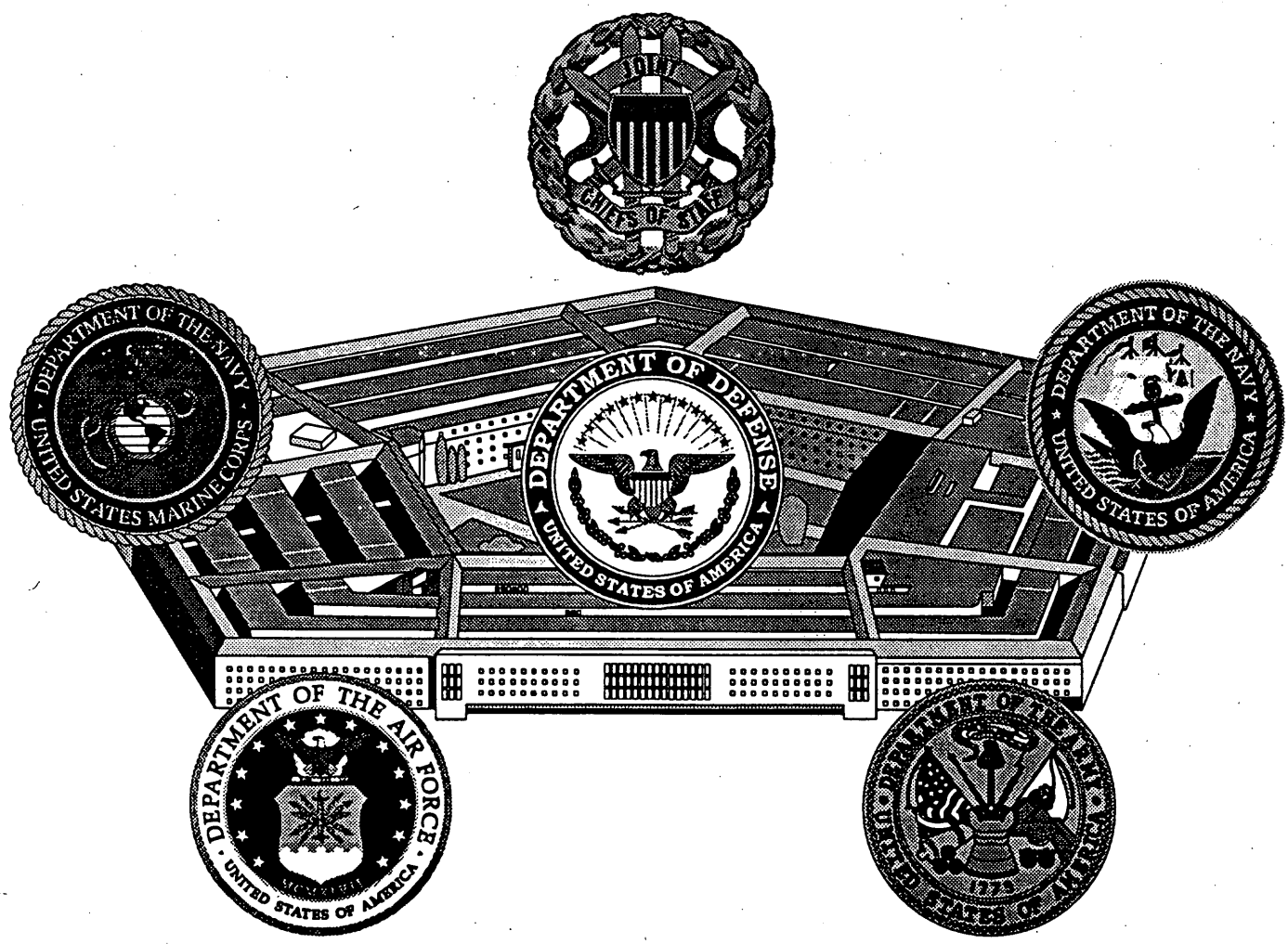
DEPARTMENT OF DEFENSE NUCLEAR/BIOLOGICAL/CHEMICAL (NBC) WARFARE DEFENSE



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ANNUAL REPORT TO CONGRESS
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EXECUTIVE SUMMARY

NUCLEAR, BIOLOGICAL, AND CHEMICAL DEFENSE

ANNUAL REPORT TO CONGRESS

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EXECUTIVE SUMMARY

The National Defense Authorization Act for Fiscal Year 1994, Public Law No. 103-160, section 1703, mandates the consolidation of all Department of Defense nuclear, biological and chemical (NBC) defense programs. As part of this consolidation, the Secretary of Defense is directed to submit an assessment and a description of plans to improve readiness to survive, fight and win in an NBC contaminated environment. This report contains modernization plan summaries which highlight the Department's approach to improve current NBC defense equipment and resolve current shortcomings in the program.

