newest program is MeRET (Medical Readiness and Training). The first pilot base was completed in January 2007.

4.3.4 NAVY CBRN DEFENSE TRAINING

The Navy continued training based on prior guidance and established training courses. During FY06, the Navy developed the Navy Training Systems Plan (NTSP) for new and in-service chemical, biological, and radiological defense (CBR-D) systems in an effort to establish CBR-D systems as formal programs of record in the Navy training community.

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 predeployment unit training exercises.

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

4.3.4.1 Navy Individual Training

In support of an on-going Navy Knowledge Online (NKO) initiative and DoDINST 1322.26 "Development, Management and Delivery of Distributed Learning" of June 2006, the Navy is working to develop Shareable Content Objective Reference Model/Integrated Learning Environment (SCORM/ILE) compliant courses that will further enhance CBR-D training in the areas of operation and maintenance. At the present, an ILE product is being developed that addresses IPE, decontamination equipment, and detection kits. In FY06 and FY07, respectively, ILE products for the CP system and in-service Navy CBD detectors were completed and delivered to the Center for Naval Engineering (CNE) for incorporation into CBR-D training.

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

Course Name	Course Location
Shipboard CBR-D Specialist Course, #CIN A-495-2062	Fort Leonard Wood, MO
Disaster Preparedness Operations Specialist Course, #CIN A-494-0006	Fort Leonard Wood, MO
Recruit Training CBR-D	Naval Training Center Great Lakes, IL
Basic Engineering Core Course (BECC), #A-651-0125	Naval Training Center Great Lakes, IL
Hospital Corpsman "A" School, #CIN B-300-0019	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 Effects of Ionizing Radiation	Armed Forces Radiobiology Research Institute Bethesda, MD
Radiation Health Indoctrination, #CIN B-5A-1050	Naval Undersea Medical Institute Groton, CT
Radiation Health Officer, CIN B-6H-0020	
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, #CIN K-495-0040	Fleet Training Center San Diego, CA Norfolk, VA; Mayport, FL Ingleside, TX Pearl Harbor HI; Yokosuka, Japan
Senior Enlisted Damage Control & Damage Control Assistant (SEDC DCA) Course, CIN A-4G-1111	Fleet Training Center San Diego, CA
Damage Control Assistant (DCA)	Surface Warfare Officer School Command, Newport, RI
Department Head, #CIN A-4H-0107	
(Prospective) Executive Officer, #CIN A-4H-0112	
(Prospective) Commanding Officer, #CIN A-4H-0111	

In the fourth quarter of FY05, the effort to outfit all of the Navy CBR-D schoolhouses with 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. This effort will continue as needed to ensure that the Navy schoolhouses are receiving adequate support. 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.

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 USACMLS, Fort Leonard

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

	2006 Accomplishments			2007 Goals**		
	DPSC*	CBR-D Ops	Total	DPSC*	CBR-D Ops	Total
Officers	1,062	97	1,159	700	13	713
Enlisted	45,047	1,203	46,250	5,990	224	6,214
Total	46,109	1,300	47,409	6,690	237	6,927

* DPSC – Disaster Preparedness Specialist Course

** 2007 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.

Wood. The Center for SeaBees and Facilities Engineering (CSFE) 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 throughput numbers.

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.

4.3.4.4 Navy Medical Training

Navy Medicine CBRNE training includes standardized, formal courses, and the tri-service CBRNE electronic training program, Emergency Medical Preparedness and Response Course (EMPRC). Information on the status of FY06 Navy CBRNE defense medical training is provided in ***Tables 4-12*** and ***4-13***.

CBRNE specific training courses include the following:

- Medical Management of Chemical and Biological Casualties Course (MCBC) – USAMRICD
- Field Management of Chemical and Biological Casualties Course (FCBC) – USAMRICD
- Hospital Management of Chemical, Biological, Radiological/Nuclear, and Explosive Incidents Course (HM-CBRNE) - USAMRICID
- Medical Effects of Ionizing Radiation Field Course – AFRRI
- Radiation Health Indoctrination - Naval Undersea Medical Institute Groton, CT
- Radiation Health Officer - Naval Undersea Medical Institute Groton, CT
- Biological Warfare Detection Course (BWDC) – Biological Detection Research Department (BDRD) – This course is for advanced lab technicians (NEC 8506) and preventive medicine technicians (NEC 8532), microbiologists, and biochemists.

Presently, Navy clinicians attend the MCBC at USAMRICD, USAMRIID, or AFRRI. Further, three Medical Service Corps officers are selected annually to complete a one-year fellowship at the U.S. Army Research, Development and Engineering Command, Aberdeen Proving Ground, MD. Advanced training in the entire medical defense spectrum against CBR agents, including environmental contaminates encountered during deployment, is provided. There is a specific focus emphasized on the planning and execution of military response and support to CBRNE-related events, both domestically and during conflict. Additionally, Advanced Lab Technicians and Preventive Medicine Technicians receive Biological Warfare detection training provided by the Navy Medical Research Center (NMRC).

In 2003, the Navy Surgeon General mandated that all Navy medical personnel complete their EMPRC training by 30 September 2006. ***Table 4-12*** provides the status of FY06 Navy CBRNE defense medical training. ***Table 4-13*** reflects compliance data as of October 2006 for all members of BSO-18.

Table 4-12. Navy Medical CBRN Defense Training Status (2006)

	Clinicians			Nonclinicians		
	Trained	Total	% Trained	Trained	Total	% Trained
Officers	6,052	6,966	86.9%	764	1,123	68%
Enlisted	64	86	74.4%	12,761	14,003	91.1%
Total	6,086	7,052	86.3%	13,525	15,126	89.4%

Table 4-13. Navy EMPRC Training Status (2006)

Clinicians by Corps	Trained	Total Inventory	% Trained
Medical Corps	2,417	2,912	83.0%
Dental Corps	916	1,135	80.7%
Nurse Corps	2,490	2,670	93.3%
Physicians Assistant	229	249	92%
Hospital Corpsman (HM)	12,825	14,089	91%
Total	18,877	21,055	89.6 %

4.3.4.5 Unit Training

Navy units conduct basic, intermediate, and advanced training exercises as part of the interdeployment 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 Skills (PQS) training. The PQS are 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 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 the 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 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 4-14***.

Table 4-14. Navy Basic CBR-D Unit Training Tasks

- 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 EMP. The 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.

4.3.4.7 Navy Medicine Emergency Management Program

In 2006, the Bureau of Medicine and Surgery (BUMED), Navy Medicine Office of Homeland Security (NMOHLS) transitioned the Disaster Preparedness Vulnerability Analysis Training and Exercise Program (DVATEX) into the "all-hazards" EMP. This program provides the health service support for installation emergency management as directed by OPNAV3400.17 and serves as the Echelon 2 complementing EMP to CNIC3440.17. The Navy Medicine EMP is being implemented in a phased approach over the midterm. The EMP provides policy guidance, tiered capabilities, standardized and centralized equipment procurement, training and exercises, integration with the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) and Commander, Navy Installations Command (CNIC) programs/projects, life cycle sustainment and National Response Plan (NRP) and National Incident Management System (NIMS) compliance.

Phase 1 (FY06) of the EMP involved final draft completion of BUMEDINST 3440.11; finalization of the CBR-D standardized equipment list, military treatment facility (MTF) tier assignments, basis of allocation tables (BoAs) and the Authorized Medical Allowance List (AMAL) development; and initial procurement to supplement the Joint Project Manager Guardian Installation Protection Program (JPMG-IPP).

Phase 1 procurement included the following items: personal protective gear (Level C suits, Air Purifying Respirators (APRs), Power APRs (PAPRs) gloves, boots), mass casualty decontamination equipment, handheld interoperable radio communications, and pharmaceutical countermeasures for first responder/receivers. Phase 2 procurement will expand the procurement to more MTFs across the Navy medical enterprise as well as incorporate those initiatives from the Assistant Secretary of Defense for Health Affairs (ASD/HA) regarding avian/pandemic influenza.

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 CBRN defense is separated from other training events, as it conditions Marines to regard CBRN defense operations as a separate form of warfare. Complete integration of CBRN defense training ensures that all Marines possess a thorough understanding of CBRN defense operations and procedures. All personnel are 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 nuclear, biological, and chemical defense (NBCD) training to develop unit integrity, cohesion, and CBRN defense operational expertise.

4.3.5.1 Individual Training

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

4.3.5.2 Unit Training

Units are required 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.

Table 4-15. USMC CBRN Defense Operating Force Training

Training Command	Type of Training	Training Duration
USMC CBRN Defense School	CBRN Defense Specialist Basic Course	12 weeks
USMC CBRN Defense School	CBRN 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

4.3.5.3 CBRN Defense Specialist Training

Completion of the required initial basic instruction and sustainment of proficiency are considered 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*. ***Table 4-15*** provides a complete list of schools available for CBRN officers/specialists.

4.3.5.4 Marine Corps CBRN Defense Initiatives

The Marine Corps' focal point for all CBRN defense issues related to the CBDP resides under the Deputy Commandant for Combat Development and Integration (DC CD&I). The DC CD&I is also the Commanding General of the Marine Corps Combat Development Command (MCCDC). Operating force CBRN defense initiatives are tailored to support MCO 3400.3F, *Nuclear, Biological, and Chemical (NBC) Defense Training* and may be adjusted as required to focus on supporting and winning the current fight. Operating force training conducted in FY06 is shown in ***Table 4-15***. During FY05, the Marine Corps initiated the Expeditionary Biological Detection (EBD) Advanced Technology Demonstration (ATD). The EBD ATD will determine if available GOTS and COTS biological agent detectors can be employed in a manner that will provide the Marine Corps an operationally suitable tactical family of biological detectors that can be employed down to the small unit level. Any resulting material solution and/or tactics, techniques, and procedures (TTPs) from this ATD may transition into the Joint Biological Tactical Detection System (JBTDS) program.

4.3.6 ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE (AFRRI) TRAINING

AFRRI is a DoD organization that develops, organizes, and conducts the postgraduate 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 with 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 following:

- Mini-MEIR–A one-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 covering 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 one-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 an 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

DTRA is designated as the DoD Executive Agent for nuclear weapons training. As part of DTRA, the Defense Nuclear Weapons School (DNWS) is the only DoD school with advanced joint and multiservice training courseware on the national nuclear weapons stockpile and the nation's nuclear weapons program. DNWS uses a blend of in-residence classroom, field training, mobile training team, and distance-learning courseware for students from the noncommissioned officer ranks through general/flag officers. DNWS also provides training to the larger combating weapons of mass destruction (CbtWMD) community in nuclear weapons orientation, nuclear weapons accident response, and general CbtWMD staff training. To ensure the full range of individual and collective training opportunities, DNWS manages the DoD's only radioactive field training sites and has recently obtained approval for this capability to be a persistent site within the Joint National Training Capability (JNTC). This linkage to the JNTC will make the DNWS field training sites available to a wider set of U.S. military customers throughout the world. DNWS also makes use of DoD's only classified nuclear weapons display area (WDA). The DNWS trains students from all levels of DoD, federal, and state agencies, and selected allied countries.

In FY07 the DTRA will continue to 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 OSA (CBD & CDP), the U.S. Army Chemical School, U.S. Joint Forces Command, U.S. Northern Command, U.S. Strategic Command's (USSTRATCOM's) Center for Combating Weapons of Mass Destruction (SCC), and the joint staff on this initiative. DTRU has published its first catalog of all of the individual and collective training courses conducted by all of DTRA. The DTRU is also in the process of establishing qualification standards for DoD nuclear and radiological instructors. The DTRU has also recently accepted responsibility for the management of the Defense Threat Reduction Information Analysis Center (DTRIAC) which maintains a specialized nuclear knowledge library, the WDA, and an associated research capability. DTRA estimates an Initial Operational Capability for the DTRU of FY08.

4.3.8 JOINT CBRN DEFENSE TRAINING

The JRO-CBRND assists the combatant commands to 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 this JRO-CBRND initiative is the Joint Senior Leaders Course (JSLC). The JSLC is sponsored by the JRO-CBRND and conducted at the USACMLS in Ft Leonard Wood 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 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.

4.4 EXERCISES

During 2006, 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 U.S. Army Medical Command (USAMEDCOM) CBRN Defense Exercise Program Initiatives

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 (MTFs); 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. Fifty-four 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 through FY07.

4.4.2 AIR FORCE EXERCISES

All AF installations are required to develop scenarios and conduct exercises based on AFI 10-2501, Air Force Emergency Management Program Planning and Operations, the installation's Comprehensive Emergency Management Plan (CEMP) Plan 10-2 and other emergency plans. ***Table 4-16*** and ***Table 4-17*** summarize the types and frequencies of exercises that installations must conduct.

In FY2004-05 the Air Force Medical Service conducted a medically centric TTX (Code Silver) that included wing and civilian community CBRNE responders. TTX Code Silver provided the medical treatment facilities, installation, and civilian responders the opportunity to envision a CBRNE event that would generate 300 casualties in the first 24–72 hours. Responders from civil engineering, public pffairs, the medical group, and the 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.

Table 4-16. Air Force CBRNE Defense Exercise Requirements

CBRNE Threat Area *	Minimum Exercise Requirements
Low	Annually - Must reflect the most stringent CBRN threats in-place or that assigned expeditionary forces could face.
Medium	Semiannually - Scenario should exercise all functional operations in a CBRNE threat environment and include a minimum of one persistent agent attack. - ANG units require only the minimum number of participants to meet exercise objectives (for example, key players). - ANG is authorized two tabletop exercises annually, with key player involvement.
High	Quarterly - Scenario should exercise all functional operations in a CBRNE threat environment and include a minimum of one persistent agent attack. - Air National Guard (ANG) units require only the minimum number of participants to meet exercise objectives (for example, key players). - ANG is authorized two tabletop exercises annually, with key player involvement.

* 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 including infiltrators, witting or unwitting human vectors infected with any contagious BW agent, off-base dispensing of an agent from ground sources, and aerial dispersal from aircraft that remain outside the base perimeter.

Table 4-17. AF Emergency Management Program Exercise Requirements – Installation Exercises

Type of Exercise	Category	Frequency *	Remarks
Major Accidents	Munitions	Annually	Applies only to the munitions at the installation.
	Radioactive material	Annually	
	Nuclear weapons	Annually**	- May not be accomplished by tabletop. - MAJCOMS will determine their installations' participation requirements.
	Off-base response	Annually	Exercise should be written with host nation or local community to allow its participation when possible.
	Mass casualties	Annually	Exercise must overwhelm the installation's medical capabilities.
	Air Show Response	As applicable***	
	HAZMAT Team	Annually	Exercise HAZMAT substance located on the installation.
Terrorist Use of CBRNE	CBRNE Incident	Two Annually	Two CBRNE exercises annually, one of which must be a biological incident.

* Exercise frequency requirements are minimal, and may be increased by the EET chief.

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

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

4.4.4 MARINE CORPS EXERCISES

The following CBRN defense exercises were conducted by Marine Forces Command (MARFORCOM).

- From October through December 2006. CBIRF conducted consequence management support in Exercise Ardent Sentry.
- During May 2006, the Chemical, Biological Incident Response Force (CBIRF) participated in a capabilities exercise at Camp LeJeune, NC.
- 2nd Marine Logistics Group participated in a Camp LeJeune–base CBRN antiterrorism/force protection exercise during August 2006.
- During August/September 2006, II MEF participated in exercise Ulchi Focus Lens (UFL) providing the II MEF Combat Operations Center (COC) with a CBRN Operations Cell.
- From January through December 2006, the CBIRF supported Operation Iraqi Freedom (OIF) with two CBRN Reconnaissance Teams.
- On May 23, 2006, the CBIRF conducted a joint/interagency chemical response exercise at the Pax River National Academy of Science.
- On July 13, 2006, the CBIRF Conducted IRF TTX, a Chemical Explosive Event at Mallinkrodtchem Facility, St. Louis, MO.

The following CBRN defense exercises were conducted by Marine Forces Pacific (MARFORPAC):

- Exercise Reception, Staging, Onward Movement, and Integration (RSO&I) (March 2006). MARFORPAC units participated in this annual U.S. forces/Korea (USFK) exercise conducting NBCD CBRN planning and execution, while exercising the NBC Warning and Reporting System using the JWARN software suite, coupled with the Command and Control Personal Computer (C2PC) software program.
- Exercise Ulchi Focus Lens (August 2006). 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 C2PC software program. Within the construct of the exercise and capabilities of various software, U. S. Marine Corps units actively engaged in CBRN scenarios, NBC scenario development, and execution with the combined forces.
- The 31st MEU E-NBC Team conducted sensitive site exploitation (SSE) in support of an amphibious boat raid in Guam during the Marine Expeditionary Unit Exercise (MEUEX) 06-1. They also conducted SSE in support of an airfield seizure on Ie Shima Island, Okinawa, and conducted SSE in support of humanitarian assistance/disaster relief (HA/DR) operations during MEUEX 06-2.
- Exercise Ryukyu Warrior. The 1st Marine Wing validated Counter-Chemical Warfare (C-CW) TTP during their counter-CBRN defense initiative. The exercise included warning the airfield/base of a possible chemical attack; and performing CBRN reconnaissance, decontamination operations, zone establishment with security personnel, and medical operations in a contaminated environment (casualty movement to medical treatment facility).

4.4.5 JOINT EXERCISES

The United States Joint Forces Command (USJFCOM) and the DTRA have partnered in creating and staffing the Joint Warfighting Center (JWFC) CBRNE Support Cell. This cell is tasked to support every combatant commander (COCOM) exercise in the Chairman's Exercise Program that has Combating Weapons of Mass Destruction (CWMD)/CBRNE events included in the exercise. Historically, this has been two exercises per year for NORTHCOM and STRATCOM and one exercise per year for the remaining COCOMs. Additionally, the cell supports mission rehearsal exercises (MRXs), as well as NATO, the Partnership for Peace (PfP), the Proliferation Security Initiative (PSI), and other multinational exercises. This support includes creating and refining training objectives and subtasks for the training audience; developing and refining scenario CBRNE themes; providing CBRNE modeling and simulation (M&S) products; creating the CBRNE portion of the ground truth document; creating Joint Master Scenario Event List (JMSEL) injects to support the scenario; and manning the CBRNE cell in the Joint Exercise Control Group (JECG) during execution.

Finally, the cell provides CWMD/CBRNE expertise relating to the Joint Enabling Capability Elimination, CWMD/CBRNE doctrine, CWMD Joint Innovation

and Experimentation, DTRA M&S integration, the Interservice/Industry Training, Simulation, Exercise Conference (I/ITSEC), and the OSD CBRNE Education and Training Integration Council.

During 2006, 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 to provide and improve CBRN defense capability to the warfighter. This organization codified a formal working relationship between the JRO-CBRND and the Joint Forces Command (JFCOM) to improve the current and emerging joint force warfighting and supporting capability in a CBRN environment. Under the JRO-CBRND lead, the JCBRN CIIT assisted COCOMs 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: the United States Pacific Command (PACOM), United States Northern Command (NORTHCOM), and the United States European Command (EUCOM).

4.4.5.1 Northern Command (NORTHCOM)

- Exercise Vigilant Shield 2007 (VS07) Nuclear Weapons Accident (NUWAX) venue. The CBRNE Support Cell supported the MSEL Development Conference (MDC), Mid Planning Conference (MPC), and Final Planning Conference (FPC) for this exercise. This support included developing and refining scenario CBRNE themes, providing CBRNE M&S products; creating the CBRNE portion of the ground-truth document, and creating JMSEL injects to support the scenario. The CBRNE Support Cell manned the JECG during the execution of this exercise, providing CBRNE expertise that included dynamic scripting of scenario and JMSEL injects based upon blue player actions and resolving white cell issues so the impact on blue players was minimal. The JRO-CBRND/CIIT also provided SME and analytical support to NORTHCOM, the DTRA, and the Air Combat Command (ACC) for this exercise. The NUWAX was led by DTRA and ACC, and was conducted at Davis-Monthan AFB (DMAFB). The VS07 NUWAX was the first time NORTHCOM took operational control of, employed, and redeployed the ACC Response Task Force (RTF). The NUWAX scenario involved a Special Assignment Airlift Mission (SAAM) that experienced an in-flight emergency resulting in the aircraft crashing short of the runway while on final approach. There was also limited play by local, county, and state officials and first responders. An Emergency Preparedness Liaison Officer (EPLO) for the State of Arizona filled the role of defense coordinating officer (DCO).
- ARDENT SENTRY 06: The CIIT supported this exercise with personnel at (1) Michigan with JTF-CS and Michigan State White Cell and at (2) USNORTHCOM HQ. The purpose was to provide CBRN/CM expertise and input to the respective exercise summary reports.
- ARDENT SENTRY/NORTHERN EDGE 07: The CBRNE Support Cell supported the Initial Planning Conference (IPC), the MDC, and the MPC for this exercise. This support included developing and refining scenario CBRNE themes, providing CBRNE M&S products, creating the CBRNE portion of the ground truth document, and creating JMSEL injects to support the scenario.

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

Sudden Response 2006 (SR-06). SR 06 was conducted August 14–18, 2006, and was a local JTF-CS exercise designed to deploy and employ the Command Assessment Element (CAE), validate deployable communications from the CAE to JTF-CS Main; complete a Commander's Assessment, and complete an Operational Order (OPORD) with briefing. The JRO-CBRND observer/trainer team participated in this exercise by providing concept development, MSEL development, collection plan design, and observer/trainer support. The scenario was a pneumonic plague outbreak in Las Vegas and environs.

4.4.5.3 USSTRATCOM WMD Interdiction Tabletop Event

The CIIT provided support to both the USJFCOM and the USSTRATCOM during the development of this short notice event. Within 30 days, the CIIT developed the scenario, prepared facilitator questions, built the tabletop books, and executed the tabletop. As a result of the tabletop, USSTRATCOM determined the need to more actively engage COCOMs to develop a USSTRATCOM training policy on the issue of combating WMD.

4.4.5.4 USJFCOM J9 URBAN RESOLVE 2015

Between February and September 2006, the CIIT provided the only CBRNE consequence management subject-matter expertise for the nine different iterations of this experiment to test the integration of subject-matter experts and emerging CBRN tools into JTFs. Two JRO-CBRND personnel were integrated into the experimental JTFs as the only CBRN planners.

4.4.5.5 Pacific Command (PACOM)

TERMINAL FURY 07: The CBRNE Support Cell supported the MDC, MPC, and FPC for this exercise. This support included developing and refining scenario CBRNE themes, providing CBRNE M&S products creating the CBRNE portion of the ground truth document, and creating Joint Master Scenario Event List (JMSEL) injects to support the scenario.

4.4.5.6 European Command (EUCOM)

FLEXIBLE RESPONSE 08: The CBRNE Support Cell supported the Concept Development Conference (CDC) for this exercise. This support included developing initial -scenario CBRNE themes.

4.4.5.7 Southern Command (SOUTHCOM)

Fuertes Defensas/PANAMAX 06: The CBRNE Support Cell manned the JECG during the execution of this exercise, providing CBRNE expertise that included dynamic scripting of scenario and JMSEL injects based upon blue player actions and resolving white cell issues so the impact on blue players was minimal.

4.4.5.8 Strategic Command (STRATCOM)

GLOBAL LIGHTNING 07: The CBRNE Support Cell supported the Training Objective Workshop (TOW), Concept Development Conference (CDC), Initial Planning Conference (IPC), MSEL Development Conference (MDC), Mid Planning Conference (MPC), and Final Planning Conference (FPC) for this exercise. This support included creating and refining training objectives and subtasks for the training audience, developing and refining scenario CBRNE themes, providing CBRNE M&S products, creating the CBRNE portion of the ground truth document; and creating JMSEL injects to support the scenario. The CBRNE Support Cell manned the JECG during the execution of this exercise, providing CBRNE expertise that included dynamic scripting of scenario and JMSEL injects based upon blue player actions and resolving white cell issues so the impact on blue players was minimal.

GLOBAL THUNDER 07: The CBRNE Support Cell supported the TOW, CDC, and IPC for this exercise. This support included creating and refining training objectives and sub tasks for the training audience and developing initial scenario CBRNE themes.

GLOBAL LIGHTNING 08: The CBRNE Support Cell supported the Concept Development Conference (CDC) for this exercise. This support included developing the initial scenario CBRNE themes.

4.4.5.9 Central Command (CENTCOM)

INTERNAL LOOK 07: The CBRNE Support Cell supported the MSEL Development Conference (MDC) and Final Planning Conference (FPC) for this exercise. This support included refining scenario CBRNE themes, providing CBRNE M&S products, creating the CBRNE portion of the ground truth document, and creating JMSEL injects to support the scenario. The CBRNE Support Cell manned the JECG during the execution of this exercise, providing CBRNE expertise that included dynamic scripting of scenario and JMSEL injects based upon blue player actions and resolving white cell issues so the impact on blue players was minimal.