Public Law 103-160 has been a critical tool for ensuring the elimination of redundant programs, focusing funds on program priorities, and enhancing readiness. While many problems remain in consolidating the NBC defense program, significant and measurable progress has been made in fulfilling the letter and the intent of Congress. Any dissipation of oversight of the NBC defense program may unravel recent accomplishments in coordinating management throughout the Department and may increase program costs and degrade readiness in the long-term. To date there has been a consolidation of the research, development and acquisition organizations for NBC defense, including the consolidation of all research, development, test and evaluation, and procurement funds for NBC defense. There has been significant progress in the development of Joint training, doctrine development, and requirements generation. Modernization and technology plans have been developed which should begin to show real savings and true consolidation of efforts among the Services. The fruits of these plans will be realized over the next few years as the public law has time to take effect and will result in the increased readiness of U.S. forces.

The Department of Defense (DoD) NBC defense program mission is to enable our forces to survive, fight, and win in NBC warfare environments. Numerous rapidly changing factors continually influence the program and its management. These factors include declining DoD resources, planning for warfighting support to numerous regional threat contingencies, the aftermath of the breakup of the Soviet Union, the signing and future ratification of the Chemical Weapons Convention, and continuing proliferation of NBC weapons. To minimize the impact of use of NBC weapons on our forces, we will need the capability not only to deter their use, but to prevent it. This will require improved NBC defensive capabilities. The DoD NBC defense program continues to work towards increasing the defensive capabilities of Joint Forces to survive and continue the mission during conflicts which involve the use of NBC weapons. NBC defense programs are managed jointly under the oversight of a single office within DoD. However, the unique physical, toxicological, destructive and other properties of each threat requires operational and technological responses unique to the threat.

For our forces to survive and fight under contaminated battlefield conditions, an integrated, balanced program is essential. Our forces must have aggressive, realistic training, and defensive equipment that allows them to avoid contamination, if possible, and to protect, decontaminate, and sustain operations on the non-linear battlefield. We must also have the capability to provide medical casualty management. Programs are in place which if fully funded would adequately equip and train our forces to accomplish their missions in an NBC environment. U.S. forces are equipped with the finest available equipment for conducting its missions in the face of NBC threats from potential adversaries around the world.

NBC WARFARE THREAT

The Former Soviet Union's large chemical weapons stockpile and its biological weapons program formed the basis for US defense planning for many years. However, with changes within Eastern Europe, the Middle East and Southwest Asia, the number of countries that have an NBC weapons capability has increased significantly and may continue to increase and pose serious threats to United States interests. The NBC warfare threat has increased in diversity and frequency. Several Third World nations now possess the technologies and capabilities to produce and deliver a wide range of chemical and biological agents. The potential for facing NBC conditions in all regions, including those with temperature extremes, has dramatically increased. In meeting this changing and evolving threat, a strong NBC defense program is an essential part of DoD strategy for countering the proliferation of weapons of mass destruction.

NBC WARFARE INTELLIGENCE REQUIREMENTS

Proliferation of weapons technology, precision navigation technology, and chemical and biological technology to developing nations presents the United States with a complicated national security challenge. Intelligence efforts must emphasize collection and analysis of nations' "dual-use" chemical and biological industrial capability and developing the indications and warning of adversarial use of dual-use capabilities. Tailored intelligence documents are essential for developing and updating requirements for NBC defense programs.

NBC DEFENSE PROGRAM MANAGEMENT

Improved Management Structure

In response to Congressional direction, the Department of Defense has implemented an improved management structure for the DoD NBC defense program. In February 1994, the Secretary of Defense designated the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, ATSD(NCB), formerly the the Assistant to the Secretary of Defense for Atomic Energy, as the single focal point for the NBC defense within the Office of the Secretary of Defense (OSD). In addition, the Secretary appointed the Army as the Executive Agent for DoD to coordinate and integrate research, development, test, evaluation, acquisition, and military construction requirements of the military departments for the NBC defense program.

Subsequently, the Army chaired a Joint Task Force to develop a management plan to coordinate and integrate the Services' NBC defense efforts. The Task Force's recommendations became the basis for the Joint Service Agreement (JSA) for Joint Nuclear, Biological and Chemical Defense Management. DoD implemented the JSA on 2 August 1994.

The Deputy Assistant to the Secretary of Defense for Chemical and Biological Matters, DATSD(CBM), is responsible for the day-to-day coordination and integration of all NBC defense research, development, and acquisition efforts. DATSD(CBM) provides overall guidance for planning, programming, budgeting, and executing the NBC defense program. In the case of medical NBC defense research programs, ATSD(NCB) provides this input by participating, as a member, in the Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee. ATSD(NCB) is then responsible for ensuring coordination between the medical programs and the non-medical efforts.