UNIFIED ENDEAVOR 07-2 Mission Rehearsal Exercise (MRX): The CBRNE Support Cell supported the Training Objective Workshop (TOW) for this exercise. This support included creating and refining training objectives and subtasks for the training audience.

4.4.5.10 Special Operations Command (SOCOM)

ABLE WARRIOR 07-1 and 07-2: The CBRNE support Cell supported the MPC for this exercise. This support included refining scenario CBRNE themes.

4.4.5.11 NATO, Partnership for Peace (PfP) and Proliferation Security Initiative (PSI) Exercises

REGIONAL COOPERATION 06: The CBRNE Support Cell provided scenario development and modeling support for this exercise.

SOUTHEASTERN EUROPE SIMULATION (SEESIM) 06: The CBRNE Support Cell provided scenario development and modeling support for this exercise.

4.5 CBRN DEFENSE DOCTRINE

CBRN Defense doctrine exists at the Allied, joint, multi-service and service levels. Initiatives continued through 2006 that 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 multiservice doctrine/TTP manuals developed by the four Services. The core joint and multiservice, and service-unique CBRN defense doctrine publications are listed in ***Table 4-18.***

4.5.1 JOINT/COALITION MEDICAL DOCTRINE INITIATIVES

The Office of the Under Secretary of Defense delegates the U.S. Army as the lead agent for the United States and serves as the Department of Defense focal point for the NATO medical, and medical chemical, biological, radiological, and nuclear (CBRN) actions. The Office of the Surgeon General (DASG-HCO) is the lead executive agent for international CBRN activities. The office of the Deputy Chief of Staff, G-3, designates the OTSG CBRN Staff Officer as the U.S. Head of Delegation (HOD) to the NATO CBRN Medical Working (CBRN Med WG) and its subgroups and panels. The HOD is responsible for coordinating and developing U.S. positions within the medical CBRN functional area in accordance with the policies and directives established by the Assistant Secretary of Defense for Health Affairs and the Assistant Secretary of Defense for Policy.

The United States achieved significant milestones in its commitment to the continued development of Medical CBRN Standardization Agreements (STANAGs) and allied publications (APs). They include;

- 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 BW agents that cause infectious disease. STANAG 2242 was last reviewed on January 25, 2006.
- STANAG 2476–*Medical Planning Guide for the Estimation of NBC Battle Casualties,* (AMedP-8), (Biological), Volume II. AMedP-8 provides the estimates of casualties and remaining operational strength after a CBRN event in a military (Brigade-sized) unit during an out-of-area contingency operation. The estimates consist of the numbers, injury type, and injury severity of patients in several brigade scenarios. Edition 2 Addendum, Ratification Draft 1, was produced by the custodian (U.S.) and distributed to the NATO nations for ratification in the fall of 2005. Ratification status is currently pending.
- STANAG 2873–*Concept of Operations for Medical Support in CBRN Environments,* Allied Medical Publications-7, (AMedP-7). AMedP-7 provides guidance for planning CBRN medical operations. This document supports medical planning for CBRN environments to sustain the force and to ensure mission success. It proposes an approach to CBRN medical defense that places greater emphasis on pre-event preparation than postevent response. Ratification Draft 1 of Edition 4, was produced by the custodian (US) and distributed to the NATO nations in October 2006 for ratification.
- AMedP-8–*Medical Planning Guide for the Estimation of NBC Battle Casualties,* consisting of three volumes, STANAG 2475, Volume I; STANAG 2476, Volume II; and STANAG 2477, Volume III; The way-a-head on AMedP-8 has lead to the revision and the proposal to consolidate the three volumes into one document. Study Draft 1 of the revision has been produced and is projected to be circulated to the nations for review and comment by January 2007.

The U.S. recommended ratification for two NATO CBRN Medical STANAGs. They include the following:

- STANAG 2463 – *NATO Handbook on the Medical Aspects of Defensive Operations,* AMedP-6(C), (Chemical, Volume III)
- STANAG 2476–*Medical Planning Guide for the Estimation of NBC Battle Casualties,* AMedP-8(B), Volume II

The following STANAGs / APs were promulgated by the NATO Standardization Agency during FY06:

Table 4-18. Core CBRN Defense Doctrine

Publication	Comment (Status)	Army	Air Force	Navy	Marine Corps
Joint Publication 3-11, Joint Doctrine for Operations in Nuclear, Biological, and Chemical Environments, July 2000	Joint Doctrine	•	•	•	•
Joint Publication 3-26, Joint Doctrine for Homeland Security, August 2005	Joint Doctrine	•	•	•	•
Joint Publication 4-02, Doctrine for Health Service Support, October 2006	Joint Doctrine	•	•	•	•
Joint Publication 3-40, Joint Doctrine for Combating Weapons of Mass Destruction, July 2004	Joint Doctrine	•	•	•	•
Joint Publication 3-41, CBRNE Consequence Management, October 2006	Joint Doctrine	•	•	•	•
Multiservice Tactics, Techniques, and Procedures (MTTP) for NBC Defense of Theater Fixed Sites, Ports and Airfields	Multiservice Doctrine	FM 3-11.34	AFTTP (I)3-2.33	NTTP 3-11.23	MCWP 3-37.5
MTTP for CBRN Contamination Avoidance, February 2006	Multiservice Doctrine	FM 3-11.3	AFTTP 3-2.56	NTTP 3-11.25	MCRP 3-37.2A
Nuclear Contamination Avoidance	Multiservice Doctrine (FM 3-11.3 under revision)	Part of 3-11.3	Part of AFTTP 3-2.56	Part of 3-11.25	MCRP 3-37.2B
MTTP for NBC Aspects of Consequence Management	Multiservice Doctrine	FM 3-11.21	AFTTP (I)3-2.37	NTTP 3-11.24	MCRP 3-37.2C
MTTP for NBC Defense Operations	Multiservice Doctrine	FM 3-11	AFTTYP(I) 3-2.42	NWP 3-11	MCWP 3-37.1
MTTP for CBRN Decontamination, April 2006	Multiservice Doctrine	FM 3-11.5	AFTTP (I) 3-2.60	NWP 3-11.26	MCWP 3-37.3
MTTP for NBC Protection, June 2003	Multiservice 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), November 1986	Multiservice 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, January 2005	Multi-Service Doctrine	FM 3-11.9	AFTTP(I) 3-22.55	NTRP 3-11.32	MCRP 3-37.1B
Flame, Riot Control Agent, and Herbicide Operations, August 1996 w/ ch1 March 2003	Multiservice Doctrine	FM 3-11.11			MCRP 3-3.7.2
MTTP for NBC Vulnerability Assessment, December 2004	Multiservice 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
MTTP for NBC Aspects of Consequence Management, December 2001	Multiservice Doctrine (under revision)	FM 3-11.21	AFTTP (I)3-2.37	NTTP 3-11.24	MCRP 3-37.2C
Weapons of Mass Destruction Civil Support Team Tactics, Techniques, and Procedures, June 2003	Army Doctrine	FM 3-11.22			
MTTP for Biological Surveillance	Multiservice Doctrine	FM 3-11.86	AFTTP(I) 3-2.52	NTTP 3-11.31	MCRP 3-37.1C
CBRN Responder Operations Handbook	Army Doctrine (New Publication)	FM 3-11. 23			
CBRN Handbook: SSE and Environmental Recon Operations	Army Doctrine (New Publication)	FM 3-11.24			

Publication	Comment (Status)	Army	Air Force	Navy	Marine Corps
MTTP for NBC Defense of Theater Fixed Sites, Ports and Airfields, September 2000	Multi-service Doctrine (under revision)	FM 3-11.34	AFTTP (I) 3-2.33	NTTP 3-11.23	MCWP 3.37.5
MTTP for Biological Surveillance, October 2004	Multi-Service Doctrine	FM 3-11.86	AFTTP(I) 3-2.52	NTTP 3-11.31	MCWP 3-37.1C
Force Health Protection in CBRN Environment, October 2000	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, December 2001	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, July 2000	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, December 1995	Multi-Service Doctrine (under revision)	FM 8-285	AFJMAN 44-149	NAVMED P-5041	FMFM 11-11
NATO Handbook on the Medical Aspects of NBC Defensive Operations (AMedP-6[B]), February 1996	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		
Emergency Management	Air Force Doctrine		AFPD 10-25		
Emergency Management Program Planning and Operations	Air Force Doctrine		AFI 10-2501		
Emergency Management Program Guidance	Air Force Doctrine (Draft development)		AFMAN 10-2502		
Emergency Management Program Tactics, Techniques and Procedures (TTPs)	Air Force Doctrine (Draft development)		AFMAN 10-2517		
Nuclear, Biological, Chemical and Conventional Defense Operations and Standards	Air Force Doctrine		AFMAN 10-2602		
Nuclear, Biological, and Chemical Defense Operations and Standards	Air Force Doctrine		AFMAN 10-2602		
Airman's Manual	Air Force Doctrine		AFMAN 10-100		

- STANAG 2478—*Medical Support Planning for NBC Environment*, Edition 1, February 10, 2006
- STANAG 2954—*Training of Medical Personnel for NBC Operations*, Edition 2, May 12, 2006

The DASG-HCO 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 DOCTRINE

During FY06, the Navy participated in all multiservice doctrine working groups to produce and update the joint and multiservice CBRN defense doctrinal publications listed in ***Table 4-18*** above. The Navy was also represented at all FY06 meetings and reviews associated with the ongoing development of improved NATO STANAGS and AP. For example, Allied Tactical Publication 3.8.1, Volume 1, *Allied Joint Tactical Doctrine for CBRN Defense* is currently under development by a NATO CBRN doctrine and terminology panel that includes U.S. Army, Navy, and Air Force representatives.

The Navy has continued their work in tandem with the Marine Corps to update existing and produce new doctrine focused on the unique maritime-related requirements of Navy and Marine Corps warfighters.

As of October 2005, the Navy updated the CBR-D Navy Mission Essential Task Lists (NMETLs) and Personnel Qualification Standards (PQSs) (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 PQSs for damage control and CBR-D training requirements.

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.

4.5.3 MARINE CORPS

The Marine Corps participates in the development and revision of the doctrinal publications listed in ***Table 4-18***. 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*.

4.5.4 AIR FORCE DOCTRINE

During 2006, the AF Doctrine Center finalized AF Doctrine Document (AFDD) 2-1.8, Counter-Chemical, Biological, Radiological, and Nuclear Operations. This document has substantially revised the former AFDD 2-1.8, *Counter-Nuclear, Biological and Chemical Operations*, dated August 2000. The new document discusses the five AF pillars of proliferation prevention, active defense, counterforce, passive defense, and consequence management. The document also introduces the relationship between the Air Force pillars with the three pillars in the National Strategy for Combating Weapons of Mass Destruction (CbtWMD) (nonproliferation, counterproliferation, and consequence management) and the eight mission areas defined in the National Military Strategy for CbtWMD. AFDD 2-1.8 discusses Air Force capabilities and tenets supporting each doctrinal pillar.

4.5.5 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 multiservice doctrinal schools and organizations. During FY06, the DTRA brought its technical capabilities and practical experience to bear into all joint-doctrine working groups involved in the development of CBRN joint doctrine and served as the technical review authority for the development of JP 3-41, CBRNE Consequence Management and JP 3-28, Civil Support. The DTRA conducted and led a doctrine workshop that served as a forum for JS J-5 (WMD), USSTRATCOM, DTRA, USSTRATCOM's Center for Combating WMD (SCC), Headquarters, Department of the Army, and various

offices of the Office of the Secretary of Defense to lay the groundwork for the revision of JP 3-40 Combating Weapons of Mass Destruction. Additionally, the DTRA actively participated in the development of JP 3-27 Homeland Defense and revision of JP 3-11 Operations in NBC Environments. DTRA also materially influenced the revision of the key doctrine policy document CJCSI 5120.02 Joint Doctrine Development System and worked with Air, Land, and Sea Applications (ALSA) in the development of the multiservice tactics, techniques, and procedures (MTTPs) for civil support publication.

4.6 CBRN DEFENSE TRAINING, EXERCISES, AND DOCTRINE ISSUES

ISSUE: **Need for C-CBRN Education, Training, and Exercises (ETE) focused on airlift and air refueling operations for Air Mobility Command (AMC) and the Air Force.**

SOLUTION: The AMC is currently incorporating C-CBRN instruction in Air Mobility Warfare Center (AMWC) courses to address the challenges and limitations to air mobility operations in a CBRN-contaminated environment. Currently, the command teaches seven courses (29 classes per year) and reaches a diverse audience from airmen to general officers. Each block of instruction is tailored to the specific audience and is designed to foster a better understanding of the effects of a CBRN event on airlift and aerial refueling operations. AMC is also incorporating C-CBRNE education and training into courses of instruction throughout the command in 27 other training courses (separate from the AMWC). AMC is seeking to expand the instruction to a broader USAF audience and to incorporate air mobility–specific C-CBRNE events in USAF-level exercises to foster a better understanding of the effects of CBRNE attack on air mobility operations.

ISSUE: **Need for Tri-Service CBRN Defense Medical Readiness and Training**

SOLUTION: Background: In April 2002, the Defense Medical Readiness Training Institute (DMRTI) was tasked by the Joint Staff and the Assistant Secretary of Defense for Health Affairs (ASD [HA]) to review the services' current CBRNE medical training and develop a standardized Tri-Service CBRNE training program.

In January 2004, the ASD (HA) directed the services to implement initial and sustainment levels of the Tri-Service CBRNE training program, incorporating CBRNE Standards of Proficiency. Upon completion of the training, personnel should have the knowledge and/or training to enable them to perform critical tasks needed to meet real-world requirements. The Services selected an on-line, distance-learning strategy utilizing the Emergency Medical Preparedness/Response Course (EMPRC) to meet this requirement. As of September 30, 2006, the services had reported that 85,611 personnel (81% compliance) completed the training. Personnel who did not complete the training during the implementation period ending September 30, 2006 must complete the training before the end of FY07. Personnel who completed the training will begin sustainment training in FY08, completing the training every three years.

Program Review: In September 2006, the Tri-Service CBRNE Medical Training Program's training levels were revised based on the lessons learned during the implementation phase of the program. The original training concept and levels created a distinct division between education and training. After the review of the program, it was determined that the Standards of Proficiency initial and sustainment training levels should be consolidated into one level. The revised training program consists of two levels—core knowledge and advanced knowledge—that utilize education and training to meet the requirements of both levels. The concept of the two levels is provided below.

(1) *Core Knowledge*: The core knowledge level provides the necessary education and training to enhance the proficiency of individual and unit/platform skills. This is a level of subject-and-task knowledge applicable to all DoD medical personnel. This level can be completed through various education and training courses, from awareness training to sustainment education and training.

(2) *Advanced Knowledge*: This level is specific training designed for a service-specific target audience of personnel who require expert-level knowledge and abilities. This level can be completed through various education and training courses that enable personnel to perform specific skills/tasks, and results in specific capabilities at the unit/MTF and/or installation.

Core Knowledge Level: Tri-Service CBRNE Medical Training Program Standards of Proficiency–Core Knowledge and answers the question "What do we need to do to prevent, protect against, respond to, and recover from a CBRNE incident?" The standards were developed based on the Universal Joint Task List (UJTL) and influenced by the Department of Homeland Security (DHS) Universal Task List (UTL) in consultation with the Toxic Chemical Training Course (TCTC) and 43 Subject Matter Experts (SMEs) throughout the DoD.

The standards encompass six capabilities and 148 standards targeting all levels and disciplines from nonmedical, nonsecurity, nonmilitary personnel to military medical/health care professionals (physicians, nurses, etc.) assigned to the Military Healthcare System (MHS). The six capabilities include are as follows:

- Assess Threat Information
- Conduct Extraction & Evacuation
- Manage Incident
- Provide Medical Care
- React to a Hazard
- Respond to a Hazard

Personnel who did not complete the training during the implementation period ending September 30 , 2006 must complete the training before the end of FY07. Personnel who completed the training will begin sustainment training in FY08 and will be required to complete the sustainment training every three years.

Advanced Knowledge Level: The emphasis for this component is on developing plans, guidelines, processes, and/or procedures to enhance preparedness and respond effectively to a CBRNE incident. This level requires in-depth performance-based or application-orientated training for positions or personnel identified by their services as requiring specialized knowledge, skills, or abilities to ensure adequate CBRNE medical response capability. The identified personnel will play a critical role in the response to a CBRNE incident.

The JRO-CBRND/DMRTI Integrated Concept Team (ICT) will identify positions and/or teams that require advanced training. Joint staff action processing (JSAP) procedures will be used to generate tasking for the services to identify SMEs to participate on a committee that establishes standards of proficiency to meet identified requirements (e.g., for specific targeted audiences, disciplines or capabilities). The recommendations generated by this review will be staffed to the services using JSAP for concurrence prior to submission to the Deputy Assistant Secretary of Defense/Force Health Protection and Readiness (DASD/FHP&R) via the Force Health Protection Council for approval. Currently, requirements for three disciplines are under review, emergency operations planners, public health emergency officers, and first receivers with the goal of submitting recommendations to the DASD/FHP&R by the end of FY07.

ISSUE: **Need for an Integrated Process Team (IPT) to discuss issues and solutions that will improve the effectiveness of CBRN Defense training and education.**

SOLUTION: The CBD Education and Training Directorate established the Education and Training Integration Council (ETIC) which will allow for improved communication and a more positive functioning CBRN Defense Education and Training program across the Department. The first ETIC conference took place March 2006 with the next one scheduled for April 2007. The ETIC is now part of the CBDP OIPT and is now functioning as the Education and Training Special WIPT, under the CBDP OIPT.

ISSUE: **Lack of a consistent and standardized system within DoD to educate, train, and exercise CBRN Defense.**

SOLUTION: The ETIC is in the process of conducting a congressionally mandated study, HR5122, to address this issue. Recommendations are due to Congress by October 1, 2007.

ISSUE: **CBRN Defense Education and Training does not have a central information source.**

SOLUTION: The CBRN Defense Education and Training Directorate created a web site at https://etic.jscbis/apgea.army.mil that will provide streamlined information for CBRN Defense related issues. This web site will increase the efficiency and effectiveness of the program across the Department. The web site initial operation is planned for completion by March 2007.

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 Chemical Agent Detector Alarm (ACADA)	Production	Joint	Joint	Joint	Rqmt
	- Improved Point Detection System (IPDS)	Production				Rqmt
	- Improved CAM (ICAM)	Production	Rqmt	Rqmt	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	Interest	Joint	*Interest*
	- NBC Recon Vehicle (NBCRV)	RDTE	Rqmt			
	- 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
Rqmt = Service requirement
Rqmt Interest = requirement or interest in sub-product
DTO = Defense Technology Objective (Science & Technology Base Program)
RDTE = Research, Development, Test & Evaluation (Advanced Development program)
Joint* = Draft Joint Service requirement
Interest = Service interest (Requirement may be pending)
* = Sub-product(s) of a Joint project

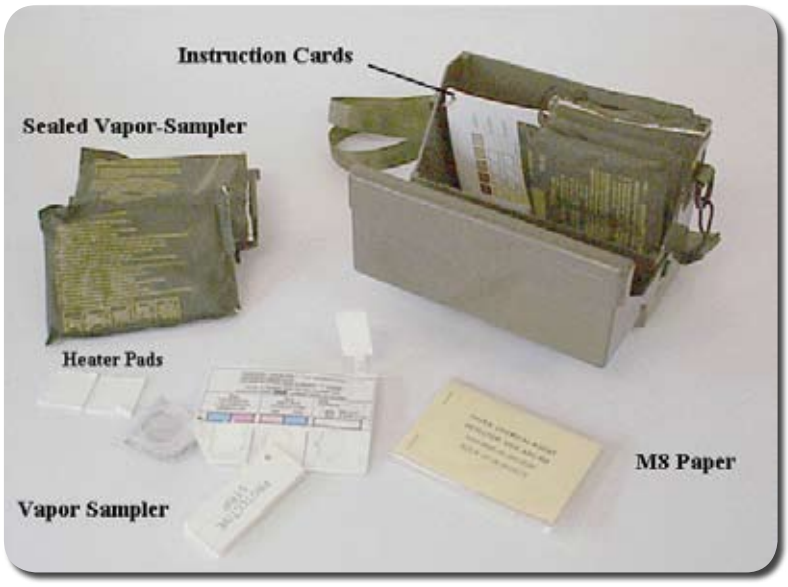
AUTOMATIC DETECTORS AND MONITORS

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 nerve and H-type blister 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 but is 300% more reliable, starts up 10 times faster, and its 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 operator crushes the glass ampoules to release reagents, which run 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, the heater was improved 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 to broaden the industrial base for the manufacture of the kits. The third, and perhaps the most significant improvement, was the addition of the Low Volatility Hazard (LVH) Kit, which expands the detection capabilities of the M256A1 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 is manually operated kit that 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 manually operated squeeze bulb and enough colormetric 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 is manually operated and 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 by employing IMS. This system is being replaced by the ACADA. In the Army, displaced M8A1 systems are being cascaded to lower priority units. 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 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 (connected by wire) 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 was purchased in limited quantities in 1993 to meet an urgent need for an automatic mustard agent point detector. It is currently in use by the Air Force. The M90 is similar in size and form to the M8A1.

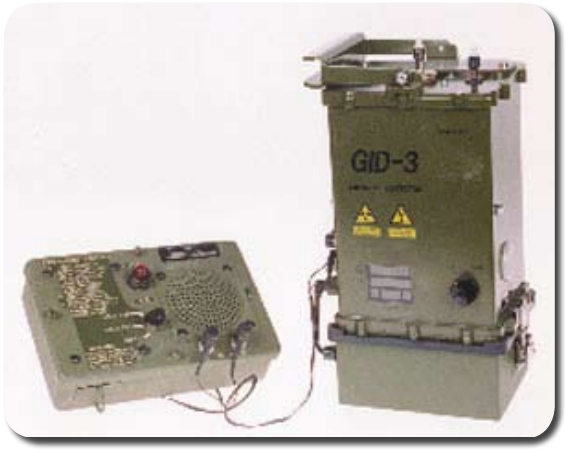
Chemical Agent Point Detection System (CAPDS), MK 21, MOD1

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)



The M22 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. The M22 employs IMS to provide 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 was 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 Chemical Biological Radiological Agent Water Monitor (JCBRAWM) 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 Radiological Agent Water Monitor (JCBRAWM). The desired capability is for the detection and identification of hazardous chemical, biological, and radiological 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 or radiological agents and a relatively long response time for chemical agents. 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 chemical, biological, and radiological 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 the JCBRAWM 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.

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. In FY06, the project assessed the abilityed of technology to meet JMCBDS requirements. A brassboard was designed and fabrication of brassboards was intiated with fabrication to completed, tested, and evaluated in FY07.

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.

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 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. JCAD Increment 1 will be fielded beginning in December 2007.

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:

The JSLSCAD requirement is to 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 JSLNBCRS.

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.

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 m^3 cloud at levels $>10^4$ 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.

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. In 2006, 17 M93A1 were outfitted with improved armor and weaponry for use in current conflicts. These vehicles are used for convoy escort as well as the normal NBC reconnaissance mission.

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. Initial NBCRV platforms began fielding in 2006 to Army Brigade Combat Teams to complete testing and evaluation.

Joint Service Light NBC Reconnaissance System (JSLNBCRS)

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 JSLNBCRS 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. Two variants, the HMMWV and the Light Armored Vehicle (LAV) are planned and will house the same equipment. Marine Air-Ground Task Forces (MAGTFs) and Air Force CBRN defense forces will receive the LAV variant, while U.S. Army Light Contingency Forces and Air Force CBRN defense forces will operate the HMMV variant. In addition, dismounted reconnaissance capability will be fielded. This will include modularized, networked and wireless sensors that enhance full spectrum reconnaissance, including Toxic Industrial Chemicals.

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 ACTD technologies 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 ACTD addresses the JRO-CBRND Joint Future Operational Capabilities (JFOCS) of NBC Reconnaissance, Chemical/Biological Standoff Detection and Point Detection.

Payoffs. The end-goal 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 JSLNBCRS. CUGR ACTD technologies will provide detection capability to 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 CBRN Unmanned Ground Vehicle (CUGV) challenge includes the aforementioned plus integration of select CBRN/TIM sensors onto small robotic platforms.

Milestones/Metrics.

Conducted JCSD technical and operational demonstrations on CBRN Recon Platforms; conducted CUGV prototype integration with CBRN sensors and completed technical and operational demonstrations; developed draft Concept of Operations (CONOPS); Developed Tactics, Techniques, and Procedures (TTPs) and Training Support Packages (TSPs) for the JSCD and CUGV and operational demonstration.

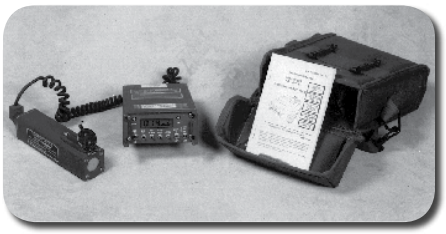
FY2007: Initiate residual Support phase with 2 CUGV to the 95th Chemical Company. Continue JCSD software and hardware hardening and CUGV sensor integration; conduct technical and operational demonstrations; continue CUGV sensor integration; continue refinement of CONOPs, TTPs, and TSPs.