The Secretary of the Army is the Executive Agent responsible for ensuring coordination, integration and administrative support for the Services' NBC defense requirements and programs. For non-medical CBD, the Secretary of the Army accomplishes this through the Joint NBC Defense Board, as defined in the JSA for Joint NBC Defense, and through the Assistant Secretary of the Army, Research, Development and Acquisition, ASA(RDA). To accomplish the required planning and programming functions, two subordinate joint groups support the Joint NBC Board. The Joint Service Integration Group (JSIG) is responsible for Joint NBC defense requirements, priorities, training, and doctrine. The Joint Service Materiel Group (JSMG) is responsible for coordinating and integrating all NBC defense research, development and acquisition efforts. These two groups perform the planning and programming functions for NBC defense.

For medical NBC defense research programs, the Secretary of the Army accomplishes this through participation in the oversight activities of the ASBREM Committee. The ASBREM Committee in concert with the ASA(RDA) is responsible for ensuring coordination and integration of Services medical CBD programs.

NBC DEFENSE PROGRAM MANAGEMENT ASSESSMENT

*** Oversight and management of the DoD NBC defense program continue to improve. It is imperative that the management system produce Joint NBC defense requirements and NBC defense equipment that can be used by all forces. The public law has provided a key tool for ensuring a jointly focused NBC defense program. The continued support of Congress and implementation of current plans will continue to improve jointness and improve readiness.**

ONGOING SOLUTIONS:

DoD continues to transition to a consolidated management approach as directed by Public Law 103-160 (50 USC 1522). Accomplishments during 1995 include:

- Establishment of OSD level oversight of research, development and acquisition of NBC defense equipment utilizing the Defense Acquisition Board (DAB) process. DAB reviews of the chemical and biological defense program and the biological defense vaccine acquisition program were held during the past year. Acquisition

Decision Memoranda were issued following each program review DAB review directing resolution of management issues during FY96.

- Coordination and development of a consolidated NBC defense Program Objective Memorandum (POM) and Budget Estimate Submission that provide the basis for the FY97 President's Budget request to Congress, with overall funding consolidated as a Defense-wide program at the OSD level.

- For many technology areas within the NBC defense programs, most notably detection technologies, requirements for most programs have been consolidated or eliminated to leverage available funds on the most promising technologies.

- Creating Joint research, development, test and evaluation (RDT&E) programs and minimizing Service-unique programs.

In addition, we also have a number of initiatives underway in FY96 to further improve the chemical and biological defense program. These include:

- Establishment of a Joint Requirements Document process focusing on common needs between the Services.

- Solidifying plans to revise the medical NBC defense RDT&E program management structure and coordinating efforts between the medical and non-medical RDT&E communities.

NBC DEFENSE REQUIREMENTS

Continued proliferation of NBC weapons requires that DoD maintain and strengthen our defensive capabilities against such weapons. We continue efforts to prevent the use of mass destruction weapons and make preparations to operate effectively in environments marked by biological, chemical, or radioactive contamination. The three principles of NBC defense—contamination avoidance, force protection and decontamination—provide the framework for formulating program requirements. When doctrinal, training, or organizational solutions (non-materiel solutions) cannot satisfy warfighting needs, we seek new equipment through the acquisition cycle, leveraging new technology developments to provide the best solutions.

The key to successful implementation of research, development and acquisition (RDA) strategy is the concept of continuous incremental investment. Our RDA goal is to equip our forces with world class equipment in sufficient quantities, in the shortest possible time, to win decisively, quickly, and with minimum casualties. As authorized under the new Joint Service Agreement for non-medical programs and the ASBREM Committee for medical programs, the Army, as executive agent, coordinates, integrates, and reviews the DoD NBC defense program. The results of these reviews, conducted with all Services participating, are documented in the

Joint Service Modernization and Joint Service RDA Plans. These documents form the basis for the consolidated NBC defense Program Objective Memorandum.