FY2008: Complete Military Utility Assessment; finalize CONOPs, TTPs, TSPs; complete Transition Readiness Level assessment; complete ACTD residual phase; support milestone decisions, document lessons learned and publish ACTD closeout report.

RADIATION DETECTION

FIELDED AND PRODUCTION ITEMS

AN/VDR-2



The AN/VDR-2 measures gamma dose rates from 0.01 µGy/hr (microgray per hour) to 100 Gy/hr (gray per hour) 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 Radiation Detection, Indication and Computation (RADIAC) Set

The AN/PDR-75 measures dose from 0 to 999 cGy. 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/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. An extension kit, commonly referred to as the Radiation Safety Officer kit, is available for the AN/PDR-77 that includes a beta-gamma pancake probe and a low-level gamma (or micro-R) probe. 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.

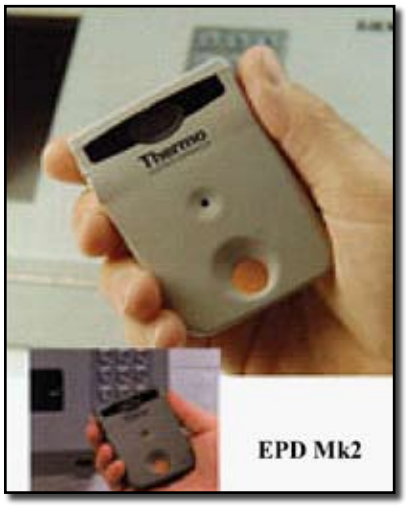
AN/PDQ-1 Multi-Function RADIAC /RADIAC Detector Group OA-9449

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.

IM-270/PD Self-Indicating Casualty Dosimeter

The Self Indicating Casualty Dosimeter (SICD) IM-270/PD is an electronic dosimeter designed to replace the DT-60/PD Casualty Dosimeter and the accompanying CP-95/PD Reader for use during a nuclear event for forces afloat personnel. It provides real-time measurement and indication of personnel dose and does not require a separate reader to evaluate the dose. It measures radiation dose from exposure to x-rays and gamma rays both pulsed and continuous. The total dose is instantly displayed on a LCD screen. The dynamic range of the dosimeter is from 10 – 1000 cGy in increments of 5 cGy. Any dose less than 10 cGy will be displayed as zero. The dosimeter is designed in a wristwatch style with a Velcro wristband of adjustable length to accommodate different wrist sizes (with over garments). Battery life of the IM-270/PD is approximately 10 years.

Electronic Personal Dosimeter



The Electronic Personal Dosimeter (EPD) is a commercial off-the-shelf dosimeter for individual wear. It replaces the IM-9/PD, IM-135/PD, IM-143/PD, and DT-60/PD at Navy shore facilities. The Navy and Air Force use the EPD for first responders, such as firefighters and emergency medical personnel. The EPD can provide real-time beta and gamma radiation exposure and dose rate information over a broad range (0.01 mSv (millisievent) to 16 Sv (sievent) and 0.01 mSv/hr to 4 Sv/hr dose rate). These dosimeters have adjustable audible and visible alarms for dose and dose rate, and hardware and software for tracking and collecting exposure data. The Air Force personnel monitoring program is certified by the National Voluntary Laboratory Accredited Program.

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 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		
	- DOD Biological Sampling Kit	Fielded	Joint	Joint	Joint	Joint
	- Dry Filter Unit (DFU)	Production	Rqmt	Rqmt		Rqmt
	- Joint Bio Stand-off Detection System (JBSDS)	RDTE	Joint	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) 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), which gave the DOD its first credible, rapidly deployable biological detection capability, is no longer fielded and has been replaced with the Pre-planned Product Improvement (P3I) BIDS (M31A1) (shown). The M31A1 BIDS is capable of detecting and presumptively identifying eight BW agents simultane-

ously 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 subsequent 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. Over 150 M31E2 BIDS have been fielded to various Chemical Companies since 2006. As of October 2006, five Chemical Companies received the M31E2 BIDS. Fielding is scheduled to continue through FY13.

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.

There are currently 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, Biological Aerosol Warning Sensor (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 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 were 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. At of the end of FY06, over 200 JBPDS systems have been fielded to the Services and over 70 additional systems will be fielded in FY07.

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 4°C, 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. Pre-milestone activities were initiated in FY05 and a Milestone A is scheduled for FY07. Concurrently, tech base activities are being monitored to leverage and/or accelerate critical detection technologies.

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/UV 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. The MOT&E will be complete in FY07 and with a FUE in 4QFY07. A MS B for the next generation system is planned for FY11. The JBSDS Increment II will increase sensitivity, range, and reliability, while reducing weight, power requirements, and size.

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 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 FASTREAD technique for dipicolinic acid (DPA) at laboratory experimental distances.

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.

Expeditionary Biological Detection (EBD) – Advanced Technology Demonstration (ATD)

Objectives. The EBD ATD is designed to support the Joint Biological Tactical Detection System (JBTDS) program and acquisition strategy. The ability to discriminate, classify or identify threats is the primary objective. The ATD is initially limited to conventionally disseminated clouds of classical BW agents. ATD candidates will be selected for their applicability to the JBTDS program, and the ATD schedule will be bounded by the JBTDS acquisition timeline. A Front End Analysis (FEA) was conducted to compare existing DoD biological agent detection/ identification systems against USMC tactical biological detection needs and to review lessons learned from past experimentation. The candidate system selected must be able to automatically detect a cloud of suspected biological agents and collect samples to confirm their presence and identify them. The candidate sampling and agent identification system must be compatible with the Joint Biological Agent Identification and Diagnostic System (JBAIDS). The system must be deployable and employable by Marine Expeditionary Forces. The candidate system must be suitable for use within existing MAGTF logistics and manpower constraints. Ideally, this will be met by a single detection/ sampling system weighing less than 37 lbs. However, modular capabilities or a family of systems will be considered if performance gains vs. logistics burdens can be achieved. The candidate must be able to operate as a stand-alone system and within Joint networks. The system must be operable with standard military batteries for a minimum of 12 hours. Additionally, use of power from military vehicles, aircraft, generators, or worldwide mains is an objective. It must be packaged as cargo for transport in C-130, CH-53, UH-60, LCAC, LAV, AAV and HMMWVs. The system must be affordable. Only systems with an estimated full-rate production unit cost of $50,000 or less will be considered. The development of a JBTDS Capabilities Development Document (CDD) based on experimentation, analysis, and lessons learned from the ATD will ensure an operationally significant capability with appropriate thresholds and objectives that accurately reflect the trade space for tactical sensors. The Military Utility Assessment (MUA) is intended to support an FY09 decision to satisfy the 2005 Marine Corps Statement of Need for an Expeditionary Biological Detector and/or identify technologies to transition to JBTDS as an interim capability. The MUA will consider detection, collection, and identification systems in conjunction with the medical response to the information provided when determining the overall system effectiveness in casualty reduction.

Payoffs. The EBD ATD serves three purposes: 1) Develop Concepts of Employment (COE) for the use of man portable, automated biological aerosol detectors and samplers; 2) Clarify and refine requirements for the Joint Biological Tactical Detection System (JBTDS) to be used to define capabilities for a JBTDS CDD; and 3) Determine the military utility of current and next generation man portable biological detectors and samplers.

Challenges. The most significant challenge identified is that selected systems may not fully meet requirements stated in the CBRN Sensors for Unmanned Applications Initial Capability Document (ICD) or the Marine Corps Statement of Need without modification or further development.

Milestones/Metrics.

FY2006: Conducted Front End Analysis, developed Integrated Assessment Plan, Initiated Management Plan Development, Completed the Technology Selection Plan, Completed the Concept Of Operations, Conducted Market Research, Completed the Demonstration Agreement, and Completed the Technology Source Selection for Biological Detectors.

FY2007: Conduct Technical Evaluations, Conduct and Develop the Modeling and Simulation Plan, Conduct Table Top Exercises, Conduct Field Demonstrations, and complete Transition Plan development.

FY2008: Complete Military Utility Assessment and CONOPS Document, Develop Technical / Lessons Learned Report, conduct Transition Readiness Evaluation, and execute Transition Plan.

ANNEX C

INFORMATION SYSTEMS

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
Joint*=Draft Joint Service requirement
Rqmt= Service requirement
Rqmt = sub-product requirement or interest
* = Sub-product(s) of a Joint project
Rqmt Interest = requirement or interest in sub-product
Fielded = Fielded Capability (Sustained by Services)
RDTE = Research, Development, Test & Evaluation (Advanced Development program)
DTO=Defense Technology Objective (Science & Technology Base Program)

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:

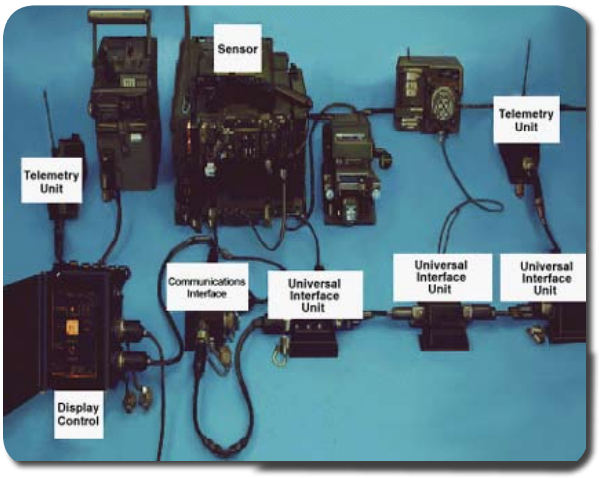
JWARN Block I is an automated Nuclear, Biological, and Chemical (NBC) Information System. JWARN Block I is essential for integrating the data from NBC detectors and sensors into the Joint Service Command, Control, Communication, Computers, Information and Intelligence (C^4I^2) systems and networks in 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 embed 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.

As part of its development strategy the JWARN program is teamed with the Defense Threat Reduction Agency (DTRA) to focus on enhanced capabilities. These include software-defined sensors, architecture and approaches to developing CBRNE sensors and CBRNE sensor capability that is plug-and-play and hardware independent; information fusion algorithms and software to reduce chemical point sensor false alarms when used for fixed site protection; and an affordable and automated way to move chemical/biological (CB) sensor data among classified and unclassified networks and be certified in an operational environment.

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.

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 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 M&S 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.

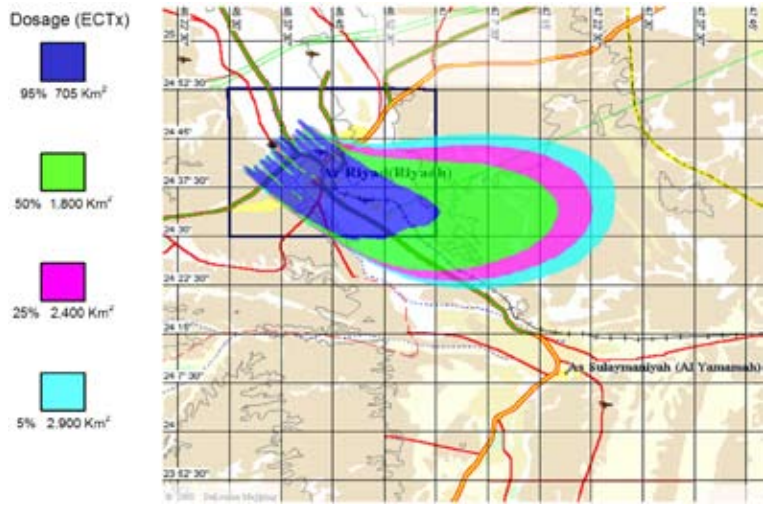
FY2006: Transition the complex terrain and flow around structures modeling capabilities to JEM Block III program.

Joint Effects Model (JEM) (FUE FY08)

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.

As part of its development strategy the JEM program is teamed with the Defense Threat Reduction Agency (DTRA) to focus on enhanced capabilities. These include development of high-quality and reliable environmental data, including terrain, land usage and buildings (exterior and interior), that are required for accurate hazard predictions; tools that allow the warfighter to estimate the source location for a Chemical/Biological (CB) release based on available CB sensor and meteorological data; a large urban area dispersion model to predict the dispersion of toxic contaminants through urban areas at ranges between 10m and 10km with visualization of 3D concentration and dosage fields as they develop over time; and enhancements to the urban model to develop a building-scale wind field solver and pressure data. The wind solver will lead to improvements in near-source dispersion around buildings, such as channeling and vortex circulations. In addition, results from DTO CB.42 – Environment Fate of Agents will provide secondary effects data for JEM.

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.

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.

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 databases

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.

As part of its development strategy the JOEF program is teamed with the Defense Threat Reduction Agency (DTRA) to focus on enhanced capabilities. These include the Nuclear Biological Chemical Casualty Resource Estimation Support Tool (NBC CREST) that provides calculations of casualty rates related to initial and secondary exposure to infectious diseases and toxic chemicals; and modeling of radiological operational effects.

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. **Milestones/Metrics.** **FY2006:** Spiral 1 (SP 1): Initiate development of prototype airborne Biological Combat Assessment System (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 C4I2RS 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 (JSCESM)	Production	Interest	Rqmt		
	Universal Common Individual Protective Equipment	- Protection Assessment Test System (PATS)	Fielded	Rqmt	Rqmt	Fielded	
		- Voice Communication Adapter	Fielded	Rqmt	Rqmt	Fielded	Rqmt
		- Joint Service Mask Leakage Tester (JSMLT)	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 (JSLIST)	Prod.*	Rqmt	Rqmt	Rqmt	Rqmt
		-- Overgarment	Prod.*	Interest	Rqmt		
		-- Boots (MULO)	RDT&E	Rqmt	Rqmt	Rqmt	Rqmt
		- Alternative Footwear Solutions (AFS)	RDT&E			Rqmt	
		- Integrated Footwear System (IFS)	Production RDT&E	Rqmt	Rqmt	Rqmt	Rqmt
		- JSLIST Block 2 Glove Upgrade (JB2GU)		Rqmt	Rqmt		Rqmt
		- JSLIST CB Coverall for CVC (JC3)		Rqmt			
		-Battledress Overgarment (BDO)	Fielded	Rqmt	Rqmt		Rqmt
		Joint Protective Aircrew Ensemble (JPACE)	Production	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			

	Category	Nomenclature	Status	USA	USAF	USMC	USN
COLLECTIVE PROTECTION	Transportable Collective Protection (CP) Systems	- M20A1 Simplified CP Equipment (SCPE)	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) (Medical)	Production	Interest	Rqmt		Interest
		- CP Deployable Medical System (CP DEPMEDS) (Medical)	Production	Rqmt			
	Mobile CP Systems	- Shipboard Collective Protection System (CPS)	Production	Interest	Interest		Rqmt
		- M8A3 Gas-Particulate Filter Unit (GPFU)	Fielded	Rqmt			
		- M13A1 GPFU	Fielded	Rqmt	Rqmt		Rqmt
	Fixed CP Systems	- Fixed Installation Filters	Fielded	Rqmt	Rqmt		Interest
	Generic CP Filtrations Systems	- Modular Collective Protection System (MCPE)	Fielded	Rqmt	Rqmt	Rqmt	Interest
		- Joint Collective Protection Equipment (JCPE)	RDTE	Rqmt	Rqmt	Interest	Rqmt
		- CB.61 Advanced Air Purification System Model	DTO				
	Generic Filters	- M98 (200 cfm) Gas-Particulate Filter Set	Fielded	Rqmt	Rqmt	Interest	Rqmt
		- M48/M48A1 (100 cfm) Gas-Particulate Filter	Fielded	Rqmt		Rqmt	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
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. The MCU-2A/P is also currently used by Air Force Aero-Medical personnel

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.

XM50/51 Joint Service General Purpose Mask (JSGPM)

The JSGPM is 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 is 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 JSGPM provides the wearer above-the-neck protection from CB agents, radioactive fallout particles, and Toxic Industrial Chemical/Toxic Industrial Materials (TICs/TIMs).

The JSGPM 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 program manager is pursuing approval from the National Institute for Occupational Safety and Health (NIOSH) to enable use by military and civilian first responders for response to CBRN incidents. Currently, NIOSH testing and certification standards require the use of screw-in filters, while the JSGPM utilizes a bayonet-style locking mechanism to attach the filters.

Joint Service Chemical Environment Survivability Mask (JSCESM)

The JSCESM is a lightweight complement to the JSGPM. It provides commanders at all levels with greater options for protection, especially in Military Operations Other Than War (MOOTW). The JSCESM provides a one-size-fits-all, disposable, emergency egress mask for use in situations confronting the US forces operating in low CBRN threat conditions and military medical care providers and patients in certain instances when using the standard service mask is not practical. Special operations personnel and other US forces can discreetly carry JSCESM when a CBRN threat is possible, but unlikely, such as while in-transit to a deployment or when operating an aerial port at a civilian airport. 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. JSCESM provides 2 hours of protection from aerosol.

SURFACE RESPIRATORY PROTECTION
R&D ITEMS
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 Type 1


Apache Variant Type 1a


Fixed Wing Type 2

Description:

The JSAM family of masks 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 aG (Type 2), 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.

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 has 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 provides capability for an overall mask serviceability and fit factor validation of protective masks in the field.

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.

SCOT Tester

The SCOT mask tester performs the same functions as the MQ1A. However, the SCOT is not reliant on oxygen cylinders and is the Air Force replacement for the MQ1A.

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 (all but the most energetic) 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 provides 24-hour protection with up to 45 days of wear and 6 launderings 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.

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 all currently fielded 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.

Joint Protective Aircrew Ensemble (JPACE)

JPACE is a CB protective ensemble that replaces the Navy and Marine Corps MK-1 undergarment and the Army Aviation Battledress Uniform (ABDU)-BDO and/or CPU system. JPACE provides aviators with improvements in protection, reduced heat stress in CB environments, extended wear, and service life. In addition, it is 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 rotary and fixed wing aviators with below-the-neck protection against CB threats.

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.

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.

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.

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 provides 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.

Alternative Footwear Solutions (AFS) / Integrated Footwear System (IFS)


AFS

The Alternative Footwear Solutions (AFS) and Integrated Footwear System (IFS) is an evolutionary development program that will achieve an incremental gain in chemical and biological (CB) footwear protection. The goals of AFS/IFS are to field common protective footwear in terms of chemical protection and durability for similar mission areas. AFS will meet the requirements for ground, aviation and shipboard mission areas. The IFS will provide a CB protective sock/liner system that meets aviation and U.S. Special Operations Command (USSOCOM) mission area requirements.

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.

Joint Service Lightweight Integrated Suit Technology (JSLIST) Block 2 Glove Upgrade (JB2GU)

The JB2GU is a hand wear item that will provide 24 hours of chemical biological (CB) protection from battlefield concentrations of all known agents for up to 30 days of wear. It is a component of the JSLIST ensemble and will improve upon the JSLIST block 1 Glove Upgrade (JB1GU) effort by offering greater durability that will satisfy a broader spectrum of ground, shipboard, and aviation requirements. The JB2GU will be available in two variants: flame resistant (FR) and non-flame resistant (nFR). The FR variant combines an outer Nomex/leather glove with an inner chemical protective liner. The nFR variant is a molded glove made from compounded butyl rubber and comes with a removable protective liner for sweat management.

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 will be worn if aircrews have to leave a covered area during the liquid dispersal stage of an attack. 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.

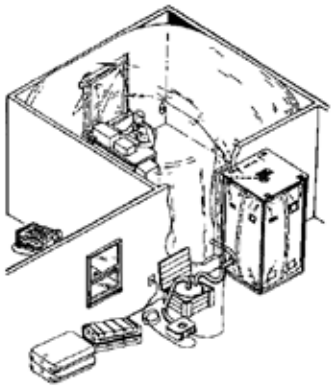
ITAP provides splash and vapor protection against potential exposure to liquid agent when worn as a system requirements: 10g/m^2 HD, VX, GB, L agent challenge for 1 hour. It provides an optional Personal Ice Cooling System (PICS) and is functional as a system where temperatures range from 0° to 100°F 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.

TRANSPORTABLE CP SYSTEMS

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 Alaska shelters, 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. CP DEPMEDS are configured to allow deployment incrementally to protect a 44 bed Early Entry Hospital, an 84 Bed Hospital Company, a 164 bed increment or a full-up 248 bed Combat Support Hospital. CP DEPMEDS achieved full material release in September 2003 and the Army Authorized Acquisition Objective (AAO) is 23 systems. A total of 14 systems were fielded, and 12 are currently available.

Collectively Protected 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), Basic, +10, +25, and WDS 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 up to 6,500. 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 CBPS consists of a dedicated M1113 Expanded Capacity Vehicle (ECV), a Lightweight Multipurpose Shelter (LMS) mounted onto the vehicle, a 300 square foot airbeam 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. The CBPS program is currently reviewing design options to convert the existing CBPS systems from an un-armored High Mobility Multipurpose Wheeled Vehicle to an up-armored Medium Tactical Vehicle platform and procure an additional 174 CBPS-M3 electric version systems. There are contracts in place for the retrofit systems and the new design systems. Fielding will continue through FY11. Beginning in FY 2010 the Army will begin procuring the vehicle platforms for CBPS.

MOBILE CP 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.

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 dedicated mobile platforms 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.

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.

Joint Expeditionary Collective Protection (JECP)

JECP is a new start Acquisition Category (ACAT) III program. JECP will provide a collective protection (CP) capability to shield and sustain the Joint Expeditionary Forces (JEF) during potential Chemical, Biological, Radiological and Nuclear (CBRN)/Toxic Industrial Materials (TIM) attacks. JECP is intended to provide CP for the Rest and Relief, Command and Control, and medical functions in support of expeditionary missions/operations. Possible materiel solutions include a stand-alone shelter system and/or kit(s) for use with selected portable shelters or within permanent structures.

FIELDED AND PRODUCTION ITEMS

NBC filters are used to remove Nuclear and Biological particulates and Chemical aerosols and vapors from the air supplied to collective protection systems. Generic, high volume airflow NBC filters, and CP filtration systems 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.

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.

GENERIC NBC CP FILTRATION SYSTEMS

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 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.

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
	- Joint Service Personnel/Skin Decontamination System (JSPDS)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
	- M100 Sorbent Decontamination System	Production	Rqmt	Interest	Fielded	Interest
	- M295 Individual Equipment Decontamination Kit	Production	Rqmt	Rqmt		Rqmt
Combat Equipment, Vehicles, and Aircraft	- M17A2/A3 Lightweight Decontamination System (LDS)	Production	Rqmt		Fielded	Rqmt
	- M17 MCHF Lightweight Decontamination System (LDS)	Production			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			

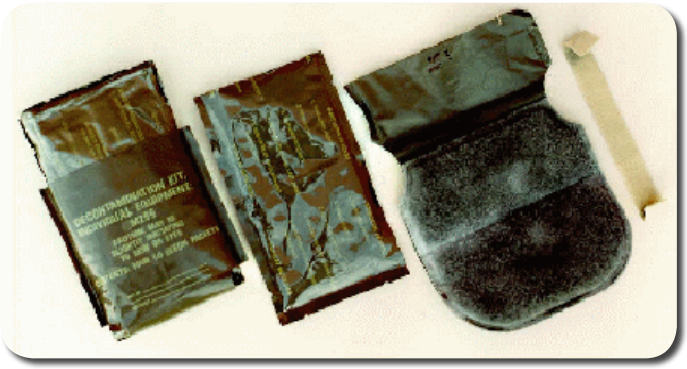
Rqmt = Product Requirement
Interest = Product Interest
Int-NIR = Product Interest, No Imminent Requirement
* = sub-Product(s) of a Consolidated Joint Service Project
Rqmt, Interest = Sub-Product Requirement or Interest
Defense Technology Objective (Science & Technology Base Program)
** This ACTD support more than the decontamination functional area, but is placed in only one annex to prevent redundancy.

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 immediate and operational 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 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)

The JSPDS will provide the warfighter with a Food and Drug Administration approved capability to decontaminate skin to a level better than the M291 Skin Decontaminating Kit. Additionally, the JSPDS will provide the capability to decontaminate limited individual equipment. Reactive Skin Decontamination Lotion (RSDL) is the commercial product selected to meet these requirements.

RSDL has been approved by the FDA and has recently undergone additional testing to ensure that the product is safe and effective in the operational environment. A production decision is scheduled for FY 2007.