Non-Medical NBC Defense Mission Area Requirements and RDA Summary

Chapter 2 provides requirements and RDA program summaries for each of the principles of NBC defense. Contamination avoidance consists of three essential elements: early warning, point detection, and warning and reporting. Early warning enables US forces to avoid NBC contamination or to assume the optimal protective posture. Detector development is the cornerstone for this area. The program is pursuing technological advances in remote detection, miniaturization, increased sensitivity, decreased false alarm rates, and improved logistics supportability. Biological detection capability has the highest priority. When contamination cannot be avoided and units are forced to occupy or traverse contaminated areas, protection provides survivability and continued operational capability in the NBC environment. Individual protection equipment includes protective masks and clothing. Technological advances are being pursued to produce mask systems fully compatible vision and weapons' sighting systems. Individual protective ensembles are being developed to improve protection, decrease heat and weight stress, and to ensure integration with laser, ballistic and other forms of individual protection. Collective protection equipment includes shelters for command posts, rest and relief, vehicular collective protection, and safe zones aboard ship. Technological improvements will reduce weight and size and increase filter lifetime to improve deployability. Technological improvements that reduce logistical and manpower requirements; *e.g.*, filter change frequency and shelter assembly and disassembly time are also being pursued. When contamination cannot be avoided, forces must decontaminate personnel and equipment to reduce or eliminate contamination hazards. While effective against a wide variety of threat agents, existing decontaminant systems are corrosive, labor intensive, and pose logistical, environmental, and safety burdens. To improve decontamination capabilities, the program places emphasis upon new decontamination technologies which reduce existing manpower and logistics requirements, are less corrosive, and which may be used to decontaminate sensitive equipment such as avionics or electronics.

NON-MEDICAL R&D REQUIREMENTS ASSESSMENT

*** No technologies or methods are currently available for large area decontamination such as ports and airfields. Investigations are planned over the next year to determine whether large area decontamination is feasible, and if so, whether it is required. Over the past year, the Services have worked together to improve the Joint orientation of NBC defense requirements. These efforts will improve the equipment fielded in the near future. More emphasis needs to be placed on the Warfighting CINCs' requirements as input for equipment research and development. This is necessary to ensure that future equipment meets the needs of the Joint battlespace environment.**

Areas of concern which are addressed under the management improvement initiatives include the following:

- Focusing and prioritization of chemical and biological detector programs to ensure that resources are leveraging the most promising technologies and are not diluted by excessive Service unique requirements.
- Developing advanced individual protection ensembles which minimally degrade an individual's performance for all tasks performed in contaminated environments.
- Identifying Joint and Service unique requirements for collective protection programs.
- Determining adequacy of funding for advanced decontamination systems, and review of requirements for large scale decontamination systems.

Medical NBC Defense Requirements

The medical NBC defense research program has three broad goals:

- protect US forces war fighting capabilities during an NBC attack;
- treat casualties to prevent lethality and maximize return to duty;
- maintain state-of-the-art research and development efforts to provide timely medical countermeasures.

To meet these three goals, the Army executes three programs. The Medical Chemical Defense Research Program (MCRDP) provides new pretreatments, antidotes, and topical skin protectants for chemical warfare agents, and develops novel therapies for chemical agent casualties. The Medical Biological Defense Research Program (MBDRP) provides medical countermeasures to deter, constrain, and defeat the use of biological threat agents, as well as advanced diagnostic defenses. Finally, improved casualty care practices doctrine will increase the return to duty rate for troops exposed to chemical and biological agents, thus adding to force sustainment.

To effectively protect individuals against biological warfare (BW) agents, the US must immunize combat forces. Our priorities are to develop new or improved vaccines against validated BW threat agents and increase the vaccine stockpile. Improved nerve agent antidotes and topical skin protectant increase force survivability against chemical threats. Fielding of a radiation antiemetic will allow service members to continue mission operations despite exposure to moderate levels of radiation in nuclear warfare environments.

MEDICAL R&D REQUIREMENTS ASSESSMENT

*** DoD lacks adequate vaccines to protect US military forces.**

***SOLUTION*:** Procure and stockpile sufficient quantities of vaccines needed to inoculate US forces in accordance with DoD Directives. In FY96, DoD will release a request for proposal to obtain a prime systems contract for the acquisition of vaccines. In addition,

DoD will complete an assessment of vaccine requirements and update vaccination policy for U.S. forces in order to define the cost and scope of the program.

NBC LOGISTICAL READINESS

Since Operation Desert Shield/Storm, the logistical readiness of NBC defense equipment has improved. Services have increased stockage of most NBC defense equipment items especially individual protection items. However, shortfalls in the accountability and management of chemical and biological defense items continue and affect readiness and sustainment. In addition, industrial base strategy for NBC defense items remains unstable. Through joint efforts, the Services are actively pursuing solutions to these shortfalls.

NBC Defense Equipment Availability

The logistics community has recognized several shortfalls in the accountability and management of NBC defense item inventories. First, the Services continue to have very limited asset visibility of most chemical and biological items below the wholesale level. Second, Services procure consumable NBC items through multiple, separate and distinct funding authorizations. For example, the Services procure most individual protection items using Operations and Maintenance (O&M) accounts managed by the subordinate unit commander. The Army also procures individual protection items from war reserve funding authorizations to place stocks in war reserve inventories. The Services will work through the Joint NBC Defense Board to establish uniform policies and implement changes to correct these shortfalls.