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, 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 for operational and thorough decontamination. 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 operational and thorough 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 Materiel Decontamination System (JMDS)

Key Requirements:

- Meet two distinct operational needs: small sensitive equipment and platforms interiors decontamination.
- 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
- Provide decontamination systems for platform (vehicle/aircraft/ship) interiors at fixed sites and "on-the-move"

Description:

The Joint Service Sensitive Equipment Decontamination (JSSED) and Joint Platform Interior Decontamination (JPID) programs were combined under a single management umbrella called the Joint Materiel Decontamination System (JMDS) program in FY06. The JMDS program will use a vaporous decontaminant technology for the decontamination of chemical and biological agents for both sensitive equipment* and platform interiors. The JMDS will neutralize chemical and biological hazards without degradation of the decontaminated equipment function allowing reutilization of sensitive equipment and platforms.

*Sensitive equipment refers small, high value or critical equipment that cannot be decontaminated using existing means without degradation or destruction of the equipment.

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 (including a shower capability) 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 (DF200 foam) with the system rather than manually through the use of mops and brushes. The JSTDS is not man-portable, but can be repositioned using available material handling equipment and can be mounted on general purpose vehicles. 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 can apply DF 200 foam and will reduce the manpower intensive decontamination processes.

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:

- medical chemical defense (Section F.1),
- medical biological defense (Section F.2),
- medical radiological defense (Section F.3).

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) addresses medical research in capability areas: pre-treatments, therapeutics, diagnostics, emerging threats, and medical radiological defense. 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 and facility resides in the Armed Forces Radiobiology Research Institute (AFRRI). The Defense Health Program, administered by the Assistant Secretary of Defense for Health Affairs, ASD(HA), funds AFRRI's operations and infrastructure as well as some research activities. Beginning in FY06, the DoD CBDP initiated a medical radiological defense effort, which initially focuses on science and technology options for radioprotectants and post-radiation exposure medical 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 (ATNAA)	Fielded	Joint	Joint	Joint	Joint
	- Convulsant Antidote for Nerve Agents (CANA)	Fielded	Joint	Joint	Joint	Joint
	- Advanced Anticonvulsant System (AAS)	AD	Joint	Joint	Joint	Joint
	- Medical Aerosolized Nerve Agent Antidote (MANAA)	Fielded	Joint	Joint	Joint	Joint
	- Improved Nerve Agent Treatment System (INATS)	RDTE	Joint*	Joint*	Joint*	Joint*
	- CB.67 Therapeutics for Ebola and Marburg Virus Infections (follow-on to CB.63) (approved for FY07)	DTO				
	-Vaccinia Immune Globulin Intravenous	Fielded				
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 (BioThraxTM)	Fielded	Joint	Joint	Joint	Joint
	- Smallpox vaccine (Dryvax vaccine (1:1))	Fielded				
	- Botulinum Vaccine	AD				
	- Improved Plague Vaccine	AD	Joint*	Joint*	Joint*	Joint*
	- Tularemia Live Vaccine (NIAID)	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 Block 1	Fielded	Joint	Joint	Joint	Joint
Emerging Threats	- CB.64 Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms Using Microarray-Based Resequencing Technologies	DTO				
	- Critical Reagents Program (CRP)	RDTE/ Fielded	Joint	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.

The Joint Biological Agent Identification and Diagnostic System (JBAIDS) Block I began fielding in 2006. JBAIDS is a fully integrated *in vitro* diagnostic system composed of the JBAIDS instrument with laptop computer, software, freeze-dried reagent assays and sample preparation protocols for isolating target DNA from whole blood, blood culture, or direct culture. The JBAIDS instrument, using Polymerase Chain Reaction (PCR) technology, is a portable thermocycler and real-time fluorimeter. JBAIDS is an integrated system for rapid identification and diagnostic confirmation of biological agent exposure or infection. Based on commercial technology, JBAIDS is man-portable, reusable, and has been approved by the U.S. Food and Drug Administration (FDA) for use as an aid in the laboratory diagnosis of anthrax. 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. 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. The JBAIDS program office delivered the final twelve Block I systems to Air Force units at Kelly USA, San Antonio, TX in December 2006, for an on-time completion of JBAIDS Total Package Fielding to the Air Force. The Air Force is now at full operational capability with 103 JBAIDS systems. Fielding events are scheduled to begin in 3rd quarter FY07 for the Army (86 systems) and in 1st quarter FY08 for the Marine Corps (11 systems). Fielding events for the Navy (49 systems) are to be determined.

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 (SNAPP), 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
- Joint Biological Agent Identification and Diagnostic System (JBAIDS) Block I, 2006

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:

- *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 FY06. Following are FY06 technical accomplishments by the DOD laboratories conducting research in the CBDP S&T medical program in FY06. 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 2006.

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: ***neurologic therapeutic development, including advanced anticonvulsants and improved neuroprotectants***

- Investigated novel targets for pharmacologic measures to protect against organophosphate injury, using animal neurobehavioral, physiological, and neuroanatomical measures.
- Utilized current and novel approaches to molecular modeling and structure activity relationship (SAR) studies of oxime reactivation to understand how different oximes interact with human and non-human AChE inhibited by different nerve agents.
- Developed and refined screening protocols to down-select therapeutic candidates within a number of drug classes, including anticonvulsants, anti-epileptics, neurosteroids, serotonin receptor agonists, serine racemase inhibitors, and antioxidants.
- Evaluated the efficacy of novel anticonvulsant compounds against nerve agent-induced seizures using in vivo models.
- Determined the efficacy of midazolam, and/or anticholinergic compounds against nerve agent-induced seizures and lethality.
- Refined animal models and validated small and large animal neurobehavioral test batteries.
- Completed and compiled data for pharmacokinetic evaluations of most promising neuroprotectants.
- Investigated role of novel agents in central nervous system (CNS) protection.
- Evaluated the neurobehavioral effects of nerve agents in non-human primates and rodents to investigate the role and efficacy of new therapeutic agents.
- Performed safety testing and dose range studies for new compounds in a non-human primate model.

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 overt and subtle neurobehavioral impacts of nerve agents.

Emerging Threats Capability Area

Research thrust: ***medical countermeasures for non-traditional agents*****:**

- Identified and tested several potential neuroprotective compounds in rat and guinea pig seizure models.
- Tested putative neuroprotectants in animal models.
- Tested Food and Drug (FDA)-approved drugs shown to be neuroprotective in both anatomic and behavioral studies.

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: Completed 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. Evaluated 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 2006.

Research thrust: medical countermeasures for cutaneous and ocular exposure

- Explored pharmacological strategies of vesicant therapeutics, to include percutaneous, ocular, and pulmonary exposures.
- Analyzed in vitro effects of sulfur mustard agent on cellular energy metabolism, and apoptotic (cell death) pathways.
- Completed development of advanced animal injury models and used these models to evaluate commercially available wound healing products, and investigational products for their efficacy in promoting improved healing of superficial dermal sulfur mustard injuries.
- Assessed instrumentation to evaluate the depth of cutaneous vesicant injury, for use as a prognostic indicator.
- Evaluated the effectiveness of new commercial skin decontamination formulations to agent challenge.
- Considered novel decontaminating wound products that can be applied before or after exposure.
- Evaluated a wide array of commercially available wound healing products for their efficacy in promoting improved

healing of superficial dermal sulfur mustard injuries using a validated weanling pig model.

- Conducted efficacy studies to evaluate Reactive Skin Decontaminant Lotion (RSDL), Skin decontamination kit M291SDK against non-traditional agents (NTA) compared to no decontamination.

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.
- 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 2006.

Therapeutics Capability Area

Research thrust: ***respiratory and systemic therapeutics***

- Established exposure/effects models to identify common injury responses which may serve as broad targets for therapeutic intervention.
- Investigated and developed technologies that may be used to integrate established and emerging toxicant therapeutic modalities into suitable candidate therapies in humans.

- Reviewed commercially evaluated human tissue models for applicability to medical chemical defense research, including the study of inhalation exposure to chemical warfare agents and evaluation of therapeutic countermeasures.

Diagnostics Capability Area

Research thrust: ***develop chemical diagnostic technologies***

- Continued basic research experiments aimed at developing detection methods in clinical samples for metabolites, adducts and/or relevant biomarkers resulting from chemical warfare agent (CWA) exposure.
- Reported on the potential for detecting sulfur mustard exposure by cleavage adducts formed with blood proteins.
- Studied the dose response and time course for skin protein (laminin-5 and integrin) degradation resulting from sulfur mustard exposure.
- Continued applied research experiments aimed at improving detection methods in clinical samples for metabolites, adducts and/or relevant biomarkers resulting from chemical warfare exposure.
- Finalized assessment of a noninvasive immunodiagnostic test using skin tape stripping detecting sulfur mustard skin exposure before the onset of vesication.
- Further developed alternate sample collection/extraction technology(s) such as solid phase micro-extraction as a simple and quick screening method to verify exposure to chemical warfare agents (CWA); performed studies assessing the suitability of different fibers to extract nerve agent metabolites from synthetic urine and their time related stability and sensitivity.
- Using the DoD developed whole blood cholinesterase assay for organophosphate exposure, assessed a healthy population with no known exposure for known test marker inhibitors and atypical marker phenotypes.
- Established baseline studies, prepared standard curves, established linearity and limits of detection and performed quantitation studies for assay development for additional selected chemical agents.
- Continued advanced research experiments aimed at transitioning detection methods in clinical samples for metabolites, adducts and/or other relevant biomarkers resulting from chemical warfare agent (CWA) exposure.
- Expanded studies adapting the DoD-developed whole blood cholinesterase assay for organophosphate exposure to automation and high throughput testing; analyzed marker studies and standardized/converted test data from various methods to Walter Reed Army Institute of Research (WRAIR) units.
- Demonstrated the utility of a sulfur mustard plasma/blood protein assay in an inhalational model for sulfur mustard exposure.
- Worked with Centers for Disease Control (CDC) to validate a method to assay urinary hydrolysis products for nerve agents.
- Proceeded with in vivo validation of the flouride reactivation assay to detect VX nerve agent and investigated potential strategies for incorporation of internal standard to fluoride reactivation assay.

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 Manager 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 FY06, IND application was submitted and Phase I clinical trials initiated.

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 form of human butyrylcholinesterase (HuBChE), a protein that can bind organophosphorus nerve agents, is the current candidate for Bioscavenger Increment I. Bioscavenger Increment program II is pursuing two technologies as a risk reduction, down-selecting to a single product at Milestone B. 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 for Bioscavenger Increment I, 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. Bioscavenger Increment II achieved a Milestone A decision in FY06.

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 oxime candidate (MMB4) transitioned to advanced development in FY05.

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 TM)
- 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)
- Recombinant Botulinum Toxin Vaccine Serotypes A and B (BB-IND #11756)

- Recombinant Plague Vaccine – Fusion (BB-IND #12031)
- Recombinant Plague Vaccine – Bivalent (BB-IND #11378)
- Cidofovir smallpox therapeutic, Intravenous
- Cidofovir smallpox therapeutic, Oral
- SIGA-246 smallpox therapeutic, Oral (Fast Track status)

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 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. Following are 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), *Francisella tularensis* (tularemia), *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:

- Enhanced aerobiology capabilities and animal model development to facilitate bacterial therapeutics research. Utilized enhanced aerobiology capabilities and animal models to characterize pharmacokinetic and pharmacodynamic profiles of bacterial therapeutics.
- Pursued development of a mouse model to study anthrax toxin function.

- Screened novel and currently available antibiotic technologies against anthrax, plague, and burkholderia infections. Technologies include small molecules, antimicrobial peptides, monoclonal antibodies, RNA inhibitors, and cytokine-based therapeutic candidates.
- Evaluated CpG motifs and heat shock protein 70 (HSP70) (stimulators of the immune response) as immunomodulators to be used in conjunction with bacterial therapeutics.
- Assessed select compounds for safety and efficacy against multiple bacterial threat agents in NHPs.

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 Barriers:

- 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 agent 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 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:

- Defined and validated essential indicators of therapeutic efficacy against selected toxins.
- Characterized aerosol models of disease to support toxin therapeutic development.
- Conducted studies to further delineate the mechanism of action of, and host response to, botulinum neurotoxin (BoNT).
- Performed structural analysis of ricin toxin and BoNT serotypes.
- Evaluated novel and currently available anti-toxin technologies against ricin toxin, Staphylococcal Enterotoxin B (SEB) and Botulinum NeuroToxin (BoNT) in-vitro and in-vivo. Technologies include small molecules, peptides, natural products and monoclonal antibodies.
- Tested efficacy of combinations of monoclonal antibodies against multiple BoNT serotypes in cell-based systems.
- Defined the key linking technologies (peptide binding design, candidate delivery systems) that have relevance to eventual human clinical efficacy trials for toxins.
- Conducted studies in animal models with lead compounds shown to have potential as inhibitors of target toxins (botulinum neurotoxin (BoNT), ricin, staphylococcal enterotoxin B (SEB))

THERAPEUTICS DEFENSE TECHNOLOGY OBJECTIVE (DTO) RESEARCH ACCOMPLISHMENTS:

Research toward the development of Therapeutic Strategies for Botulinum Neurotoxins (DTO CB.59)

- Developed lead mixtures of human antibodies against Botulinum Neurotoxin (BoNT) as passive immunotherapeutics in-vivo.
- Completed in-vitro testing of combinations of monoclonal antibodies against multiple BoNT serotypes and proof-of-concept studies with lead BoNT active-site inhibitors and/or receptor antagonists in-vivo using qualified surrogate endpoints of human clinical efficacy.
- Developed a strategy for development of BoNT therapeutic candidates.
- Developed a technology for nonclinical studies of optimum therapeutic candidates/treatment modalities.
- Evaluated potential delivery systems for the lead peptide inhibitors.
- Refined and demonstrated technologies that integrate established and emerging toxin therapeutic modalities into suitable candidate therapies in humans, specifically as a complement to future vaccination strategies

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:** Developed lead mixtures of human antibodies against BoNT as passive immunotherapeutics in vivo. Completed 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.

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:

- Enhanced aerobiology capabilities and animal model development to facilitate viral therapeutics research.
- Optimized drug discovery assays with application to identifying and testing antivirals against threat agents.
- Validated potential mediators of shock and toxemia associated with hemorrhagic fever virus infection in appropriate animal models.
- Screened novel and currently available antiviral technologies, including interferons, Virus Like Particles (VLP), small interfering RNA (siRNA), small compounds, artificial nucleases and monoclonal antibodies, against viral threat agents in-vitro.

- Evaluated lead antiviral candidates using in-vivo efficacy models.
- Performed dose ranging studies in primates for lead compounds effective against viral threat agents.
- Initiated development of a treatment algorithm for severe Ebola infection 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)

- Conducted initial evaluation in pock lesion variola primate model at the Centers for Disease Control and Prevention.
- Evaluated oral cidofovir prodrug against monkeypox in primate model to determine drug efficacy.
- Evaluated minimal and sufficient viral therapeutic requirements such as dose, route, pharmacokinetics, and pharmacodynamics.
- Performed appropriate testing in nonhuman primates for FDA licensure consideration under the FDA Animal Efficacy Rule.
- Developed and executed initial steps in plan for licensure and manufacturing of oral cidofovir therapeutic candidate, leading up to milestone approval and transition. Oral cidofovir achieved investigational new drug (IND) status for the smallpox indication.
- Tested the intravenous formulation of cidofovir in non-human primates (NHPs) to support FDA licensure of the drug as a therapeutic for smallpox under the FDA Animal Efficacy Rule.

Research toward the Development of Therapeutic Strategies for Treating Filovirus (Marburg and Ebola Viruses) Infection (DTO CB.63)

- Concluded studies to select anti-Marburg monoclonal antibodies for molecular reengineering and primate testing.
- Began shift from discovery of protein targets for Marburg virus therapy to testing of compounds to inhibit protein-protein interactions.
- Expanded characterization of the role of neutrophils in innate and adaptive immunity to Marburg virus, focusing on cellular pathways possibly common to many viruses.
- Evaluated the utility of recombinant nematode anticoagulant protein c2 (rNAPc2) against Marburg hemorrhagic fever in nonhuman primates.
- Determined the effect of treatment on viral pathogenesis in the mouse Ebola virus model and Marburg mice and guinea pigs models.
- Performed efficacy studies in NHP models that provide the best model for evaluation of the potential for treating filoviruses.
- Developed and executed initial steps in plan for licensure and manufacturing with lead compounds, leading up to milestone approval and transition.
- Completed analysis of studies performed to characterize the pathogenesis of Marburg virus in nonhuman primates in support of the FDA two animal efficacy rule.

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.

Milestones/Metrics.

FY2006: Conducted initial evaluation in variola primate model at the Centers for Disease Control and Prevention. Evaluated 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: Established an assay to screen drugs that inhibit protein-protein interactions in filovirus infection. Tested 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:

Improved the sensitivity and specificity of existing nucleic acid and immunodiagnostic assays.

- Designed new nucleic acid and immunodiagnostic assays to augment pathogen detection.
- Continued study to identify biomarkers of immunity in individuals vaccinated against biological warfare agents (BWA).
- Pursued new chemistries for the identification of BWA.
- Verified host response markers correlating with viral infections.
- Advanced study to develop analytic signatures of biothreat agents.
- Recommended a block improvement to the Joint Biological Agent Identification and Diagnostic System (JBAIDS) Program Office which was to replace the current DNA extraction kit in the Block I deployment pallet with a commercial off the shelf (COTS) kit; recommendation was accepted.
- Initiated multicenter study comparing the recommended COTS Block I DNA extraction kit to automated DNA extraction methods.
- Accelerated development of alternate sampling/extraction techniques to address the JBAIDS, Block I gap in sample processing.
- Designed multiplexed nucleic acid assays for the detection and identification of validated threat agents in clinical samples.
- Assessed novel technologies such as microarrays for suitability as a next generation diagnostic device.
- Continued to test DoD developed assays, reagents and sample preparation techniques and platforms in field and animal studies.
- Evaluated newly developed assays targeting the presence of active toxin in a clinical sample.

- Expanded evaluation of new chemistries for the identification of BWAs to latest state-of-the-art methods.
- Matured recombinant DNA technologies for mass immunodiagnostic reagent production.
- Continued to build a pathogen database for a Defense Advanced Research Projects Agency (DARPA) transitioned broad range pathogen detection system potentially capable of identifying genetically engineered bacterial strains.
- Further developed techniques to develop a proteomics microarray to establish an analytic profile for threat agents.
- Utilized proteomics data to design immunologic assays for BWA detection. Assessed components of future integrated diagnostic systems.
- Developed additional multiplexed nucleic acid assays, focusing on the orthopox viruses.
- Invested in improving the sensitivity and specificity of existing assays, developing assays for new targets and new threats, as genomic data and techniques become available.
- Provided test and evaluation support for the Joint Biological Agent Identification and Diagnostic System (JBAIDS) , Block 1 assays upcoming for Food and Drug Administration (FDA) approval.
- Continued to augment field studies of assays, reagents and platforms for the diagnosis of potential BWAs with animal studies prior to transition to the Advanced Developer. Developed a more coordinated and relevant application for animal and field studies, with emphasis on better characterizing JBAIDS Block I assays.
- Further applied new technological approaches for processing clinical samples to complex matrices and different organisms.
- Initiated evaluation of a broad range pathogen detection system capable of potentially identifying genetically engineered bacterial strains.
- Continued to apply proteomics to the development of immunologic assays for pathogen detection.
- Pursued assessment of next generation diagnostic technologies and their components and explored adaptation for military use.

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)

- Delivered four nucleic acid detection/diagnostic assays and/or supporting reagents to the advanced developer with comprehensive standardized transition data packages.
- Delivered four antigen detection assays and/or supporting reagents to the advanced developer with comprehensive standardized transition data packages..
- Continued to elevate previously transitioned assays up to established test and evaluation standards.

Research Toward Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms Using Microarray-Based Resequencing Technologies (DTO CB.64)

- Developed sample collection procedures.
- Expanded biothreat agent strain collection.
- Sequenced multiple B. anthracis group genomes and release data to other relevant DOD projects.

- Evaluated two high-density microarray systems, (Affymetrix, Inc. and Nimblegen Systems), as whole-genome resequencing platforms.
- Developed and implement data analysis pipeline

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 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.

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.

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.

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 and recombinant plague 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. VIGIV will be procured from an alternate producer, Cangene Corporation.

F.2.3.5 ADVANCED DEVELOPMENT OF THE PLAGUE VACCINE

- Achieved Milestone B in FY06 for plague vaccine program which consists of two vaccine candidates (US and UK) that will be jointly developed through an event driven down select, planned for 2008
- Initiated Phase II Clinical trials in FY06.

F.2.3.6 ADVANCED DEVELOPMENT VENEZUELAN EQUINE ENCEPHALITIS VACCINE

- Program terminated due to reallocation of funding to TMTI.

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 9.3 million FDA-released doses of BioThrax™ to the DOD as of October 2006.

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.

F.3 MEDICAL RADIOLOGICAL DEFENSE

F.3.1 MEDICAL RADIOLOGICAL DEFENSE PRODUCTS

At present, there is no medical countermeasure against radiological and nuclear threats within the Department of Defense stockpile. As such, appropriately applied, advances in medical radiological countermeasures will significantly affect the warfighting mission by sustaining unit effectiveness and conserving the fighting strength of warfighters. The warfighter's performance is greatly decremented by radiation injury and illness is significantly more likely to become a traumatic casualty.

Currently, there are no licensed non-toxic pharmaceutical agents or diagnostic capabilities suitable for use in military operational environments. An aminothiol compound, amifostine, is FDA approved for use in patients receiving chemotherapy or radiation therapy, but its performance degrading toxic side effects prohibit its use in a fit fighting force. Other pharmacologic agents, such as hematopoietic cytokines for treating bone marrow injury, may be used off-label on a case-by-case basis by a physician, but regulatory restrictions for such use make it impractical for treating large numbers of casualties in the battlefield operations. Antibiotics are commonly used to treat the infectious sequelae of radiological injuries, but they must be appropriately selected to effectively treat exogenous and endogenous systemic infections while not affecting beneficial intestinal normal microfluora.

In addressing the issue of currently limited medical countermeasure alternatives, a novel compound, 5-androstenediol (5-AED), developed at the Armed Forces Radiobiology Research Institute (AFRRI) in collaboration with a corporate partner, showed good efficacy as a radioprotectant in a rodent model. However, expanded studies in a nonhuman primate (NHP) model in preparation for the Investigational New Drug (IND) application proved the drug is far less effective than in the mouse model when administered as a radioprotectant but yielded good efficacy in the NHP model when administered therapeutically in serial doses shortly following irradiation. Therefore, the focus of this effort has thus shifted to a therapeutic tack, and a Phase 1 clinical trial is currently undergoing.

The following is a summary of the AFRRI S&T efforts for medical radiological defense:

- Antimicrobials directed at Gram-negative aerobes and facultative Gram-positive bacteria.
- Cytokine-based therapeutic, probiotics, anti-oxidants, and anti-apoptotic agents applications to mitigate the two major fatal syndromes: sepsis and uncontrolled bleeding and of acute radiation syndromes

F.3.2 MEDICAL RADIOLOGICAL DEFENSE R & D ACCOMPLISHMENTS

Due to a new S&T program at JSTO-CBD that began FY06 with one project, no significant development at this time. However, on 1 December 2006, per request of JPMO-CBMS, fifteen MRC candidates were selected for possible transition to the advanced developer. The milestone-A decision is scheduled 2QFY07.

MEDICAL RADIOLOGICAL COUNTERMEASURES THRUST AREA

Countermeasure approaches, technical barriers, and accomplishments in the Medical Countermeasures area are outlined below.

Countermeasure Approaches:

- Pharmacologic agents that neutralize highly reactive oxygen species that are generated in tissues upon the deposition of ionizing radiation and that are a major cause of tissue damage.

- Small molecular weight synthetic agents that modulate cell cycle regulatory checkpoints by reversibly arresting cell division to allow a cell's natural surveillance and repair mechanisms time to correct DNA damage before lethal mutations become incorporated into daughter cells.
- Small molecular weight synthetic molecules that inhibit apoptotic pathways that are activated by ionizing radiation and that lead to programmed cell death.
- Antimicrobial agents to effectively treat systemic infections caused by enteric microorganisms that translocate across damaged intestinal epithelium.
- Recombinant hematopoietic growth factors that stimulate the replication and maturation of bone marrow progenitor cells to help reverse myelosuppression, and restore circulating polymorphonuclear leukocytes and thrombocytes.
- Recombinant keratinocyte growth factor that stimulates the regeneration of epithelial cells from basal progenitor cells.
- Medical treatment strategies to mitigate injuries induced by protracted/delayed exposure to radiation from both external and internal sources.
- Improved techniques to detect and remove internally deposited sources of radioactivity.
- Improved drug delivery systems that provide non-encumbering protection during the entire period of radiation exposure.

Technical Barriers:

- Minimizing the performance-degrading effects of prophylactic drugs that otherwise have good efficacy for the prevention of radiological injury.
- Advancing knowledge of cellular, sub-cellular, and molecular mechanisms of radiological injury to improve rational development of prophylactic and therapeutic drugs.
- Increasing drug stability in order to improve bioavailability and enhance therapeutic and prophylactic efficacy.
- Formulating slow-release drug delivery preparations that extend bioavailability and enhance efficacy.
- Engineering pharmacologic means of up-regulating cellular damage surveillance and repair mechanisms.
- Developing appropriate animal models and bridging endpoints for extrapolating data from animal studies to human efficacy predictions acceptable to the FDA for licensure of drugs under the new efficacy rule.

Accomplishments:

- Initiated studies on efficacy, toxicity, pharmacology, and the mechanisms of action of toll-like receptor that protect lethal hamatopoietic and gastrointestinal radiation syndromes.
- Initiated studies to mitigate radiation-injury using gamma- tocotrienol (GGT) as a radioprotectant.
- Initiated studies on efficacy, toxicity and safety of phenylbutyrate against acute and late effects of radiation exposure.
- Initiated studies on efficacy, toxicity and safety of combined agents – genistein, captopril and tranilast – to mitigate radiation-induced pneumonitis and lung fibrosis.

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 57 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. The 11 additional teams authorized in 2005 have been fielded and certified. Two additional teams were authorized in 2006 and will be fielded in 2008.

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 (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.

- The Commercial Small Program Acquisition (C-SPA) program provides the CSTs and the United States Army Reserve Chemical Companies with CBRN life-support equipment (individual protection clothing, detection and survey 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:

Defense Reform Initiative Directive Number 25, which created the WMD-CSTs also directed that the US Army Reserve (USAR) train and equip Decontamination and Reconnaissance Elements to support Domestic Response missions.

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 train with three platoon sets of Domestic Response Reconnaissance Equipment.

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 military operations and in support of the Lead Federal Agency for domestic and foreign crisis and CM operations. The enhanced capabilities of the USAR Chemical Decontamination and Reconnaissance elements mean improved support to Combatant Commanders.

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), 14 October 2003 and re-validated 19 August 2005.

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 is reduced by focusing on mature GOTS/COTS technologies and products. The IPP consists of a tiered Family of Systems (FoS) that includes detection, identification, warning, incident management, individual and collective protection, medical surveillance, protection, response and initial recovery. The Baseline Tier consists of non-material solutions to include training materials, military and civilian CONOPS and mission area analysis (MAA) templates, and exercise plans and scenarios. Tier 1 adds to the Baseline Tier by providing material solutions to include enhanced first responder capability to include: individual protection and chemical, biological and radiological portable handheld detection and identification systems; mass notification and telephonic alerting systems and an incident management system. Tier 2 consists of the baseline and Tier 1 capabilities and adds collective protection, fixed chemical and biological point detection systems and a more robust decision support system. This FoS package is fielded as a single, integrated system designed to meet the specific needs of the installation. This approach is flexible enough to accommodate the needs of specific installations and accommodate technology insertion while standardizing major system elements to

provide cost effective solutions.

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 an additional 15 installations in FY06. For FY07, 16 Army CONUS installations, 6 OCONUS installations and 10 Army National Guard installations are in progress. 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, 1-1-1 Requirements, FY06 stocks on-hand quantities (as of 30 September 2006), and FY07–13 planned procurements for each of the four Services and the Defense Logistics Agency (DLA). Total Service Requirements and 1-1-1 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 1-1-1 force planning construct. Until the E2C2 study is complete, requirements developed from previous models have become outdated and are not consistent with the 1-1-1 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 FY06, but has not received the requisitioned items are included in FY07. 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 "1-1-1 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

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
INDIVIDUAL PROTECTION											
CB MASK											
MASK, CB, M40/ M40A1	4240-01-258-0061-63 4240-01-370-3821/3/4	629,490		795,348 18,428	39,841						
MASK, M42A2, TANK	4240-01-413-4100-02			50,674	11,050						
	4240-01-258-0064-66			29,262							
	4240-01-370-2622			545							
MASK, M43, APACHE	4240-01-208-6966-69			1,808							
	4240-01-265-2679			1,457							
MASK, M45, AVIATOR	4240-01-414-4034-35/-4051-52			19,999	2						
MASK, M45, LAND WARRIOR	4240-01-447-6987-9, 8967			9,084	1,695						
MASK, M48, APACHE	4240-01-386-0198/-4686/-0201/-0207			18,292							
MASK, M49	4240-01-413-4095-99			909							
JSAM FIXED WING	NOT ASSIGNED	187	187								
JSAM ROTARY WING	NOT ASSIGNED	25246	25246								
JSGPM	4240-01-512-4429/31/34-7	1,238,801	508,024	0	63,546	51,500	60,502	57,845	57,872	59,628	65,455
MISC PROTECTION											
PATS, M41	4240-01-365-8241			6,727	10						
CONTAMINATION AVOIDANCE											
NUCLEAR DETECTION EQUIPMENT											
AN/PDR-75	6665-01-211-4217			3,823	42						
AN/PDR-77	6665-01-347-6100		1,343	929							
AN/UDR-13	6665-01-407-1237	71,152	50,568	23,695	76						
AN/VDR-2	6665-01-222-1425		44,733	30,446	80						

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
IM-9	6665-01-241-3844 6665-00-243-8199 6665-00-705-6068			64							
IM-93	6665-01-330-7520 6665-00-752-7759			15,331							
IM-147	6665-00-542-0729			82							
PP-1578	6665-00-542-1177			6,368							
BIOLOGICAL DETECTION EQUIPMENT											
BIDS, M31A1	6665-01-436-2309										
BIDS, M31E2	6665-01-500-4040	930	777	119	56						
JBPDS INC I MANPORT	6665-01-452-8643			28							
JBPDS INC I RECON			311	0	29	14	13	8	15	22	39
JBPDS INC I SHLT VEH	6665-01-453-5385	1,200	545	0	56	28	28	28	21	35	28
JBSDS INC I	NOT ASSIGNED		6	0							
JBSDS INC II	NOT ASSIGNED	1,263	545	0							
JBAIDS - Backpack	6665-01-523-4902	126	91	5	86						
JBAIDS Analyzer -	6665-01-523-5629	126	91								
JBAIDS Computer -	6665-01-524-2745	126	91								
CHEMICAL DETECTION EQUIPMENT											
ACADA, M22	6665-01-438-6963	46,527	33,103	19,601	3,094	1,500					
ALARM, CAA, M8A1	6665-01-105-5623			14,795	609						
ALARM, M42				1,952	4,494						
CAM/ICAM	6665-01-357-8502	27,190	19,966	15,818	1,500	1,000	1,000				
	6665-01-199-4153			2,560	20						
JCAD	NOT ASSIGNED	97,994	80,273								
JWARN BLOCK 1E	NOT ASSIGNED			23							
MICAD	NOT ASSIGNED			36							
M21 RSCAAL	6665-01-324-6637			75							
NBCRS, M93A1	6665-01-372-1303			40	21						
JNBCRS HMMWVNBCRS	NOT ASSIGNED	214	170								

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
JNBCRS (NBCRV STRYKER)	2320-01-481-8579	353	311								
JNBCRS (SSE)	NOT ASSIGNED		263								
JSLSCAD RECON	6665-01-475-6658/ 6787/6795/6802/6799	1,263	311								
CBMS	6665-01-533-0140				13	10					
DECONTAMINATION											
DECON APPAR, PDDA, M12A1	4230-00-926-9488			404							
L/WT DEC SYS, M17	4230-01-251-8702			514							
L/WT DEC SYS, M17A1	4230-01-303-5225			79							
L/WT DEC SYS, M17A2	4230-01-150-8660			66							
L/WT DEC SYS, M17A3	4230-01-346-3122	6,388	6,388	669							
KARCHER DECON SYS	NOT ASSIGNED			14							
COLLECTIVE PROTECTION											
CHATH, AIR HANDLER	4240-01-423-0915										
CP DEPMEDS	5410-01-479-9727/9730	23	12	12							
CP DEPMEDS-MRI	5410-01-523-0255 / 0257										
SHELTER, CB PROTECT	5410-01-441-8054	1,259	1,035	172							
SHELTER, CP, M20/ M20A1	4240-01-166-2254/4240-01-330-7806			3,000	232	426	213	353	286	285	285

Table H-1b. Army Logistics Readiness Data – Consumables

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
INDIVIDUAL PROTECTION						
OVERGARMENTS						
CHEM PROT UNDERGARMENT TOP	8415-01-363-8692-00			328	0	0
CP UNDERSHIRT	8415-01-488-5715/7			0 ‡	0	0
MCP UNDERSHIRT	8415-01-497-7963/84			50,450	49,538	10,260
CPU DRAWERS	8415-01-363-8683-91			35,711	81,297	10,020
	8415-01-488-5719/22			3,558	1,547	240
JPACE AC	NOT ASSIGNED					
JPACE CVC	NOT ASSIGNED	203,329	117,479			
JSLIST OVERGARMENTS *		5,195,302	1,305,461			
Woodland Coat	SEE TABLE H-5			444,248	75,210	34,104
Woodland Trousers	SEE TABLE H-5			309,756	76,111	34,104
Desert Coat	SEE TABLE H-5			512,805	86,232	83,496
Desert Trousers	SEE TABLE H-5			527,287	58,919	83,496
SCALP (TAN)	8415-01-333-0987-89					
SCALP (GREEN)	8415-01-364-3320-22			3,629		
SUIT, CP CAMO (BDOs) WOOD	8415-01-137-1700-07			78,342		
SUIT, CP CAMO (BDOs) DESERT	8415-01-327-5346/53			3,090		
OVERBOOTS/GLOVES						
JLIST MULO	8430-01-464-9453-84			1,372		
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85			782,034	259,185	61,491
	8430-01-450-0357-60			34,505	16,470	1,500
	8340-01-496-0668			1,155	1,003	8
	8430-01-049-0878-87			4,452		
CP FOOT COVERS	8430-01-021-5978			50		
AFS	8430-01-536-5413-19	11,323,827	1,305,461			
CP GLOVES 7 MIL	8415-01-138-2501-04			74,249	39,340	3,151
CP GLOVES 14 MIL	8415-01-138-2497-00			246,120	90,498	12,601
CP GLOVES 25 MIL	8415-01-033-3517-20			821,570	152,456	47,425
	8415-01-144-1862			626,762	23,205	518

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
CP GLOVE INSERTS	8415-01-494-2854, -2868			135,076	64,916	15,750
JB2GU	NOT ASSIGNED	11,323,827	1,305,461			
MISC PROTECTION						
2D SKIN, M40 SERIES	4240-01-413-1540-43			204,046	80,080	31,500
BATTERY, BA-5800 (PRO MASK)	6135-01-440-7774			2,052		
CP HELMET COVER	8415-01-111-9028			873,776	266,308	63,000
FILTER CAN, C2	4240-01-119-2315			22,189		
FILTER CAN, C2A1	4240-01-361-1319			512,916	2,000,000	600,000
HOOD, M40A1 (QUICK DOFF)	4240-01-376-3152			557,689	0	0
HOOD, M40 (ONE PIECE)	4240-01-260-8723			15,004		
HOOD, M45, LAND WARRIOR	4240-01-441-0553			25,305	0	0
JSCESM	NOT ASSIGNED				54,274	49,306
CONTAMINATION AVOIDANCE						
CHEMICAL DETECTION EQUIPMENT						
BATTERY, ACADA BA-5590	6135-01-036-3495			1,965	1,000	1,000
BATTERY, BA-3517	6135-00-450-3528			203		
BATTERY, ICAM BA-5800	6665-99-760-9742			2,109		
BATTERY, M42 BA-3030	6135-00-835-7210			4,425		
DET KIT, M256A1 (Boxes of 10 tickets)	6665-01-133-4964			126,610	14,239	0
DET PAPER, M8 (Indiv. Books)	6665-00-050-8529			768,794	1,584,447	575,000
DET PAPER, M9 (Indiv. Rolls)	6665-01-226-5589			1,959,177	158,000	234,000
MAINT KIT, M312	5180-01-462-7469			4,150		
MAINT KIT, M293	5180-01-379-6409			31		
MAINT KIT, M273	5180-01-108-1729			46		
NBC MARK SET, M274	9905-12-124-5955			4,141		
	9905-01-346-4716			2,899	0	0
WATER TEST KIT, M272	6665-01-134-0885			1,555	1,745	1,632
BIOLOGICAL DETECTION EQUIPMENT						
HAND HELD ASSAY	6665-01-504-8534			3,999	360	360
DECONTAMINATION						
DECON KIT, M291 (Box of 20)	6850-01-276-1905			139,256	14,000	25,300
DECON KIT, M295 (Box of 20)	6850-01-357-8456			171,013	13,000	19,500

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
JS PERS/SKIN DECON SYS	NOT ASSIGNED	2,558,788	2,572,788			
SORBENT DECON SYSTEM	4230-01-466-9095			283,127		26,515
STB, 50 LB	6850-00-297-6653			324		
COLLECTIVE PROTECTION						
FILTER, CP, M12A2 (M14 GPFU)	4240-01-365-0981			2,534	0	0
FILTER, CP, M13 SERIES (M14 GPFU)	4240-00-368-6291			896	1,655	242
FILTER, CP, M18A1 (M13 GPFU0	4240-01-365-0982			8,781	2,955	5,478
FILTER, CP, M18	4240-00-828-3952				0	0
FILTER, CP, M19	4240-00-866-1825			939	698	1,267
FILTER, GP, M48A1	4240-01-363-1311			4,516	0	0
M98 FILTER SET (M59, M56, SHIPBOARD)	4240-01-369-6533			3,307	6,799	2,142
M28 Liner, End Section	4240-01-330-8882			75	62	0
M28 Liner, End Section, Type II	4240-01-461-5983			3	0	0
M28 Liner, Center Section	4240-01-330-8884			100	117	5
M28 Liner, Center Section, Type II	4240-01-460-9058			33	0	0
M28 Liner, Vestibule	4240-01-330-8891			0	61	13
M28 Liner, Vestibule, Type II	4240-01-460-9059			18	0	57
M28 Liner, ISO Adapter	4240-01-330-8890			23	42	6
M28 Liner, ISO Adapter, Type II	4240-01-460-9056			0	10	10
MEDICAL DEFENSE						
ANTID TREATMENT KIT CYANIDE	6505-01-143-4641 6505-01-457-8901			102 3,814		
SODIUM NITRITE INJECTION USP 300MG 10ML AMPUL 5 / PACKAGE	6505-01-206-6009			411		
SODIUM NITRITE INJECTION USP 30MG/ML 10ML VIAL 2S	6505-01-533-4408			7,905		
SODIUM THIOSULFATE INJECTION USP 25% 50ML SINGLE DOSE VIAL	6505-01-533-4417	kits		9,309		
ANTIDOTE TREATMENT KIT NERVE AGENT (MARK 1)	6505-01-174-9919			668,107		
ANTID TREAT NERVE AGENT AUTO DUAL-CHAMBER (ATNAA)	6505-01-362-7427			815,824		
ATROPINE INJECTION AQUEOUS TYPE 0.7ML SYRINGE W / NEEDLE	6505-00-926-9083			1,791,645		

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
2-PAM CHLORIDE INJ 300MG/ML 2ML AUTOMATIC INJECTOR	6505-01-125-3248			0		
ATROPINE SULFATE INHALATION AEROSOL 6/PKG (MANAA)	6505-01-332-1281			2,909		
ATROPINE SULFATE INJECT USP 1ML VIAL 25 VIALS / PACKAGE	6505-00-957-8089	vials		2,525		
CIPROFLOXACIN TABLETS USP 500MG 50 TABLETS / BOTTLE	6505-01-272-2385			505		
CIPROFLOXACIN TABLETS USP 500MG I.S. 100 TABS / PACKAGE	6505-01-273-8650			11,417		
CIPROFLOXACIN TABLETS USP 500MG I.S. 30 TABS / PACKAGE	6505-01-491-2834	tablets		9,242,420		
DIAZEPAM INJ USP 5MG/ML 2ML SYRINGE-NEEDLE UNIT (CANA)	6505-01-274-0951	doses		1,054,325		
DOXYCYCLINE HYCLATE CAPS USP 100MG I.S. 100 CAPS / PKG	6505-00-009-5060	capsules		9,353,600		
DOXYCYCLINE HYCLATE TABS USP 100MG 20/BT	6505-01-511-7393	tablets		107,629,210		
PATIENT WRAPS	6530-01-383-6260			3,300		
POTASSIUM IODIDE TABLETS 130MG 14S	6505-01-496-4916			18,614		
PRUSSIAN BLUE CAPSULES 500 MG 30 TABLETS / BOTTLE	6505-01-517-5214			3,588		
PYRIDOSTIG BROMIDE TABS USP 30MG I.S. 210 TABS/PKG (SNAPP)	6505-01-178-7903			128,333		
SKIN EXP REDUC PASTE AGAINST CHEM WAR AGENT (SERPACWA)	6505-01-483-7162			397,754		

* Requirements are for all protective overgarments

‡ On-hand data from JACKS as of 6 Nov 2006

Table H-2a. Air Force Logistics Readiness Data - Non-Consumables

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
INDIVIDUAL PROTECTION											
CB MASK											
MASK, M45, LAND WARRIOR	4240-01-447-6988/6989			2644							
MASK, MCU-2/P,	4240-01-415-4239-41										
MASK, MCU-2A/P	4240-01-284-3615-17										
MASK, MCU-2A/P (WR) USAF	4240-01-327-3299-01										
JSAM FIXED WING	NOT ASSIGNED	35497	35497								
JSAM ROTARY WING	NOT ASSIGNED	0	1857								
JSGPM	NOT ASSIGNED	416,357	419,223								
MISC PROTECTION											
PATS, M41	4240-01-365-8241			517							
JSMLT	NOT ASSIGNED	1,312	741								
CONTAMINATION AVOIDANCE											
NUCLEAR DETECTION EQUIPMENT											
ADM 300 - A KIT	6665-01-363-6213NW			145							
- B KIT	6665-01-342-7747NW			883							
- C KIT	6665-01-320-4712NW			962							
- E KIT	6665-01-426-5071NW			301							
BIOLOGICAL DETECTION EQUIPMENT											
JPS	6665-NSN			314	0	0					
JBPDS INC I - MAN PORT	6665-01-452-8643	734	342								
JBPDS INC I - RECON	6665-01-453-5385		77								

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
JBPDS INC I - SHLT VHCL		93	77								
JBPDS INC I - TRAILER			114								
JBSDS INC I	NOT ASSIGNED		12								
JBSDS INC II	NOT ASSIGNED	407	246								
CHEMICAL DETECTION EQUIPMENT											
ACADA, M22	6665-01-438-6963	3,521	1,914								
JCAD	NOT ASSIGNED					1,006					
JCBAWM	NOT ASSIGNED					350					
CAM/ICAM	6665-01-357-8502	1,960	1,436								
JSLNBCRS LAV	NOT ASSIGNED	0	0			6					
JSLNBCRS HMMW	NOT ASSIGNED	93	88			7					
DECONTAMINATION											
L/WT DEC SYS, M17A2	4230-01-349-1778	324									
COLLECTIVE PROTECTION											
CP DEPMEDS	5410-01-479-9727 / 9730	21	16								
J EXPED CP SHELTER	4240-01-346-2564	6,339	4,645								
MEDICAL DEFENSE											
JBAIDS - Backpack	6665-01-523-4902	332	103	44	69						
JBAIDS Analyzer -	6665-01-523-5629	332	103	44	69						
JBAIDS Computer -	6665-01-524-2745	332	103	44	69						

Table H-2b. Air Force Logistics Readiness Data - Consumables

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
INDIVIDUAL PROTECTION						
OVERGARMENTS						
AIRCREWMAN CAPE	8415-01-040-9018					
JSLIST OVERGARMENTS		1,444,001	1,555,510			
Woodland Coat	SEE TABLE H-5	672,872		466,193‡		102,074
Woodland Trousers	SEE TABLE H-5	678,899		462,422‡		96,740
Desert Coat	SEE TABLE H-5	673,167		333,759‡		142,384
Desert Trousers	SEE TABLE H-5			501,242 ‡		
SUIT, AIRCREW, CWU-66/77P	8475-01-328-3434-57					
SUIT, CP CAMO (BDO) WOOD	8415-01-137-1700-07			118,350 ‡		
SUIT, CP CAMO-DESERT 3 clr	8415-00-327-5347-53			2,979 ‡		
OVERBOOTS/GLOVES						
JLIST MULO	8430-01-464-9453-84					
BLK/GRN VINYL O/BOOTS BVO	8430-01-317-3374-85	1,445,453		771,396‡		220,336
	8430-01-450-0357-60			96,535 ‡		
CP FOOTWEAR COVERS	8430-01-118-8172					
	8430-01-021-5978					
AFS	NOT ASSIGNED	1,444,001	1,555,510			
CP GLOVES 7 MIL	8415-01-138-2501-04	149,956		53,078‡	6,527	22,677
CP GLOVES 14 MIL	8415-01-138-2497-00	2,608,366		1,828,179‡		446,553
JB2GU	NOT ASSIGNED	0	1,555,510			
GLOVE INSERTS	8415-00-782-2809 (S)	2,608,186		2,081,736	716	117
MISC PROTECTION						
FILTER CAN, C2/C2A1	4240-01-119-2315	1,607,675		824,378‡	355,298	208,227
	4240-01-361-1319			585,164 ‡		
HOOD, MCU-2/P	4240-01-189-9423	797,379		1,262,072		9,173
SECOND SKIN, MCU-2	4242-00-151-3342/2617	186,294	253,385			38,236
JSCESM	NOT ASSIGNED	373,700	373,700			

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
CONTAMINATION AVOIDANCE						
CHEMICAL DETECTION						
DET PAPER, M8	6665-00-050-8529	591,642		1,153,670‡	2	481
DET PAPER, M9	6665-01-049-8982	338,284		397,815	70,210	63,747
	6665-01-226-5589			453,705 ‡		
DECONTAMINATION						
DECON KIT, M291 (Box of 20)	6850-01-276-1905	648,030		610,453‡		
DECON KIT, M295 (Box of 20)	6850-01-357-8456			687,689 ‡		
JS PERS/SKIN DECON SYS	NOT ASSIGNED	741,141	550,070			
MEDICAL DEFENSE						
ANTIDOTE TREATMENT KIT CYANIDE	6505-01-457-8901	kits		251		
ANTIDOTE TREATMENT KIT NERVE AGENT (MARK 1)	6505-01-174-9919			256		
ANTIDOTE TREATMENT NERVE AGENT AUTOINJECTOR DUAL-CHAMBER (ATNAA)	6505-01-362-7427			907,175		
ATROPINE INJECTION AQUEOUS TYPE 0.7ML SYRINGE WITH NEEDLE	6505-00-926-9083			1,178,770		
PRALIDOXIME CHLORIDE FOR INJ 300MG/ML 2ML AUTOMATIC INJECTOR (2-PAM CHLORIDE)	6505-01-125-3248			649,944		
ATROPINE SULFATE INJECTION USP 1ML VIAL 25 VIALS PER PACKAGE	6505-00-957-8089	vials		2,035,690		
CIPROFLOXACIN TABLETS USP 500MG I.S. 30 TABLETS PER PACKAGE	6505-01-491-2834	tablets		71,050,640		
DIAZEPAM INJECTION USP 5MG/ML 2 ML UNIT 10 PER PACKAGE DIAZEPAM INJECTION USP 5MG/ML 2ML SYRINGE-NEEDLE UNIT (CANA)	6505-01-505-3476 6505-01-274-0951	 doses		 637,622		
DOXYCYCLINE HYCLATE CAPSULES USP 100MG I.S. 100 CAPSULES/PACKAGE	6505-00-009-5060	capsules		211,600		
DOXYCYCLINE HYCLATE TABS USP 100MG 20/BT DO NOT RQN REPACKAGE	6505-01-511-7393	tablets		34,243,780		
OSELTAMIVIR PHOSPHATE CAPSULES 75 MG 10S (TAMIFLU)	6505-01-522-6420			4,359		
PATIENT WRAPS	6530-01-383-6260			0		

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
POTASSIUM IODIDE TABLETS 130MG 14 TABLETS PER BOTTLE	6505-01-116-8198					
POTASSIUM IODIDE TABLETS 130MG 14S	6505-01-496-4916			157		
PYRIDOSTIGMINE BROMIDE TABLETS USP 30MG I.S. 210 TABS/PACKAGE (SNAPP)	6505-01-178-7903			79,462		