Industrial Base

Since OPERATION DESERT SHIELD/STORM, DoD has completed several industrial base assessments. These studies confirm that the NBC defense industrial base sector primarily consists of small to medium size companies. These companies depend heavily on military requirements and sales for their survival. Recent changes in the NBC threat, as well as reductions in overall DoD NBC defense requirements have had a severe impact on this sector making it extremely fragile. DoD's "War Stopper" program aids in sustaining this base for some selected systems (battle dress overgarment, chemical gloves, and nerve agent auto-injectors). The Services must continue to integrate the vulnerability of the industrial base into acquisition and procurement decisions in order to maintain a responsive industrial base.

LOGISTICS SUPPORT ASSESSMENT

*** DoD lacks a joint, integrated system to maintain asset visibility of NBC defense equipment below wholesale level, and lacks a standardized war reserve program for NBC defense equipment. Resourcing the procurement and sustainment of wartime stocks of individual protective equipment, decontamination kits, and detector kits remains the responsibility of the Services.**

***SOLUTION*:** DoD established the requirement for asset visibility and reviewed existing systems and procedures, both for peacetime reporting and war time reporting. The Services and DLA are addressing the NBC defense asset visibility deficiency under the auspices of the Total Asset Visibility initiative. Little progress occurred in 1995.

Progress has been made in 1995 in the transfer of resourcing procurement programs for new NBC defense equipment, previously resourced using Services' Operations and Maintenance (O&M) accounts, to the DoD procurement line for some programs.

Though the Services continue to be responsible for determining war reserve requirements and managing their inventories, the sustainment of these stocks is a significant resourcing issue. The Services are reluctant to program scarce O&M funds for the Defense Business Operations Fund (DBOF) to replenish War Reserves Secondary Items, including NBC defense items. Considering these secondary items collectively as a single principal item would allow funding to be transferred to a procurement appropriation under the DoD Financial Management Regulation. It also would allow resource management of this significant portion of NBC defense items to come under the purview of the Joint NBC Defense Program.

There are a number of initiatives under study in the FY96 Joint Service NBC Defense Industrial Base Assessment that should lead to closer ties with industrial partners. These actions are vital toward improving the overall NBC defense sector of the DoD industrial base. Support from DoD and Congress will be an important issue in implementing these recommendations and in stabilizing the NBC defense sector of the DoD industrial base.

NBC DEFENSE TRAINING AND READINESS

NBC defense training and readiness continues to be a critical element of deterrence. The Services continued to improve the exercising of their NBC defense responsibilities under Title X of the FY94 National Defense Authorization Act. The vision for the future is to build on the Service successes to develop a viable joint orientation to NBC defense capabilities. This capability must include joint doctrine and tactics, techniques, and procedures; joint modeling, simulation and wargaming; and joint professional training.

Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense (Joint Pub 3-11) is the cornerstone Joint doctrinal manual. This document provides an overview of NBC defense operations at the strategic level. To fully implement this doctrine, the Services must develop solid operational joint NBC defense doctrine and tactics, techniques, and procedures that integrate Service operations in the battlespace.

Each of the Services has established adequate training standards and programs to sustain unit NBC training and readiness. They conduct NBC defense training at schools and in units. In

compliance with Public Law 103-160, Section 1703, the Services co-located their NBC defense professional training at the US Army Chemical School, Ft McClellan, Alabama. Currently, Services conduct their own training with their own instructors, but all use the Chemical Defense Training Facility at the Army's Fort McClellan, Alabama, to train NBC defense experts and leaders in a lethal agent environment.

NBC DEFENSE TRAINING AND READINESS ASSESSMENT

*** DoD lacks adequate feedback on the status of training, equipment, and readiness. It needs information adequate for assessing operational force capabilities from the Department perspective and the warfighting CINCs' perspectives.**

SOLUTION: Assign consistent and higher priority to NBC defense, especially by the Joint Chiefs of Staff and the warfighting CINCs, in order to maintain an adequate state of readiness and to ensure NBC defense reporting information is accomplished in a timely and adequate manner. Existing reporting systems may provide an adequate mechanism for assessing readiness.

*** Joint NBC defense doctrine needs to continue to develop and include joint tactics, techniques, and procedures.**

SOLUTION: Initiatives began in 1987 to develop joint NBC defense doctrine which resulted in Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense*. In FY95 efforts were initiated to update this document. The Joint Service Integration Group, assisted by the U.S. Army Chemical School Joint Doctrine Cell, is responsible for assisting the U.S. Army in the development of this doctrine under sponsorship of the Joint Staff. Continued Service interaction and cooperation facilitated by these organizations will produce the next generation of Joint NBC Defense Doctrine.