‡ On-hand data from JACKS as of 6 Nov 2006

Table H-3a. Navy Logistics Readiness Data - Non-Consumables

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
INDIVIDUAL PROTECTION											
CB MASK											
MASK, A/P 22P-14(V)	NOT ASSIGNED			3,149							
MASK, CB, M40A1	4240-01-370-3821-23	26,400		35,368							
MASK, M45, LAND WARRIOR	4240-01-447-6987/89			335							
MASK, M45, AVIATOR	4240-01-414-4034-35/-4051-52			210							
MASK, MCU-2/P	4240-01-175-3443-45 4240-01-497-7467 (S) 4240-01-497-7783 (M) 4240-01-498-1189 (L)			19,069 17,462 33,276 13,310							
MASK, MCU-2A/P	4240-01-284-3615-17			8,675							
MASK, MCU-2A/P USN	4240-01-415-4239/41			121							
JSAM FIXED WING	NOT ASSIGNED	2207	3824								
JSAM ROTOARY WING	NOT ASSIGNED	3970	2334								
JSGPM	NOT ASSIGNED	426,500	219,368								
MISC PROTECTION											
TDA-99M	6665-01-450-3022	0	0	355							
JSMLT	NOT ASSIGNED	268	97	2							
CONTAMINATION AVOIDANCE											
NUCLEAR DETECTION EQUIPMENT											
EPD	6665-01-544-5580	2,000		0	2,000						
IM-270	6665-01-526-1889	200,000		0	60,000	140,000					

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
AN/PDR-65	6665-01-279-7516	386		386							
CP-95	6665-00-526-8645	993		993							
PP-4276	6665-00-489-3106	1,156		1,156							
IM-143	6665-00-764-6395	13,883		13,883							
DT-60	6665-00-978-9637	155,533		155,533							
AN/PDQ-1 MFR	6665-01-435-0127	2,147		2,147							
OA-9449/PDQ	6665-01-435-0131	2,147		2,147							
EPD	6665-01-544-5580	2000		0	2000						
IM-270	6665-01-526-1889	200000		0	60000	140000					
BIOLOGICAL DETECTION EQUIPMENT											
DFU 1000	6665-01-523-3927		417	2300	38	38					
DFU 2000	6665-01-523-3926			2300	32	32					
DRY FILTER UNIT	6665-01-523-3927		417	683							
JBPDS INC I - RECON			22								
JBPDS INC I - SHIP	6665-01-452-9645	116	121	13	11	11					
JBSDS INC I	NOT ASSIGNED										
JBSDS INC II	NOT ASSIGNED	190	66								
CHEMICAL DETECTION EQUIPMENT											
ACADA, M22	6665-01-438-6963	450	154	450	10						
ACADA, SHIPBOARD	6665-01-484-7823	0		0							
ALARM, CAA, M8A1	6665-01-105-5623	0		6							
ALARM, M42		0									
CAPDS	6665-01-294-2556			7							
CAM/ICAM	6665-01-199-4153	1,009	364	1,266							
CWDD, AN/KAS-1A	5855-01-352-7033	130		703							
IMP POINT DETECTION SYSTEM	6665-LL-HAL-5532	488	285	234	20						
JCAD	NOT ASSIGNED	2,743	2,743	0	0	1,075	0	1,668	0	0	0
JWARN BLOCK I	NOT ASSIGNED										
MICAD	NOT ASSIGNED										
M21 RSCAAL	6665-01-324-6637										
JSLSCAD RECON	6665-01-475-6658/										

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
DECONTAMINATION											
L/WT DEC SYS M17A3 DIESEL	4230-01-346-3122	412		8							
L/WT DEC SYS M17A3	4230-01-346-1778										
COLLECTIVE PROTECTION											
SHELTER, CP, M20/ M20A1	4240-01-166-2254	0									
SHIP CPS BACKFIT	NOT ASSIGNED										
SHIP CPS NEW CONSTRUCTION	NOT ASSIGNED										
JOINT EXPEDITION-ARY CP SHELTER	4240-01-346-2564	2,952	377								
MEDICAL DEFENSE											
JBAIDS - Backpack	6665-01-523-4902	71	54	5	49						
JBAIDS Analyzer -	6665-01-523-5629	71	54	5	49						
JBAIDS Computer -	6665-01-524-2745	71	54	5	49						

Table H-3b. Navy Logistics Readiness Data - Consumables

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
INDIVIDUAL PROTECTION						
OVERGARMENTS						
APRON, TAP M-2	8415-00-281-7813-16			76		
JSLIST OVERGARMENTS *		1,139,000	523,770			
Woodland Coat	SEE TABLE H-5			177,353		
Woodland Trousers	SEE TABLE H-5			163,117		
Desert Coat	SEE TABLE H-5			299,958		
Desert Trousers	SEE TABLE H-5			279,218		
SUIT, CP, OG MK3	8415-01-214-8289-92			802		
SUIT, CP, SARATOGA	8415-01-333-7573-76			308		
SUIT, CP SARATOGA-DESERT	8415-01-333-7577-80					
UNDERGARMENTS						
CMU-34 UNDERSHIRTS	8415-01-490-1900/17			29,575		
CMU-35 DRAWERS	8415-01-490-4368/71/72/74/76-84			31,503		
OVERBOOTS/GLOVES						
JSLIST MULO	8430-01-464-9453-84					
IFS	NOT ASSIGNED	32,871	33,660			
AIRBOSS LTWEIGHT OVERBOOT	8430-99-869-0395/9			225,647		
BLK/GRN VINYL O/BOOTS BVO	8430-01-317-3374-85			23,985		
	8430-01-450-0357-60			553		
	8340-01-496-0668					
GVO	8430-01-049-0878-87			33		
CP FOOTWEAR COVERS	8430-01-118-8172					
	8430-01-021-5978			56,416		
AFS	8430-01-536-5413-19	1,139,000	523,770			
CP GLOVES 7 MIL	8415-01-138-2501-04			1,117		
CP GLOVES 14 MIL	8415-01-138-2497-00			49,298		
CP GLOVES 25 MIL	8415-01-033-3517-20			148,000		
	8415-01-144-1862			0 ‡		

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
JB1GU	NOT ASSIGNED					
JB2GU	NOT ASSIGNED	1,139,000	523,770			
AIRBOSS GLOVE	8415-21-921-2167/72			19,019		
CP SOCKS	8415-01-040-3169			65,107		
DISP FOOTWEAR COVER	8430-00-580-1205-06			7,687		
	8430-00-591-1359			2,862		
GLOVE INSERTS	8415-00-782-2809			255,005		
CP GLOVE INSERTS	8415-01-138-2494-96			48,856		
MISC PROTECTION						
2D SKIN, M40 SERIES	4240-01-413-1540 -43			35,368		
CP HELMET COVER	8415-01-111-9028			0 ‡		
FILTER CAN, C2/C2A1	4240-01-119-2315			95,676		
	4240-01-361-1319			429,781		
	4240-01-871-7842			1,781		
HOOD, MCU-2/P	4240-01-189-9423			866		
HOOD, M45, LAND WARRIOR	4240-01-441-0553			901		
HOOD, M40/42 (ONE-PIECE)	4240-01-260-8723					
HOOD, M40A1 (QUICK DOFF)	4240-01-376-3152			23		
SECOND SKIN, MCU-2	NOT ASSIGNED	530,250	190,983	200,000		
JSCESM	NOT ASSIGNED					
CONTAMINATION AVOIDANCE						
CHEMICAL DETECTION EQUIPMENT						
DET KIT, M256A1	6665-01-133-4964			5,295		
DET PAPER, M8	6665-00-050-8529			46,131		
DET PAPER, M9	6665-01-226-5589			20,107		
NBC MARK SET, M274	9905-12-124-5955			14		
TUBE PHOSGENE	6665-01-010-7965			228		
WATER TEST KIT, M272	6665-01-134-0885			18		
BIOLOGICAL DETECTION EQUIPMENT						
HAND HELD ASSAYS	6665-01-504-8534			2,000	20,000	
CARRIER BOX ASSEMBLY JBPDS HHA	6665-01-525-7009			39	360	480

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
LIQUID CONSUMABLE MISSION PACK - JBPDS	6665-01-512-4430			516	630	840
DRY COLLECTION KIT JBPDS	6665-01-520-7072			138	180	240
BOTTLES, SAMPLE STERILE, JBPDS	6850-01-512-4433			368	225	300
TUBE, BIO CUL (SAMPLE VIALS), JBPDS	6640-01-512-4432			14	27	36
DECONTAMINATION						
CALCIUM HYPOCHLORITE (6 oz)	6810-00-255-0471			2,082		
CALCIUM HYPOCHLORITE (100 lb)	6810-12-255-0472			114		
CALCIUM HYPOCHLORITE (45 lb)	6840-00-242-4770					
DECON FOAM-200 (DF-200), 2 X 55-GAL DRUMS	6850-01-501-2891					
DETERGENT, GENERAL PURPOSE, LIQUID, 5-GAL CAN	7930-00-985-6911					
ANTISETTING COMPOUND (STB DECON SLURRY ANTI-CAKING), 12.5 LB IN GAL CAN	6850-00-656-0926					
SORBENT DECONTAMINATION SYSTEM (SDS), M100, (SQUADBOX, 2 KITS PER BOX)	4230-01-466-9095					
DECON KIT, M291 (Box of 20)	6850-01-276-1905			149,064		
DECON KIT, M295 (Box of 20)	6850-01-357-8456			82,307		
JS PERS/SKIN DECON SYS	NOT ASSIGNED	472,599	122,767			
SODIUM HYPOCHLORITE	6810-00-598-7316			147		
STB, 50 LB	6850-00-297-6653					
COLLECTIVE PROTECTION						
FILTER, GP, M48A1	4240-01-363-1311				87	112
FILTER SET, SHIPBOARD (M98)	4240-01-369-6533				3,650	3,928
PRE-FILTER, BAG (3 DEEP NO CCT)	4240-01-474-8855				215	516
PRE-FILTER, BAG (3 DEEP CCT)	4130-01-474-8851				666	288
PRE FILTER, BAG (2 DEEP)	4130-01-531-0898				2	0

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
PRE FILTER, BAG (5 DEEP)	4130-01-531-0891				0	0
PRE FILTER, BAG (1 DEEP)	NOT ASSIGNED				4	0
GASKET, O-RING (LARGE)	5330-01-340-5099				941	373
GASKET, O-RING (SMALL)	5330-01-339-0967				941	373
LP FILTER, 1000 CFM	4240-01-347-6190				362	112
MEDICAL DEFENSE						
ANTID TREATMENT KIT CYANIDE	6505-01-143-4641 6505-01-457-8901	kits		26		
ANTIDOTE TREATMENT KIT NERVE AGENT (MARK 1)	6505-01-174-9919			5,034		
ANTID TREAT NERVE AGENT AUTO DUAL-CHAMBER (ATNAA)	6505-01-362-7427			186		
ATROPINE INJECTION AQUEOUS TYPE 0.7ML SYRINGE W / NEEDLE	6505-00-926-9083			555,031		
2-PAM CHLORIDE INJ 300MG/ML 2ML AUTOMATIC INJECTOR	6505-01-125-3248			606,555		
ATROPINE SULFATE INJECTION USP 1ML VIAL 25 VIALS / PACKAGE	6505-00-957-8089	vials		2,927,775		
CIPROFLOXACIN TABLETS USP 500MG I.S. 30 TABLETS / PACKAGE	6505-01-491-2834	tablets		3,038,120		
DIAZEPAM INJ USP 5MG/ML 2ML SYRINGE-NEEDLE UNIT (CANA)	6505-01-274-0951	doses		167,998		
DOXYCYCLINE HYCLATE CAPS USP 100MG I.S. 100 CAPS / PKG	6505-00-009-5060	capsules		8,876,500		
DOXYCYCLINE HYCLATE TABS USP 100MG 20/BT	6505-01-511-7393	tablets		624,240		
OSELTAMIVIR PHOSPHATE CAPSULES 75 MG 10S (TAMIFLU)	6505-01-522-6420			2505		
POTASSIUM IODIDE TABLETS 130MG 14S	6505-01-496-4916			80,592		
PYRIDOSTIG BROMIDE TABS USP 30MG I.S. 210 TABS/PKG (SNAPP)	6505-01-178-7903			29,537		

* Requirements are for all protective overgarments

‡ On-hand data from JACKS as of 6 Nov 2006

Table H-4a. Marine Corps Logistics Readiness Data – Non-Consumables

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
INDIVIDUAL PROTECTION											
CB MASK											
MASK, CB, M40/ M40A1	4240-01-258-0061-63 4240-01-370-3821-23	149,512		189,653	94,032						
JSAM FIXED WING	NOT ASSIGNED	1,575	1,417								
JSAM ROTARY WING	NOT ASSIGNED	3,666	3,300								
JSGPM	NOT ASSIGNED	257,785	198,297								
MISC PROTECTION											
MASK COMM AMPLIFIER M7	5996-01-381-9012			25,362							
PATS, M41	4240-01-365-8241			371							
JSMLT	NOT ASSIGNED	293	158	0	128						
CONTAMINATION AVOIDANCE											
NUCLEAR DETECTION EQUIPMENT											
AN/PDR-56	6665-00-086-8060			0							
AN/PDR-56D	6665-00-053-3391			22							
AN/PDR-56E	6665-00-211-6895			1							
AN/PDR-56G	6665-01-016-8267			7							
AN/PDR-56H	6665-01-161-5407			26							
AN/PDR-75	6665-01-211-4217			1,074							
AN/PDR-77	6665-01-347-6100		16,500	0							
AN/UDR-13	NOT ASSIGNED	16,500	16,520	565	3,205	3,000	3,000				
AN/VDR-2	6665-01-222-1425		16,500	2,074							
VEHICLE MOUNT AN/VDR-2	TBD										
IM-143	6665-00-764-6395			15							
	6665-00-540-9004			762							
	6665-01-134-9714			6,366							

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
CHARGER PP4276A/PD	6665-00-104-7246			24							
CHARGER PP4276B/PD	6665-00-110-5081			1							
CHARGER PP4276C/PD	6665-00-489-3106			377							
CHARGER PP4276/PD	6665-00-788-5779			316							
CHARGER PP4276D/PD	6665-01-281-9637			7							
CHARGER PP 8444A/U	6130-01-443-0970			97							
DT-236				173,328							
BIOLOGICAL DETECTION EQUIPMENT											
JBPDS INC I - SHLT VEH	6665-01-453-5385	113	22								
CHEMICAL DETECTION EQUIPMENT											
ACADA, M22	6665-01-438-6963	622	622	760							
ACADA, M22 (TIM)	NOT ASSIGNED										
CAM 1.5	6665-01-359-9006			38							
CAM 2.0	6665-99-725-9996			2,582							
JCAD	NOT ASSIGNED	15,485	14,000								
M21 RSCAAL	6665-01-382-1968			8							
NBC RECON SYS, M93	6665-01-372-1303			2							
NBC RECON SYS, M93A1	6665-01-372-2582			8							
JSLNBCRS LAV	6665-07-000-0776	22	22								
JSLNBCRS HMMWV	NOT ASSIGNED	37	37								
JSLSCAD RECON	6665-01-475-6658/6787/6795/6802/6799	229	22								
DECONTAMINATION											
L/WT DEC SYS, M17A1	4230-01-303-5225			0							

				FY06	PROJECTED DUE IN						
		TOTAL SERVICE	1-1-1	STOCKS							
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08	FY09	FY10	FY11	FY12	FY13
				(as of 30 Sept 06)							
L/WT DEC SYS, M17 MCHF	4230-01-470-5826			82							
HEAVY FUEL DECON	4230-01-492-1540	1,570		828							
L/WT DEC SYS, M17A3	4230-01-346-3122			0							
MEDICAL DEFENSE											
JBAIDS - Backpack	6665-01-523-4902	98	16	5	11						
JBAIDS Analyzer -	6665-01-523-5629	98	16	5	11						
JBAIDS Computer -	6665-01-524-2745	98	16	5	11						

Table H-4b. Marine Corps Logistics Readiness Data - Consumables

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
INDIVIDUAL PROTECTION						
OVERGARMENTS						
JSLIST OVERGARMENTS *		867,586	641,246			
Woodland Coat	SEE TABLE H-5			236,323		
Woodland Trousers	SEE TABLE H-5			201,832		
Desert Coat	SEE TABLE H-5			210,771		
Desert Trousers	SEE TABLE H-5			209,645		
M-2 APRON	8415-00-281-7812-16			32,127		
SUIT, CP, SARATOGA	8415-01-333-7573-76			197,135		
SUIT, CP SARATOGA-DESERT	8415-01-333-7577-80			9,195		
JPACE AC	NOT ASSIGNED					
JPACE CVC	NOT ASSIGNED	25,950	21,774			
OVERBOOTS/GLOVES						
JLIST MULO	8430-01-464-9453-84			325,389		
BLK/GRN VINYL O/BOOTS BVO	8430-01-317-3374-85			229,631		
	8340-01-450-0357-60			196,739		
	8340-01-496-0668			12,190		
GVO	8430-01-049-0878-87			4,053		
CP FOOT COVERS	8430-01-021-5978			21		
AFS	8430-01-536-5413-19	872,374	641,246	91,071	257,045	
CP GLOVES 7 MIL	8415-01-138-2501-04			579		
CP GLOVES 25 MIL	8415-01-033-3517-20			342,258		
JB1GU GROUND	8415-01-033-3517-20			467,923		
JB1GU SUMMER FLIER	8415-21-921-2165,67, 70,72			36,733		
JB2GU	NOT ASSIGNED	854,051	641,246			
MISC PROTECTION						
2D SKIN, M40 SERIES	4240-01-413-1540-43			408,233		
FILTER CAN, C2/C2A1	4240-01-119-2315			92,197		
	4240-01-361-1319			486,348		
HOOD, M40	4240-01-376-3152			0		
WP BAG, M1A1	4240-00-377-9401			49,238		

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
	4240-00-803-5839			1,905		
CONTAMINATION AVOIDANCE						
CHEMICAL DETECTION EQUIPMENT						
BATTERY, ICAM BA-5800	6665-99-760-9742			4,698		
BATTERY, ACADA BA-5590	6135-01-036-3495			431		
BATTERY, ACADA BA-5590 B/U	6135-01-438-9450			53,224		
DET KIT, M256A1	6665-01-133-4964			8,214		
DET PAPER, M8	6665-00-050-8529			345,336		
	6665-01-226-5589			118,879		
NBC MARK SET, M274	9905-12-346-4716			3,186		
WATER TEST KIT, M272	6665-01-134-0885			1,532		
DECONTAMINATION						
DECON KIT, M291	6850-01-276-1905			32,287		
DECON KIT, M295	6850-01-357-8456			22		
JSPDS	NOT ASSIGNED	696,488	494,750			
SORBENT DECON SYSTEM	4230-01-466-9095			150,543		
STB, 50LB	6850-00-297-6653			928		
MEDICAL DEFENSE						
ATROPINE INJECTION AQUEOUS TYPE 0.7ML SYRINGE WITH NEEDLE	6505-00-926-9083			74,558		
PRALIDOXIME CHLORIDE FOR INJ 300MG/ML 2ML AUTOMATIC INJECTOR (2-PAM CHLORIDE)	6505-01-125-3248			83,585		
CIPROFLOXACIN TABLETS USP 500MG I.S. 30 TABLETS PER PACKAGE	6505-01-491-2834	tablets		17,800		
DIAZEPAM INJECTION USP 5MG/ML 2ML SYRINGE-NEEDLE UNIT (CANA)	6505-01-274-0951	doses		50,360		
POTASSIUM IODIDE TABLETS 130MG 14 TABLETS PER BOTTLE POTASSIUM IODIDE TABLETS 130MG 14S	6505-01-116-8198 6505-01-496-4916			651		

				FY06	PROJECTED DUE IN	
		TOTAL SERVICE	1-1-1	STOCKS		
NOMENCLATURE	NSN	REQUIREMENT	REQUIREMENT	ON HAND	FY07	FY08
				(as of 30 Sept 06)		
PRUSSIAN BLUE CAPSULES 500 MG 30 TABLETS PER BOTTLE	6505-01-517-5214			0		
PYRIDOSTIGMINE BROMIDE TABLETS USP 30MG I.S. 210 TABS/PACKAGE (SNAPP)	6505-01-178-7903			3,117		

* Requirements are for all protective overgarments

Table H-5. Defense Logistics Agency Logistics Readiness Data - Consumables

		FY06	PROJECTED DUE IN	
NOMENCLATURE	NSN	STOCKS ON HAND	FY07	FY08
		(as of 30 Sept 06)		
INDIVIDUAL PROTECTION				
OVERGARMENTS				
CAPE, AIRCREWMAN	8415-01-040-9018	177,992		
CHEM PROT UNDERGARMENT TOP	8415-01-363-8692-00	23,336		
CPU DRAWERS	8415-01-363-8683-91	12,594	64,000	64,000
JSLIST OVERGARMENTS *				
Woodland Coat	8415-01-444-1163/-1169/-1200/38/49/65/70	296,527	215,000	215,000
Woodland Trousers	8415-01-444-1435/39/-1613-/2308/10/25/38	307,711	215000	215,000
Desert Coat	8415-01-444-5902/05/13/26/-6116/31/38	117,301	415,000	415,000
Desert Trousers	8415-01-444-5417/5504/06/-5892/93/98/-5900	107,138	415,000	415,000
SUIT, AIRCREW, CWU-66/77P	8475-01-328-3434-57	3,327	16,000	16,000
OVERBOOTS/GLOVES				
BLK/GRN VINYL O/BOOTS	8430-01-450-0357-60	28,289	1,092,482	642,504
CP GLOVES 7 MIL	8415-01-138-2501-04	63,347	64,000	64,000
CP GLOVES 14 MIL	8415-01-138-2497-00	18,237	950,000	845,000
CP GLOVES 25 MIL	8415-01-033-3517-20	206,767	50,000	250,000
GLOVE INSERTS	8415-00-782-2809	163,725	440,000	372,000
CP GLOVE INSERTS	8415-01-138-2494-96	40,534	600,000	300,000
CP SOCKS	8415-01-040-3169	90,957	0	0
DISP FOOTWEAR COVER	8430-00-580-1205-06	10,099	22,400	27,864
MISC PROTECTION				
CP HELMET COVER	8415-01-111-9028	5,005	800,000	500,000
CONTAMINATION AVOIDANCE				
BATTERY, ACADA BA5590	6135-01-438-9450			
BATTERY, BA3517	6135-00-450-3528			
MAINTENANCE KIT, M293	5180-01-379-6409			
TUBE, DET, PHOSGENE GAS	6665-01-010-7965	249	665	665
DECONTAMINATION				
CALCIUM HYPOCHLORITE (6 oz)	6810-00-255-0471	13,218	287,988	240,312
STB, 50 LB	6850-00-297-6653	376,400	0	0
COLLECTIVE PROTECTION				

		FY06	PROJECTED DUE IN	
NOMENCLATURE	NSN	STOCKS ON HAND	FY07	FY08
		(as of 30 Sept 06)		
PRE-FILTER, SHIPBOARD CPE	4130-01-474-8855, -8851 (each)	1,046	2,241	2,252
MEDICAL DEFENSE				
2-PAM CHLORIDE, AUTOINJ	6505-01-125-3248	550,000	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	1,796,000	800,000	800,000
PYRIDOSTIGMINE TABLETS	6505-01-178-7903	36,000	36,000	36,000
ANTIDOTE TREAT KIT, CYANIDE	6505-01-143-4641	0	5,000	5,000
	6505-01-457-8901			
CIPROFLOXACIN 500 MG TAB 100s IS+	6505-01-273-8650	2,063		
500 MG TAB 100s BTL+	6505-01-333-4154	35,720		
DOXYCYCLINE CAPS, 500s +	6505-00-009-5063	3,024		
DOXYCYCLINE TABS, 100 MG, 500s +	6505-01-153-4335	7,812		

H.2 FIELDED CBRN DEFENSE ITEMS - ISSUES AND CONCERNS

For the purposes of this section, CBRN defense systems are categorized into five functional areas: (1) Contamination Avoidance, (2) Information Systems (3) Individual Protection and 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 FY06. Thus several systems may appear to be initially low in inventory, but their quantities will improve with continued procurement in coming years.

Radiological / Nuclear Detection

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 AN/VDR-2, AN/UDR-13 and AN/PDR-77. New AN/VDR-2 systems are being procured and will be available through the depot system. 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 Navy is seeking a replacement for the shipboard, mast-mounted AN/PDR-65. This RADIAC is used for over-the-horizon detection of a nuclear blast and has been in service for over 40 years. The AN/PDR-65 is no longer manufactured and repair parts are not available. Current stocks will be exhausted by FY09. The Navy is working on an updated, definitive operational requirement in the post-Cold War environment for a replacement device. The Marine Corps has sufficient AN/VDR-2s, but 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.

Biological Detection

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 beginning to be deployed in significant numbers. The USAF has limited quantities of the Joint Portal Shield biological networked Sensor Systems and will be receiving Joint Biological Standoff Detection Systems (JBSDS) in FY 08 followed by Joint Biological Point Detection Systems (JBPDS) in FY09. The Marine Corps' current capability consists of a limited number of DFUs and Hand Held Assays (HHA), a type of biological agent assay, that were fielded to support Operation Iraqi Freedom (OIF). In FY08-FY09, the Marine Corps will receive the Joint Service Lightweight NBCR System in the Light Armor Vehicle (LAV) configuration, which contains the JBPDS system for Biological Detection as part of its reconnaissance platform. The Navy fielded the DFU, an environmental air sampling system designed to be used with HHAs 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 currently available as a Common Table of Allowances (CTA) item and can be requisitioned from depots along with HHAs.

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. However, the JBPDS 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 Navy is currently using bar-coding capabilities to better track shelf life items and to reduce risk of spoilage.

Chemical Detection

The combined total of chemical agent detection systems will improve significantly when the M22 Automatic Chemical Agent Detection Alarm (ACADA) and M8A1 Automatic Chemical Agent Alarm are replaced by the Joint Chemical Agent Detector (JCAD), which begins fielding in FY08. Standoff chemical detection will begin to be available in FY08 with the Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD).

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.

Reconnaissance

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. The Joint Services began increasing the reconnaissance capabilities in FY06 with the upgrades to the M93A1 Fox Nuclear, Biological, Chemical Reconnaissance Vehicle (NBCRV) fitted with anti-RPG Armor, additional Improvised Explosive Device (IED) protection, and the Common Remote Operated Weapons Station (CROWS).

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 the Program Office into two teams: Ground Protection Ensembles and Aviation Protection Ensembles /Test Equipment. Fielding and continued development of Joint Individual Protection equipment through these teams has begun to resolve many of these former challenges.

Ground 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 produced more than 128,000 overgarments per month beginning in April 2003 to meet requirements. Over the past year, planned ramp down efforts are underway. While the monthly production rates have decreased, production lines are maintaining the ability to surge in order to provide coverage of any contingency for meeting future expected deployment rates.

On 24 Oct 06, the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) directed the

recall of all JSLIST chemical protective suits produced by Southeastern Kentucky Rehabilitation Industries (SEKRI). This precautionary recall is due to sewing and assembly irregularities found in some SEKRI produced suits. As of September 30, 2006, the Services reported an inventory of approximately 170,000 SEKRI suits. The DLA, who manages JSLIST production, is not issuing remaining SEKRI stocks and SEKRI no longer produces JSLIST suits. The JPEO CBD, as the JSLIST Life Cycle Manager, is working with the Services on plans to resolve individual Service concerns, mitigate any readiness impacts, and through DLA and the Defense Contract Management Agency, implement improved quality assurance procedures for all JSLIST manufacturers. Production and inventory of JSLIST with known acceptable performance are sufficient to support all current and anticipated needs.

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 and will begin fielding in FY08.

Gloves. The Services are expected to have adequate stocks of 14 and 25-mil chemical protective gloves for contingency use. 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. The JB1GU began fielding in FY06 and will be followed by the JSLIST Block 2 Glove Upgrade (JB2GU) in FY07. JB2GU will provide hand protection for military personnel from battlefield concentrations of all known C/B agents when worn as part of a CB protective ensemble. The JB2GU has two variants: A Flame Resistant (FR) variant that has a combination of an outer Nomex/leather glove and an inner CB protective liner and a Non-Flame Resistant (nFR) variant, which consists of a molded glove made from compounded butyl rubber and a removable Coolmax/Lycra/Viscose protective liner.

Footwear. Chemical Protective Footwear Covers, also known as the "fishtail", have been removed from the inventory and replaced with the Black/Green Vinyl Overboot (BVO/GVO), which is the interim chemical protective footwear solution until the JSLIST footwear solution has been completely fielded. 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. Since existing chemical protective footwear volume is too large 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 on ships requiring replacements for the fishtail, and for new construction ships pending fielding of the Alternative Footwear Solution (AFS). Accordingly, 175,000 pairs of Airboss Lightweight Overboot were fielded to the U.S. Nay during FY04 and FY05. In FY06, Alternative Footwear Solutions (AFS) fielding began with 538,000 pairs to the U.S. Marine Corps. The Integrated Footwear Solution will begin fielding in FY07. IFS are a CB protective sock/liner worn under standard Service combat footwear. AFS is a Butyl rubber CB protective overboot packaged in a vacuum sealed bag. The vacuum sealed bag will enhance recovery rate of issued footwear with reduced weight and packaged volume. AFS also has improved traction for ground and shipboard environments.

Respiratory: The Services continue modernizing their field 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 CVC) series masks replace the M17 and M25-series masks, respectively. For the Marine Corps, the M40A1 mask has replaced the M42, M17, and M25-series masks. Some Navy shore activities and Navy Expeditionary Air squadrons are also using the M40 series masks.

The MCU-2/P and MCU-2A/P masks are designed to meet the needs of the Air Force ground crews, and Navy

shipboard and shore-based support missions. In FY01, due to the inability of production to keep with demand, the decision was made to transition Navy shore-based expeditionary forces in the more readily available M40A1 mask. This decision allowed the Navy to redistribute its inventory of MCU-2/P masks from shore facilities to ships, thus increasing the readiness of Navy CBRN Defense assets afloat. Additionally, testing of MCU-2/P Masks as part of the Navy Readiness Improvement Program (RIP) has generated failure rates of up to 30%, increasing the production requirement to meet replacement demands. The addition of new production lines for MCU-2/P at the vendor has stabilized the shortage problem for now. Additionally, the USAF has some shortages in masks. MCU-2-series second skins, which ensure more complete personal protection, are currently in First Article Testing in preparation for production and fielding. This is significant since the MCU-2/P and MCU-2A/P masks will continue to be the mainstay of USAF units until the JSGPM is fielded.

The recall, re-certification, and replacement of 4.5 million suspect C2A1 canisters (filters) produced between February 2003 and July 2005 continues. Due to flaws in the automated production process controls at the manufacturer, approximately 106 non-conforming canisters were commingled with every one-million conforming canisters. The non-conforming filters meet standards for protection against gaseous agents, but do not meet standards for protection against particulate agents. All canisters, produced between February 2003 and July 2005, regardless of lot number, have been replaced for all deployed/deploying forces. All the canisters involved are being retested and 100% re-certification of all suspect lots is scheduled for completion in February 2007. After re-certification, these filters will be marked as serviceable and returned to operational stocks.

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 have been developed and issued in FY04. 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 as it begins fielding in FY07.

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.

Aviation Protection Ensembles/Test Equipment

Aviation Garments/Footwear: 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. USN and USMC aircrews 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 Army, Navy, and Marine aircrew ensembles for both fixed and rotary wing aircrew personnel.

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 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 Aircrew Eye/Respiratory Protection (AERP) mask is another mask specially designed to enable pilots of high performance aircraft to conduct missions in a contaminated environment. The Joint Service Aircrew Mask (JSAM) is scheduled to replace all existing aircrew protective masks as it begins fielding in FY08.

Respiratory Test Equipment: 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. 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 will continue to use the M41 PATS and the Navy and Air Force will use the JSMLT. The Marine Corps will continue to use the M41 PATS to conduct fit testing; the JSMLT will be used primarily for checking mask serviceability, but will also be used to validate mask fit. The JSMLT began fielding in FY06 with the Marine Corps CBRN Defense School receiving 6 systems on 29 Jun 06 as the First Unit Equipped. The JSMLT will achieve Full Operational Capability (FOC) in FY10.

The MQ1A mask tester also validates proper fit of a mask to the face of the individual. It tests the 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 aforementioned masks.

Key Component Consumables for Respiratory Protection. Filters and canisters provide the active ingredients that absorb and otherwise react with chemical and biological agents to provide the essential respiratory and ocular protection required to the warfighter. The C2/C2A1 canister is the principal filter in the military inventory and it is used with the M40, M42, M43, M45, M48, A/P22P-14(V1-4), and MCU-2/P series masks.

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 supplementary liquid agent protection for personnel wearing the M40-series protective mask. 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.2.3 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, 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.

The M51 shelter has been replaced by the Chemical and Biological Protective Shelter (CBPS). All Army M51 shelters have been coded as unserviceable. The CBPS received Milestone C approval and is presently in full rate production. Limited quantities of CBPS were fielded to U.S. Army units in support of an Urgent Materiel Release for Operation Enduring Freedom/Operation Iraqi Freedom. Currently 191 of the required 1035 CBPS systems have been fielded.

Both Army and Air Force field hospitals have been integrated with environmentally controlled collective protection. The Army's Chemically Protected Deployable Medical Systems (CP DEPMEDS) achieves collective protection through the integration of the M28 Simplified Collective Protection Equipment, chemically protected air conditioner, heaters, water distribution and latrine and alarm systems. The M28 Simplified CPE is in production and production of chemically protected heaters and air conditioners was initiated in FY99. Procurement and production of CP DEPMEDS components are ongoing. Limited quantities of CP DEPMEDS were fielded to U S Army hospitals in support of an Urgent Materiel Release for Operation Enduring Freedom/Operation Iraqi Freedom. As a result of Lessons Learned, the Army developed the Medical Reengineering Initiative or MRI configuration to replace the Mission Force 2000 or MF2K. The Collective Protection aspects of the program are well underway and are being incorporated into existing hospitals. The Collective Protection for Expeditionary Medical Shelter System (CP EMEDS) program is an effort to fill the shortfall by inserting environmentally controlled collective protection into currently fielded hospital Alaska shelters. In FY00, production was initiated for remaining M28 CPE, CB protected water distribution and latrine systems, CB ISO Shelter Seals and Low Pressure Alarms.

The Services have continued to improve integrated collective protection systems in armored vehicles, vans, and ships. All modern armored vehicles and armored vehicles in development have either filtered air systems, hybrid collective protection or full collective protection systems designed into their chassis. Notable progress has been made in providing shipboard collective protection. By the year 2007, most Naval ships that have close-in support roles (including amphibious ships, gunfire support combatants, and new logistics support ships) will contain significant CPS capabilities.

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. The M20/M20A1 Simplified CPE is no longer a free issue item since the class of supply was changed from class VII to a class II secondary major end item and as such is funded by Army Working Capital Funds. 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 Marine Corps has Portable Collective Protection Shelters (PCPS) that are being replaced by the Collective Protection System (CPS) for the Modular General Purpose Tent System (MGPTS). This is a modified M28 liner, support kit and NBC Filter canister. They are fielded to Strategic Logistics Asset Management (SLAM) sites. The Marine Corps is using the PCPS for training purposes.

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 1-1-1 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. Past availability problems have been resolved with the sole provider, Rohm & Haas, committing to assure availability of the resin throughout the M291 lifecycle. Since October 1996, Pine Bluff Arsenal, Arkansas, has been the sole producer of the M291 Decontaminating Kit. Block I of the Joint Service Personal/skin Decon System (JSPDS) program may field a new skin decon kit to replace the M291 in 2007. The replacement could be a Canadian product, Reactive Skin Decon Lotion (RSDL), an FDA approved Class VIII item controlled by Medical CB Defense. This skin decon kit would be fielded as the Joint Service Personnel/Skin Decontamination System (JSPDS). Currently the Joint Program Office for Decontamination is conducting a Business Case Analysis to determine the path forward for procurement of personnel/skin decontamination capability based on benefits and costs. This analysis is comparing the M291 SKD and RSDL. Results of this analysis will be available for the Milestone C Full Rate Production Decision in March 2007.

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 include those that are used to counteract the effects of exposure to chemical, biological, or nuclear agents through pre-and post-exposure treatment, and vaccines. Current projections for medical chemical defense material indicate that sufficient quantities should be on hand through the far-term; however areas of potential risk or concern are described below.

The Office of the Surgeon General of the Army has centrally programmed and funded the Army's Medical Chemical Defense Materiel since 1994. US Army Medical Materiel Agency (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.

Current projections for medical chemical defense material indicate that sufficient quantities should be on hand through the far-term. Quantities of Soman Nerve Agent Pyridostigmine Pretreatment (SNAPP) Tablets (also known as PB Tablets) will probably remain at low risk because of continued purchases. Quantities of Nerve Agent Antidote Kits (NAAK), and Atropine and 2-PAM Chloride Autoinjectors may fall short of requirements. Convulsant Antidote Nerve Agent (CANA) will probably remain at low risk because of continued purchases. In the area of biological agent 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 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.

The FDA 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 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, and Medical Chemical, Biological, Radiological, and Nuclear Defense Materiel (MCDM) Programs. The Defense Medical Standardization Board (DMSB) manages the shelf-life extension program for the Services and interfaces with the FDA. The FDA requests samples from the Joint Readiness Clinical Advisory Board (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 materiel at strategic locations that re-mark the materiel and maintain it for the deploying 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 material must be relabeled with the Lot number, new expiration date and FDA Project number, covering only the original expiration date, before it may be issued. The complete label may not be replaced. 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. 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 and the web-based DOD/FDA Shelf Life Extension Program (SLEP) system.

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.

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 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. The decontaminable litter is now the only litter procured by the Services and is no longer tracked as a CBRN item.

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, 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 FY2006–FY2013. Detailed funding request for FY 2006–2013 are provided separately in the President's FY2008 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)	FY06‡	FY07‡	FY08*	FY09*	FY10*	FY11*	FY12*	FY13*
0601384BP – Basic Research	91.281	104.257	72.003	59.191	55.484	52.990	56.651	54.348
0602384BP – Applied Research	240.904	258.862	305.327	216.705	189.404	177.988	188.074	188.771
0603384BP – Advanced Tech. Dev.	227.204	235.760	232.302	388.487	313.810	203.549	193.416	184.822
Science & Technology Base Subtotal	559.389	598.879	609.632	664.383	558.698	434.527	438.141	427.941
0603884BP – Advanced Component Development and Prototypes	127.371	80.407	57.160	42.467	170.556	184.559	185.620	209.767
0604384BP – System Development and Demonstration (SDD)	250.752	212.369	247.935	242.266	216.249	294.589	277.131	234.968
0605384BP – Management Support	100.510	82.521	99.053	100.889	114.164	116.006	120.932	123.180
0605502BP- Small Business Innovative Research (SBIR)	6.579	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0607384BP – Operational Systems Development	9.671	7.008	7.716	10.359	12.707	14.841	15.376	14.050
Reimbursable Program Reimbursable Activity	0.123	1.165	0.000	0.000	0.000	0.000	0.000	0.000
RDT&E Subtotal	1047.693	981.184	1021.496	1060.364	1072.374	1044.522	1037.200	1009.906
0208384BP – Procurement Subtotal	713.351	516.909	548.753	540.685	552.575	552.927	585.649	637.743
CB Defense Program Total	1761.044	1498.093	1570.249	1601.049	1624.949	1597.449	1622.849	1647.649

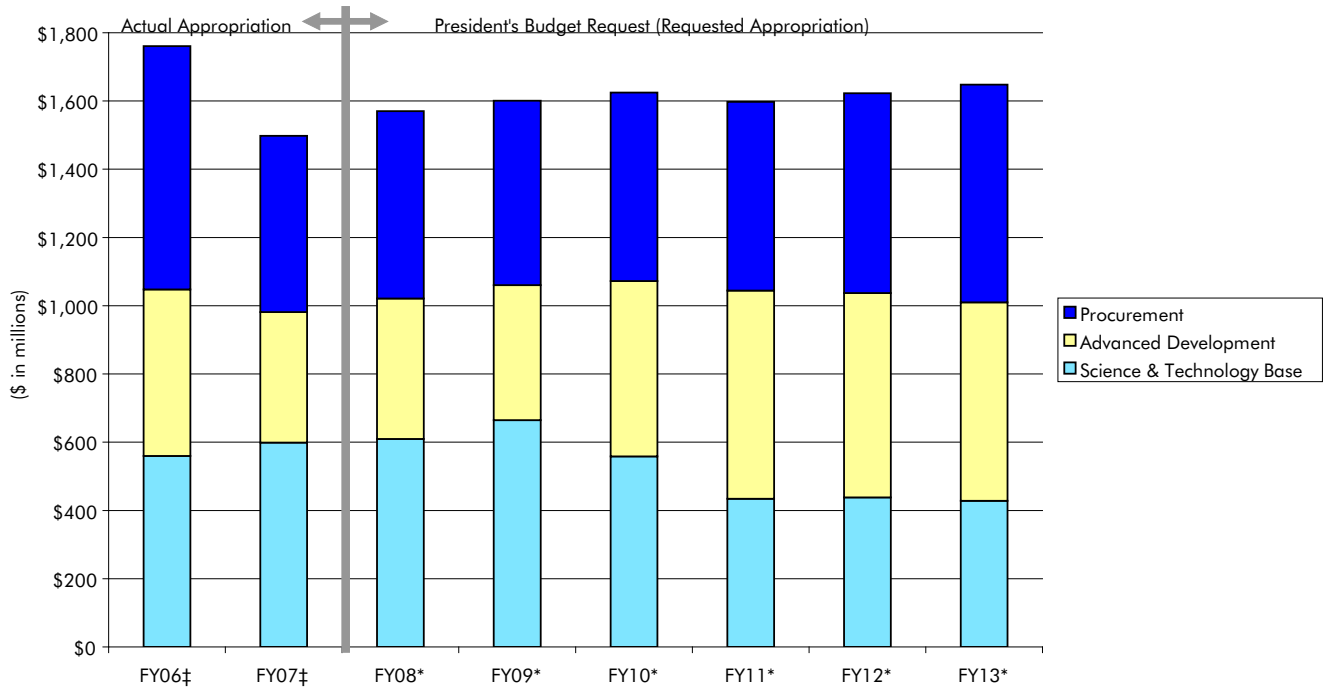
‡ Total Obligation Authority (TOA)

* Estimated [from FY2008 President's Budget Request]

Table I-2. CB Defense Program Expenditures Summary†

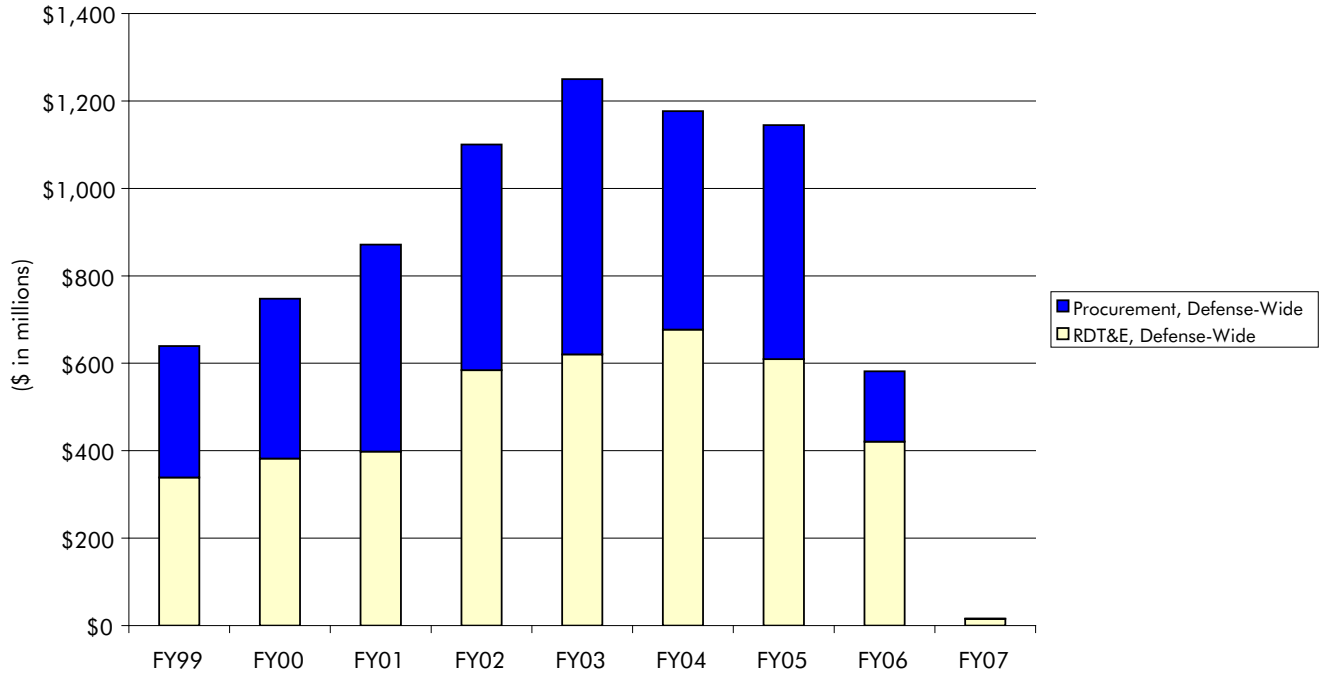
Program Element (PE) ($ millions)	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07
RDT&E, Defense-Wide	338.682	382.288	398.055	584.170	620.572	677.226	609.413	420.850	15.383
Procurement, Defense-Wide	300.996	365.411	473.249	516.470	629.360	499.328	535.509	161.063	0.641
CB Defense Program Total	639.678	747.699	871.304	1100.64	1249.932	1176.554	1144.922	581.913	16.024

†Expenditures as of December 31, 2006



‡ FY06-FY07 = Total Obligational Authority (that is, actual appropriation) * FY08-13 = President's Budget Request (that is, requested appropriation)
Science and Technology Base includes Basic Research, Applied Research, and Advanced Technology Development (Budget Activities 1 through 3)
Advanced Development includes Advanced Component Development and Prototypes, SDD, Management Support, SBIR, and Operational Systems Development (Budget Activities 4 through 7)

Figure I-1. CB Defense Program Appropriations Summary



†as of December 31, 2006 (includes reimbursable expenditures)

Figure I-2. CB Defense Program Expenditures Summary

ANNEX I

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, 2007 there are 181 States Parties to the CWC, including the United States. In 2006, six countries ratified or acceded to the CWC. The eleventh 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 5 to 8 December 2006. Delegates from the 122 of the 181 member states, four noteworthy non-member states, at least eight international organizations, and seven non-governmental organizations and chemical industry associations were in attendance. Primary to the agenda was the approval of the chemical weapons destruction extension requests to 2012 submitted by five of the six chemical weapons possessor States Parties, which included the United States and Russian Federation. 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 2006, DOD hosted 96 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 assisted the Department of Commerce (DOC) with CWC inspections at U.S. chemical industry sites pursuant to a Memorandum of Agreement (MOA). The DOC is the lead agency for chemical industry inspections. DTRA supported 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 eight chemical industry inspections in 2006. During 2006, DOC assumed all escort and logistics responsibilities. DTRA will maintain responsibility for expedited customs and immigration processing at the Point of Entry and technical equipment inspections under a MOA with DOC.

DOD conducts a Chemical Weapons Agreements Implementation Working Group (CWIWG), chaired by the CW/BW Treaty Manager, the Acting Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, to implement the CWC. Through regularly recurring meetings, representatives of OSD, the Joint Staff, 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 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 CW/BW 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 163 currently assigned OPCW TS inspectors attended HSO training and 14 inspectors attended the 48-hour DPE class in 2006. 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 Air Force, DOD sponsored a seven day mock challenge inspection exercise in 2006, using RAF Mildenhall, UK, as the challenged site. DOD's overall objective was to practice using existing and revised CWC compliance guidance, exercise the Host Country agreement, 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 2006, DTIRP distributed arms control and security educational products (electronic and print media). The program also provided the Army's Chemical Materials 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 briefings 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 the 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, except that being provided to Russia and Albania under DOD's Cooperative Threat Reduction (CTR) program.

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.

(10) A description of the coordination and integration of the program of the Defense Advanced Research Projects Agency (DARPA) on basic and applied research and advanced technology development on chemical and biological warfare defense technologies and systems under section 1701(c)(2) with the overall program of the Department of Defense on chemical and biological warfare defense, including—

(A) an assessment of the degree to which the DARPA program is coordinated and integrated with, and supports the objectives and requirements of, the overall program of the Department of Defense; and

(B) the means by which the Department determines the level of such coordination and support.

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.