*** There are limited chemical and biological features in wargaming and planning models.**

SOLUTION: Funding to add chemical and biological warfare to exercise scenarios has been received for FY96. Efforts are underway in the current DoD programming cycle to establish long term support. The CB Modeling Process Action Team is also addressing this issue.

CHEMICAL WEAPONS CONVENTION ISSUES

DoD has set up a functional Implementation Working Group (IWG) to plan for the implementation of the Chemical Weapons Convention (CWC) and related chemical weapons agreements. Through regularly recurring meetings, representatives of OSD, the Joint Staff, the

Military Services, and DoD agencies and activities plan and coordinate to ensure successful implementation of the CWC and related bilateral CW agreements.

OSD, the Joint Staff, the Military Services, On-Site Inspection Agency (OSIA) and the Defense Nuclear Agency (DNA) provide technical experts to support activity at the CWC Preparatory Commission (PrepCom) in The Hague, The Netherlands on a recurring basis. The PrepCom is charged with developing procedures and establishing the international forum, the Organization for the Prohibition of Chemical Weapons (OPCW), which will oversee international compliance with the CWC. These activities focus on all requirements of the CWC, including those outlined in Article X of the CWC, "Assistance and Protection Against Chemical Weapons."

The Military Services and the OSIA have developed individual, detailed implementation plans to provide guidance for their commands and activities under the CWC and the related agreements. As outlined in their individual plans, the Services and OSIA have conducted assistance visits and formal exercises to ensure that all elements are prepared to comply with the agreements.

In accordance with the DoD Master Program Plan for Research, Development, Test and Evaluation for Arms Control, DNA directs the DoD research and development effort to ensure the arms control verification proceeds using the most effective technology available.

CONCLUSION

The DoD NBC defense program has made significant progress in improving the coordination and integration of Service NBC defense research, development, and acquisition (RDA). The community is now better prepared to address shortcomings which still exist in our NBC defensive posture. The established RDA program will resolve many shortcomings by executing current procurement plans and adapting available technologies. Funding constraints will delay modernization and could effect training realism. For programs which demand state-of-the-art solutions, the Services must demonstrate a continued commitment of time and resources. Together with improved joint management initiatives, proactive programs, and stable and balanced funding, U.S. capabilities and readiness will continue to improve into the future.

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ANNUAL REPORT TO CONGRESS

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I. PURPOSE

This report provides Congress with an assessment of the overall readiness of the Armed Forces to fight in a nuclear, biological, and chemical (NBC) warfare environment. Section 1703 of the National Defense Authorization Act for Fiscal Year 1994, Chemical and Biological Weapons Defense, directs the Secretary of Defense to submit this assessment and a description of plans to improve readiness. This is the third report submitted since Section 1703 was passed.

The Department of Defense (DoD) NBC defense program objective is to enable our forces to survive, fight and win in NBC contaminated environments. Numerous rapidly changing factors are continually influencing the program and its management. These factors include a new defense strategy, an era of declining DoD resources to include force structure reductions, the aftermath of the breakup of the Soviet Union, the signing and future ratification of the Chemical Weapons Convention (CWC), and continued proliferation of weapons of mass destruction (WMD).

The President's July 1994 Report, *A National Security Strategy of Engagement and Enlargement,* outlines the "three central components" of the administration's strategic approach as "maintaining a strong defense capability and promoting cooperative security measures; our work to open foreign markets and spur global economic growth; and our promotion of democracy abroad." U.S. military capabilities are critical to the success of this strategy. United States forces must be capable of deploying rapidly and being able to respond to a variety of tasks. One of these tasks is to counter WMD—nuclear, biological and chemical weapons—along with their delivery systems, which pose a major threat to our nation's security. Thus, a key part of the Department of Defense's strategy is to seek to stem the proliferation of such weapons and to develop an effective capability to deal with these threats. To minimize the impact of use of WMD on our forces, we will need the capability not only to deter their use, but also, where necessary and feasible, to prevent it. This will require improved WMD defensive capabilities. The DoD NBC defense program continues to work towards increasing the capabilities of Joint Forces to survive and continue the mission during conflicts which involve the use of WMD.

The DoD NBC defense program continues to invest in future technology to provide improved capabilities with minimal adverse impact on our war fighting potential. Our goal is to improve our Forces' capability to detect NBC agents which facilitates the possibility to avoid them. We seek smaller, lighter protection and decontamination systems with reduced logistical burden. An integrated, balanced system of force protection and medical casualty care and management are necessary to sustain operational tempo on a nonlinear battlefield. Sound doctrine and realistic training remain fundamental to our defense against WMD.

II. THREAT ASSESSMENT

Nuclear Weapons Threat: The threat posed to the United States and its allies by the proliferation of nuclear weapons is real and growing. While there is no current, direct Inter-Continental Ballistic Missile (ICBM) threat against the United States by nations other than Russia and China, the threat from theater ballistic missiles is of growing concern. More than two

dozen countries have operational ballistic missiles, and more have programs in place to develop them. North Korea has sold Syria and Iran extended-range Scud Cs and has apparently agreed to sell missiles to Libya. Egypt, Israel, and Pakistan are developing and producing missiles, and several Persian Gulf states have purchased whole systems as well as production technology from China and North Korea. Some have equipped these missiles with WMD, and others are striving to do so.

In a more recent, and perhaps more dangerous development, North Korea has developed and tested an indigenous ballistic missile with a range of about 1,000 kilometers. This missile is capable of carrying the full range of WMD, including nuclear weapons. North Korea's continued efforts to sell the missile abroad—particularly to dangerous and potential hostile countries such as Iran—is of greatest concern. With this missile, North Korea could reach Japan; Iran could reach Israel, and Libya could reach US bases and allied capitals in the Mediterranean region.

One of the trouble spots in the world that could erupt into warfare with the actual use of nuclear weapons is the one involving India and Pakistan. Both nations have nuclear weapon development programs. Other areas such as the Mid-East and Far-East have the potential for similar action. The nuclear threat posed by North Korea is of major concern not only to South Korea and Japan but also to China. Nuclear weapons in the hands of North Koreans leaders can destabilize the entire region. However, things can change and change rapidly. As long as nations perceive nuclear weapons as enhancing their security, and others are willing to sell the technology, required production equipment, or finished weapons, the threat from nuclear proliferation will grow.

Chemical and Biological Weapons Threat:

The threat of proliferation of chemical and biological weapons is as great as it has ever been, and the future is bleak with regards to controlling this form of warfare in third world regions where demographics, religious and ethnic, and economic conflicts continue to boil over into both guerilla and open warfare. In regions such as the Middle East, the pressures to have a military response to potential military actions is a powerful driver towards both chemical and biological warfare. The costs of nuclear weapons, the requirement for large supporting infrastructures, and the acquisition of many different technologies to support a single program are highly limiting factors in the spread of nuclear weapons. Conversely, the only requirement for effective production of chemical agents is a rather baseline chemical process industry; biological agents production can be adequately supported in a country with a variety of pharmaceutical, veterinary, or medical establishments, assuming the political will and cooperation of the scientists and engineers to do so. The effectiveness of weaponization of these weapons will depend on the overall support which the military provides and the training and doctrine development which they undertake, however with only modest investments and credible and effective program can be established, even if it is held as a clandestine program which is largely isolated from the main stream of a countries military.

The proliferation of knowledge and technology world wide is a growing concern as it relates to the issues of chemical and biological agents and weapons. Ready access to the emerging international network of computer databases and communications provides a would be proliferent in

this area with unparalleled access to information which can greatly accelerate a program. Further, the ability to communicate in an unhindered way with people involved in development of such programs throughout the world accelerates programs by providing means for the rapid elimination of unproductive avenues of investigation, thereby saving time and money.

The former Soviet Union (FSU) may have had the most advanced chemical and biological weapons program in the world; at the very least, they certainly had the largest. The collapse of the Soviet Union and the current problems of employment in the resulting republics may have significant impact in the coming years on the direction and pace of development of chemical and biological weapons programs throughout the world. While not necessarily sanctioned by the standing governments of the FSU, individuals and organizations may find themselves obliged to sell their knowledge and products for hard currency just to survive. Certainly the scientists and engineers formerly employed in the FSU CBW programs are believed to be in dire straights, with the only commodity which they can sell for income being their knowledge of the production and weaponization of chemical agents.

Open press reporting of the chemical agents which the FSU developed suggests that these chemicals may be much harder to detect, protect against, and treat exposures to, then the current nerve agents which have been the main threat to American forces for several decades, and which are the standards to which our programs have been designed. Proliferation of these new agents to regions of political and economic instability such as the Middle East, could potentially impact U.S. national interests in unforseen ways. With much of the developed world operating in the Middle East and depending on open lines of communications for their economic survival, the United States is likely to become embroiled in any hostile actions threatening those lines of communications. The prospect of facing a country such as Iraq, equipped not just with chemical weapons, but chemical weapons for which we do not possess adequate means of detection or protection is a sobering thought.

However, these very countries which are a concern to the region also have the means, the will, and the ability, to acquire this information on new chemical agents. Supporting the concern that such proliferation is likely is the current state of employment and falling living standards in the FSU. If history is any basis for predicting the future, it is only a matter of time until certain knowledge and know how migrates into the programs of proliferating countries.

Another problem is in the realm of fringe groups which may or may not be aligned with other states and/or political or religious organizations. The prime example of both is the Aum Shinrikyo Cult in Japan—fringe in that they did not represent any main stream religion or political group, yet religious in their belief system and organization. Intending to disrupt and planning to replace the existing government, they operated on a world wide scale, visiting Russian and other FSU republics, as well as the United States. They were extremely well funded and in a span of only a couple of years accomplished what some countries have strived to do over decades. They made use of advanced technologies, commuter networks, and international travel to acquire, assemble, and operate production facilities for the sole purpose of making chemical and biological weapons.

Recently, there have been cases of people obtaining for reasons of terrorism seed cultures of bacteriological organisms which have enormous potential to infecting large populations of people.

Others have been found to be acquiring toxins, such as ricin which is extracted from the castor oil bean, again for reasons of terrorism. It is unlikely that all such attempts will be discovered or intercepted, however there is no doubt that they would have a major disruptive effect on the daily execution of business and commerce in the United States, and as such represents a serious threat to our national security.

Aimed at certain critical nodes in the military infrastructure of the United States, either domestically or abroad, chemical or biological weapons could disrupt the execution of military objectives. Therefore, it is imperative that the United States have an ability to operate effectively in a contaminated environment while simultaneously being able to identify threat agent(s), treat injured personnel, and remediate the contaminated area.

Another less well understood threat in the realm of chemical warfare or terrorism is the potential for a Bhopal-like event resulting from deliberate targeting of industry or commerce in population centers. A current example of this is found in the operations in Bosnia. Chemical plants in Bosnia, some even around Tuzla, are designed to produce large quantities of chemicals for the manufacture of such common products as plastics, which are themselves chemical agents which were first used in warfare during WWI. These chemicals, such as phosgene and chlorine, have become staples of the modern chemical industry; yet their potential for use during conflict is as great today as ever. Moreover, the political situation and the restraints on the use of such non-specific weapons, restraints which have precluded their use in warfare among the industrialized nations over the past 80 years, are missing in these regions of ethnic and religious conflict.

United States forces which have to operate in these regions face, therefore, the combined threats of both conventional chemical agents and weapons and the potential for exposure to chemicals produced as an element of the regions chemical industry. Scale of operation is the main discriminator between military uses of weapons and chemicals released from chemical plants by saboteurs or collateral damage resulting from military operations. The chemical plant at Tuzla is a prime example; the chemical storage tanks there have a capacity to hold over 2 times as much chlorine as was released by Germany in their first ever chemical attack, which killed or injured over 5,000 people in a span of just 15 minutes. If released in an area like Tuzla, such a catastrophic release would have an incalculable effects on military operations, as well as affecting future humanitarian, political, and economic considerations at all levels ranging from local to international.

Currently there are dozens of countries with known or suspected chemical and biological weapons programs. Some of these are relics from the cold war, others are the result of current tensions and instabilities, and still others defy explanation based on our concepts of logic and decision making. However, whatever the rationale for the existence of these programs, they nonetheless will pose threats of varying degrees to the military forces of the United States when operating in these countries. Further, because the countries which are of the greatest concern to the United States as far as the proliferation of chemical and biological weapons is concerned are also in regions in which the United States has well defined national security interests, it is of paramount importance that we continue to maintain a credible capability to operate effectively in a CBW contaminated environment in executing military operations.

NBC WARFARE INTELLIGENCE REQUIREMENTS

Nations with CBW capabilities are increasing. Proliferation of weapons technology, precision navigation technology, and chemical and biological technology to developing nations presents the United States with a complicated national security challenge. Intelligence efforts must emphasize collection and analysis of nations' "dual-use" chemical and biological industrial capability and developing the indications and warning of adversarial use of dual-use capabilities. Tailored intelligence documents are essential for developing and updating requirements for CB defense programs. The Intelligence Community should conduct a national review of chemical and biological warfare intelligence requirements and assess the adequacy of current assets to execute the required intelligence program.

III. OVERVIEW OF CONTENTS

- *Chapter 1* describes measures taken to improve the overall joint management and coordination of the NBC defense program.

- *Chapter 2* provides non-medical NBC defense requirements and research and development programs information. Requirements and the status of research and development assessments are described within the framework of the functional areas of NBC defense.

- *Chapter 3* provides medical NBC defense requirements and research and development information. Medical technologies preserve combat effectiveness by timely provision of medical countermeasures in response to Joint Service NBC defense requirements. Both requirements and the status of research and development are examined in detail.

- *Chapter 4* provides an analysis of NBC defense logistics posture. The analysis reviews the status of quantities, characteristics, and capabilities of all fielded NBC defense equipment; industrial base requirements; procurement schedules; and problems encountered.