3-D – three-dimensional

A

AAALAC – Association for Assessment and Accreditation of Laboratory Animal Care

AAAV – Advanced Amphibious Assault Vehicle

AAE – Army Acquisition Executive

AAP – Advanced Air Parification (model)

AAR – after action review

AAS – Advanced Anticonvulsant System

ABDU – Aviation Battle Dress Utilities

ABV – Assault Breacher Vehicle

AC – Active Component

ACC – Air Combat Command

ACAA – Automatic Chemical Agent Alarm

ACADA – Automatic Chemical Agent Detector Alarm

ACAT – Acquisition Category

ACCME – Accreditation Council for Continuing Medical Education

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

AE – Aeronautical Evaluation

AEFRP – Army Engineering First Responder Program

AEL – Allowance Equipage List

AEPS – Army Electronic Product Support

AERP – Aircrew Eye/Respiratory Protection

AETC – Air Education and Training

AF – Air Force

AFB – Air Force Base

AFCESA – Air Force Civil Engineer Support Agency

AFDD – Air Force Doctrine Document

AFI – Air Force Instruction

AFIA – Air Force Inspection Agency

AFIOH – Air Force Institute of Occupational Health

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 Solutions

AFTH – Air Force Theater Hospital

AFTTP – Air Force tactics, techniques and procedures

AIDET – Aircraft Interior Detector

AIT – Aeromedical Isolation Team or Advanced Individual Training

ALO – Acton Lightweight Overboot

ALS – Analytical Laboratory System

ALSA – Air, Land, and Sea Applications

AMA – American Medical Association

AMAD – Automatic Mustard Agent Detector

AMAL – Authorized Medical Allowance List

AMC – U.S. Army Materiel Command or Air Mobility Command

AMEDD – Army Medical Department

AMEDDC&S – Army Medical Department Center and School

AMSAA – Army Materiel Systems Analysis Activity

AMSNY – Associated Medical Schools of NY

AMWC – Air Mobility Warfare Center

AMWC – Air Mobility Warfare Center

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

AOR – Area of Responsibility

AP – Allied Publications

APB – Acquisition Program Baseline

APBI – Advance Planning Briefing for Industry

APC – Armored Personnel Carrier

APOD – Aerial Port of Debarkation

APS – Army Prepositioned Stock

ARNG – Army National Guard

ARS – acute radiation syndrome

ASA(ALT) – Assistant Secretary of the Army for Acquisition, Logistics, & Technology

ASAP – Advanced Situational Awareness Program

ASBREM – Armed Services Biomedical Research Evaluation and Management

ASC – Active Standoff Facility

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

ATC – Applied Technology Center

ATD – Advanced Technology Demonstration

ATEC – Army Test and Evaluation Command

ATG – afloat training group

ATH – Air Transportable Hospital

ATGL – Acquisition, Technology, and Logistics

ATNAA – Antidote Treatment Nerve Agent Autoinjector

ATRRS – Army Training Requirements & Resources System

ATRv6 – Atmosphere Transport of Radiation Version 6

ATS – Automatic Transfer Switch

ATSD – Assistant to the Secretary of Defense

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

AUSA – Association of the U.S. Army

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)

BAA – Broad Agency Announcement

BAIS – Battlefield Anti-Intrusion Detection System

BAT – Biodosimetry Assessment Tool

BCA – Baseline Capability Assessment or business case analysis

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

Bio-OPT – Biological Operational Planning Team

BL – Biosafety Level

BLA – Biologics Licensing Application

BNCOC – Basic Non-Commissioned Officer Course

BOA – basis of allocation

BOI – basis of issue

BoNT – Botulinum Neurotoxin

BoNT/A – Botulinum Neurotoxin A

BSL-4 – Biosafety Level 4

BSM – Business System Modernization

BuChE – butyrylcholinesterase

BUMED – Bureau of Medicine and Surgery

BVO/GVO – black vinyl overboot/green vinyl overboot

BW – biological warfare

BWA – Biological Warfare Agent

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

CAE – Command Assessment Element

CAM – Chemical Agent Monitor

CANA – Convulsant Antidote Nerve Agent autoinjector

CAPDS – Chemical Agent Point Detection System

CASPOD – Contamination Avoidance at Sea Ports of Debarkation

CASRAR – Commander and Staff Radiological Accident Response

CATOX – catylitic oxidation

CatOx – catalytic oxidation

CATS – Consequence Assessment Tool Set

CB – chemical and biological (also, C/B)

CBA – Capabilities-Based Assessment

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 and Biological Defense Program

CBIAC – Chemical and Biological Information Analysis Center

CBDIF – Chemical and Biological Defense Initiative Fund

CB IBDST – Chemical Biological Industrial Base Decision Support Tool

CBIRF – Chemical Biological Incident Response Force

CBMS – Chemical Biological Mass Spectrometer

CBMS – Chemical Biological Medical Systems

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

C–BW – Counter Biological Warfare

CBW – chemical and biological warfare or counter biological warfare or CB weapon

CBWA – chemical and biological warfare agent

CBW-CFX – CB Warfare Computational Fluid Effects

CCA – Contamination Control Area

CCATT – Critical Cave Air Transport Team

C-CBRNE – Counter Chemical, Biological, Radiological, Nuclear, and High-Yield Explosive

CcrM – cell-cycle regulated methyltransferase

CCTF – Combined Chemical Test Facility

C–CW – counter chemical warfare

CDC – Centers for Disease Control and Prevention or Concept Development Conference

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)

CEMP – Comprehensive Emergency Management Plan

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

cGLP – current Good Laboratory Practices

cGMP – current Good Manufacturing Practices

cGy – centiGray

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 Chiefs of Staff

CICSI – Chairman of the Joint Chief of Staff Instruction

CLS – contractor logistics support

CM –Consequence Management, crisis management, or countermeasures

CME – Continuing Medical Education

CNAF – Commander Naval Air Forces

CNE – Center for Naval Engineering or Continuing Nursing Education

CNIC – Commander Navy Installation Command

CNS – Central Nervous System

C-NW – Counter Nuclear Warfare

COC – Combat Operations Center

COCOM – Combatant Commander

COE – Concepts of Employment

COLPRO – Collective Protection

CoM – Consequence Management

CONOPS – concept of operations

CONUS – continental United States

COP – common operational picture

COTS – commercial off-the-shelf

CP – chemical protective (also, collective protection, command post, or counterproliferation)

CPC – USAF Counterproliferation Center

CPDEPMEDS – Chemically Protected Deployable Medical System

CPFH – Collectively Protected Field Hospital

CPE – Collective Protection Equipment

CPEMEDS – Collective Protection for Expeditionary Medical Support or Collectively Protectived Expeditionary Medical Support

CPO – Chemical Protective Overgarment

CPRC – Counterproliferation Review Council or Counter-proliferation Program Review Committee

CPS – Collective Protection System

CP-SSS – Collective Protection for Small Shelter System

CP-TRE – Collective Protection Technology Readiness Evaluation

CPEMF – Chemically Protected Expeditional Medical Facility

CPU – Chemical Protective Undergarment

CPX – Command Post Exercise

CRADA – Cooperative Research and Development Agreement

CREST – Casualty and Requirements Estimation Tool

CRG – Compliance Review Group

CRP – Critical Reagents Program

C-RW – Counter Radiological Warfare

CSF – consolidated storage facility

CSFE – Center for Seabees and Facilities Engineering

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

DAWN – Deposition and Weathering of a Chemical Attack on a Vessel

DC – Dental Corps

DCA – Damage Control Assistant

DC CD – Deputy Commandant for Combat Development

DC CD & I – Deputy Commandant for Combat Development and Integration

DCO – defense coordinating officer

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

DEARE – delayed effects of acute radiation exposure

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

DMAFB – Davis-Monthan AFB

DMRTI – Defense Medical Readiness Training Institute

DMSB – Defense Medical Standardization Board

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)

DPSC – Disaster Preparedness Specialist Course

DROC – Defense Research and Development Center

DRES – Defense Research Establishment Suffield

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

DsRNA – double standard RNA

DT – Dental Techs or developmental testing

DTAP – Defense Technology Area Plan

DTIF – DARPA Transition Initiative Fund

DTIRP – Defense Treaty Inspection Readiness Program

DTO – Defense Technology Objective

DT/OT – developmental/operational testing

DTPA – diethylenetriamene pentaacetate

DTRA – Defense Threat Reduction Agency

DTRA(CB) – Defense Threat Reduction Agency's Chemical and Biological Defense Directorate

DTRIAC – Defense Threat Reduction Information Analysis Center

DTRU – Defense Threat Reduction University

DTS – Diagnostic Test Set

DTT – Doctrine and Tactics Training

DU – depleted uranium

DUSA – Deputy Under Secretary of the Army

DVATEX – Disaster Preparedness Vulnerability Analysis Training and Exercise Program

DVC – Dynport Vaccine Company

E

E2C2 – Expendable Equipment Combat Consumption

EAU – Equipment Assessment Units

EBO – Ebola virus

ECBC – Edgewood Chemical & Biological Center

ECL – electrochemilluminescense

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

EM – Emergency Management or electromagnetic

EMAT – Emergency Management Team

EMF – expeditionary mechical vehicle

EMPRC – Emergency Medical Preparedness Response Course (web-based)

EMT – Emergency Medical Technician

EMW – Expeditionary Maneuver Warfare

EOC – Emergency Operation Center

EOD – Explosive Ordnance Disposal

EPA – Environmental Protection Agency

EPP – Enhanced Planning Process

ESA – electrothermal saving adsorption

ESLI – end-of-service life indicator

ETE – Education, Training, and Exercise

ETIC – Education and Training Integration Council

EU – European Union

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

FOX – M93/M93AI NBC Recon Vehicle

FP1 – Force Package 1

FPA – focal plane array

FPC – Final Planning Conference

FR – flame resistance

FRAT – First responder Radiological Assessment Triage

FSA – Functional Solutions Analysis

FSP – Force Protection Steering Group

FTX – Field Training Exercise

FUE – First Unit Equipped

FY – fiscal year

FY99 – Fiscal Year 1999

FYDP – Future Years' Defense Plan or Future Years' Defense Program

G

G8 – Army Deputy Chief of Staff for Programs

GA – tabun, a nerve agent

GAO – Government Accountability Office

GB – sarin, a nerve agent

GD – soman, a nerve agent

GF – cyclosarin, a nerve agent

GI – gastrointestinal

GIDEP – Government Industry Data Exchange Program

GIG – Global Information Grid

GLOC – G-force induced loss of consciousness

GLP – Good Laboratory Practices

GMP – Good Manufacturing Practice

GOTS – government off -the-shelf

GP – glycoprotein

GPFU – Gas Particulate Filter Unit

GPRA – Government Performance and Results Act

GSS – Ground Soldier System

GUARDIAN – DOD-JPEO Readiness Installation Protection Program

GVO/BVO – green vinyl overboots/black vinyl overboots

GWOT – Global War on Terror

Gy – Gray

H

HA/DR – humanitarian assistance/disaster relief

HAC – House Appropriations Committee

HASC – House Armed Services Committee

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

HM–CBRNE – Hospital Management of CBRNE Incidents

HMMWV – High Mobility Multipurpose Wheeled Vehicle

HN – Host Nation

HOD – Head of Delegation

HP – heteropolymer

HPAC – Hazard Prediction Assessment Capability

HQ – headquarters

HRDS – Human Remains Decontamination System

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

HuBuChe – human butyrylcholinesterase

HVAC – heating, ventilation, and air conditioning

I

IAB – Interagency Board

IAV – Interim Armored Vehicle

IAW – In Accordance With

IBAD – Interim Biological Agent Detector

IBIS – Industrial Base Information System

IBMC – Industrial Base Maintenance Contract

ICAM – Improved Chemical Agent Monitor

ID – intradermal or identification

IDC – Independent Duty Corpsmen

IDE – integrated digital environment or Investigational Device Exemption

IDLH – Immediate Danger to Life and Health or immediately dangerous to life and health

IET – Initial Entry Training

IFS – Integrated Footwear System

IIDP – industry initiated demonstration products

I/ITSEC – Interservice/Industry Training Simulation Exercise Conference

ILE – Integrated Learning Environment

ILS – Integrated Logistics Support

IM – intramuscular

IMETS – Integrated Meteorological System

IMP – Industrial Preparedness Measure(s)

IMS – Ion Mobility Spectroscopy

INATS – Improved Nerve Agent Treatment System

IND – Investigational New Drug

IOC – Initial Operational Capability

IOT&E – Initial Operational Testing & Evaluation

IP – intraperitoneal or individual protection

IPC – Initial Planning Conference

IPDS – Improved (chemical) Point Detection System

IPDT – Integrated Product Development Team

IPE – individual protective equipment

IPE – IM-IPE Inventory Manager

IPM – Industrial Preparedness Measures

IPP – Installation Protection Program

IPR – In-Process Review

IPT – Integrated Product Team

IR – infrared

IR&D – Independent Research & Development

IRTD – Incident Response Training Detachment

ISD – Individual Soldier Detector

ISO – International Standards Organization

ISS – individual survival standards

IT – information technology

ITAP – Improved Toxicological Agent Protective Ensemble

IV – intravenous

IWG – Interagency Working Group

J

J-8 – Force Structure, Resources, and Assessment Directorate, the Joint Staff

JABT – Joint Ambient Breeze Tunnel

JACKS – Joint Acquisition CBRN Knowledge System

JACKS-RW – Joint Acquisition CBRN Knowledge

System - Reporting Warehouse

JCAHO – Joint Committee on Accreditation of Healthcare Organizations

JASQ – JSLIST Alternative Source Qualification

JAWS – Joint Advanced Warfare School

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

JC3 – JSLIST CB Coverall for CVC

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

JCDRS – Joint CBRN Dismounted Recon System

JCE – Joint Chemical Ensemble

JCEP – Joint Expeditionary Collective Protection

JCHEMRATES – Joint Chemical Defense Equipment Consumption Rates

JCID – JWARN component interface device

JCIDS – Joint Capabilities Integration and Development System

JCPE – Joint Collective Protection Equipment

JCS – Joint Chiefs of Staff

JEAP – Joint Equipment Assessment Program

JEAU – Joint Equipment Assessment Unit

JECG – Joint Exercise Control Group

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

JILA – Joint Independent Logistics Assessment

JLAC – CBD Joint Logistics Advisory Council for Clinical and Biological Defense

JLASS – 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

JMDS – Joint Meterial Decontamination System

JMET – Joint Mission Essential Task

JMNBCDST – Joint Medical NBC Decision Support Tool

JMPAB – Joint Materiel Prioritization Allocation Board

JMSEL – Joint Master Scenario Event List

JMR – Joint Materiel Release

JPMG–IPP – Joint Project ManagerGuardian Installation Protection

JOEF – Joint Operational Effects Federation

JORD – Joint Operational Requirements Document

JPACE – Joint Protective Aircrew Ensemble

JPMIS – Joint Project Manager Information Systems

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-BD – Joint Project Manager for Biological Defense

JPM-CBMS – Joint Program Manager for Chemical and Biological Medical System

JPM-CP – Joint Project Manager for Collective Protection

JPM IP – Joint Program Manager for Individual Protection

JPM IS – Joint Program Manager for Information Systems

JPMO – Joint Project Management Office

JPMO-IP – Joint Project Management Office for Individual Protection

JPO – Joint Program Office

JPS – Joint Portal Shield

JQRR – Joint Quarterly Readiness Review

JRCAB – Joint Readiness Clinical Advisory Board

JRO – Joint Requirements Office

JROC – Joint Requirements Oversight Council

JRO-CBRND – Joint Requirements Office for Chemical, Biological, Radiological, and Nuclear Defense

JSAM – Joint Service Aircrew (or Air Crew) 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 Standoff 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

JSS-CBB – Joint Service Sustainment Chemical and Biological Defense Working Group

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

JSWG – Joint Services Working Group

JTAV – Joint Total Asset Visibility

JTAVRW – Joint Total Asset Visibility Reporting Warehouse

JTF – Joint Task Force

JTS – Joint Training System

JTWG – Joint Training, Working Group

JVAP – Joint Vaccine Acquisition Program

JWARN – Joint Warning and Reporting Network

JWIS – Joint Weather Impact System

JWTC – Joint Warfighting Center

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

LCS – Littoral Contact Ship

LD – Lethal dose

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

LLR – low-level radiological

LMS – Lightweight Multipurpose Shelter

LNBCRS – Light NBC Reconnaissance System

LSCAD – Lightweight Stand-off Chemical Agent Detector

LSP – Logistics Support Plan

LSTI – Life Sciences Test Facility

LTA – low-threat areas

M

M&S – modeling and simulation

MAA – mission area analysis

Mabs – monoclonal antibodies

MACOM – Major Command

MAGTF – Marine Air Ground Task Force

MAJCOM – Major Command

MANAA – Medical Aerosolized Nerve Agent Antidote

MARFORCOM – Marine Force Command

MARFORPAC – Marine Force Pacific

MAT – Medical Analysis Tool

MBDRP – Medical Biological Defense Research Program

MBGV – *marburg* virus

MC – Medical Corps

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

MCDM – Medical Chemical, Biological, Radiological and Nuclear Defense Materiel

MCHF (LDS) – Marine Corps Heavy Fuel LDS

MCLB – Marine Corps Logistics Base

MCM – medical countermeasures

MCO – Marine Corps Order

MCOTEA – Marine Corps Operations T&E Activity

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 Program

MDARS – Mobile Detection Assessment Response System

MDC – MSEL Development Conference

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

MeRET – Medical Readiness and Training

MES – Medical Equipment Set

MESO – Multi-community Environmental Storm Observatory

MEU – Marine Expeditionary Unit

MEUEX – Marine Expeditionary Unit Exercise

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

MILVAX – Military Vaccine Agency

MIST – Man-in-Simulant Test

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

MNF – multinational force

MOA – Memorandum of Agreement

MOPP – mission-oriented protective posture

MOT&E – multiservice operational test & evaluation

MOU – Memorandum of Understanding

MPC – Mid Planning Conference

MPDS – Multi-Purpose Decontamination System

MPF – Maritime Prepositioning Forces

MPH – miles per hour

MRD – medical radiological defense

MRDP – Medical Radiological Defense Program

MPS – Mission Performance Standard (*also,* Multipurpose Protective Sock)

MRMC – Medical Research and Materiel Command

MRTFB – Major Range and Test Facility Base

MRX – Mission Rehearsal Exercise

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, or military treatment facility

MTO&E – Modified Table of Organization & Equipment

MTT – Mobile Training Team

MTTP – Multiservice tactics, techniques, and procedures

MTW – Major Theater War(s)

MULO – Multipurpose Overboot

mCPU – Modified Chemical Protective Undergarment

N

NAAK – Nerve Agent Antidote Kit

NAPP – Nerve Agent Pyridostigmine Pretreatment

NAS – National Academy of Sciences

NATO – North Atlantic Treaty Organization

NATOPS – Naval Air Training and Operating Procedures Standardization

NAVAIR – Naval Air Systems Command

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

NBIC – nanotechnology, biotechnology, information technology, and coginitive sciences

NC – Nurse Corps

NCBR – Nuclear, Chemical, Biological, and Radiological

NCO – Non-Commissioned Officer

NDAA – National Defense Authorization Act

NDC – National Drug Company

NDI – Non-Developmental Item

NDIA –National Defense Industry Association

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

NGDS – Next-Generation Diagnostics System

NGS – Next Generation Sensor

NHP – nonhuman primate

NIAID – National Institute of Allergies and Infectious Diseases

NICP – National Inventory Control Point

NIH – National Institute of Health

NIIN – National Item Identification Number

NIOSH – National Institute for Occupational Safety and Health

NIMS – National Incident Management System

NIST – National Institute of Standards & Technology

NKO – Navy Knowledge Online

NMETL – Navy Mission Essential Tasklist

NMOHLS – Navy Medicine Office of Homeland Security

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

NSMO – nuclear medicine science officer

NSN – National Stock Number

NSTM – Naval Ships Technical Manual

NSWC – Naval Surface Warfare Center

NTA – Novel Threat Agent or nontraditional agent or "nontraditional" chemical agent

NTSP – Navy Training Systems Plan

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 and 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 Team

OMFTS – Operational Maneuver From the Sea

OOTW – operations other than war

OPCW – Organization for the Prohibition of Chemical Weapons (in The Hague)

OPLAN – Operational Plan

OPMED – Officer Professional Military Education Policy

OPNAV – Office of the Chief of Naval Operations

OPTEVFOR – operational T&E force

ORARNG – Oregon National Guard

ORD – operational requirements document

ORM – Operational Risk Management

OSA (CBD & CDP) – Deputy Assistant to the Secretary of Defense for Chemical/Biological Defense

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 – Protection Assessment Test System

PB – President's Budget or pyridostigmine bromide

PBA – Pine Bluff Arsenal

pBuChE – plasma-derived human butynlcholinesterase 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

PDP – Protein Design Process Program

PD-TESS – Program Director for Test Equipment Strategy and Support

PE – Program Element

PEGEM – Post Engagement Ground Effects Module

PEO-CBD – Program Executive Office for Chemical and Biological Defense

PFP – Partnership for Peace

PICS – personal ice cooling system

PIP – Product Improvement Program

PIU – Patient Isolation Unit

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

PRA – Physicians Recognition Award

PSA – pressure swing adsorption

PSI – Proliferation Security Institute

P/TSA – pressure/temperature swing adsorption

Q

QDR – Quadrennial Defense Review

QEF – Quality Evaluation Facility

QMS – Quality Management System

QNFT – Quantitative fit testing

QPL – Qualified Products List

QSA – quantitative structure activity relationship

R

R&D – Research and Development

R&T – Research and Technology

RAAD – Rapid Aerosol Agent Detection

RAC3 – Radiological Accident Command, Control, and Coordination (a course)

RADIAC – Radiation Detection, Indication, and Computation

RAMAN – Regional Atmospheric Measurement and Analysis Network

RAPID – Ruggedized Advanced Pathogen Identification Device

rBot – Recombinant Botalnum A/B Vaccine

rBuChe – recombinant butyrylcholinesterase

RC – Reserve Component

RCRA – Resource Conservation and Recovery Act

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

RETOPS – Radiological Emergency Teams Operation

RF – radio frequency

RFI – Request for Information

RFQ – Request for Quotation

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

RTF – Response Task Force

RTI – Research Triangle Institute

RVA – Rapid Vaccine Assessment or Reporting Warehouse

RW – radiological/nuclear warfare

S

S&T – science & technology

SA(CBD&CDP) – Special Assistant (Chemical and Biological Defense and Chemical Demilitarization Programs)

SAAM – Special Assistant Airlift Mission

SAC – Senate Appropriations Committee

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

SCORM – Shareable Content Objective Reference Model

SCPE – Ship (or Shipboard or Simplified) Collective Protective Equipment

SD – Stand-off Detector

SDD – System Development and Demonstration

SDF – Sensor Data Fusion

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

SEDC – Senior Enlisted Damage Control

SERPACWA – skin exposure reduction paste against chemical warfare agents

SERS – Surface Enhanced Roman Scattery

SERT – Smallpox Epidemic Response Team

SIM – Strategic Inventory Manager

SLAM – Strategic Logistics Asset Management

SLEP – Shelf-Life Extension Program

SLS – Senior Level Seminar

SMAT – small molecule anti-genomic therapeutics

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

SoS – system of systems

SOUTHCOM – Southern Command

SPG – Strategic Planning Guidance

SPM – selectively permeable material

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

STRATCOM – Strategic Command

STTR – Small Business Technology Transfer

SURFORTRANMAN – Surface Forces Training Manual

SUVOS – Semiconductor Ultraviolet Optical Sources

Sv – Sievert

SVP – Smallpox Vaccination Program

SWA – Southwest Asia

T

T&D – transport & diffusion or transport and dispersion

T&E – test & evaluation

TAVMS – Total Asset Visibility Management System

TACOM – Tank and Automotive Command

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

TAS – Threat Agent Sciences

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

TCTC – Toxic Chemical Training Course

TCTI – Transformational Countermeasures Technologies Initiative

TDA – table of distribution and allowances

TE – Technical Escort

TED – Troop Equivalent Dose

TEI – Technical Equipment Inspection

TEMP – T&E 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

TMTI – Transformational Medical Technologies Initiative

TOF – Time of Flight

TOP – test operating procedure

TOW – Training Objective Workshop

TQT – task qualification training

TRADOC – Training and Doctrine Command

TRANSCOM – Transportation Command

TRE – Technology Readiness Evaluation

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

TTE – technical training equipment

TTP – tactics, techniques, and procedures

TTX – tabletop exercise

U

UCS – Unified Command Suite

UFL – Ulchi Focus Lens

UGVS – Unmanned Ground Vehicle System

UID – unique item identifier

UJTL – Universal Joint Task List

UN – United Nations

UNS – Urgent Needs Statement

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

USAFE – United States Air Forces Europe

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) – Under Secretary of Defense for Acquisition, Technology and Logistics

USD(Policy) – Under Secretary of Defense for Policy

USEUCOM – US European Command

USFK – U. S. Forces, Korea

USG – United States Government

USJFCOM – United States Joint Forces Command

USMC – United States Marines Corps

USN – United States Navy

USPACOM – US Pacific Command

USS – United States Ship

USSTRATCOM – United States Strategic Command

USSOCOM – United States Special Operations Command

USTRANSCOM – United States Transportation Command

USUHS – Uniformed Services University of the Health Sciences

UTC – Unit Type Code

UV – ultraviolet

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

VNE -NCS – Virtual Natural Environment Net-Centric Services

VPS – Virtual Prototyping System

VS 07 – Vigilant Shield 2007

VTC – Video Teleconference

VTT – Video Teletraining

V&V – verification and validation

VX – a nerve agent

W

W&R – Warning & Reporting

WAARS – Wide Area Aerial Reconnaissance System

WCF – Working Capital Fund

WDA – Weapons Display Area

WDTC – West Desert Test Center

WDTIC – West Desert Technical Information Center

WEE – Western Equine Encephalomyelitis

WIPT – working integrated process team

WMD – weapons of mass destruction

WMD-CST – Weapons of Mass Destruction Civil Support Teams

WMD IRT – Weapons of Mass Destruction Incident Response Training

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)


DEPARTMENT OF DEFENSE
CBDP
CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM


DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA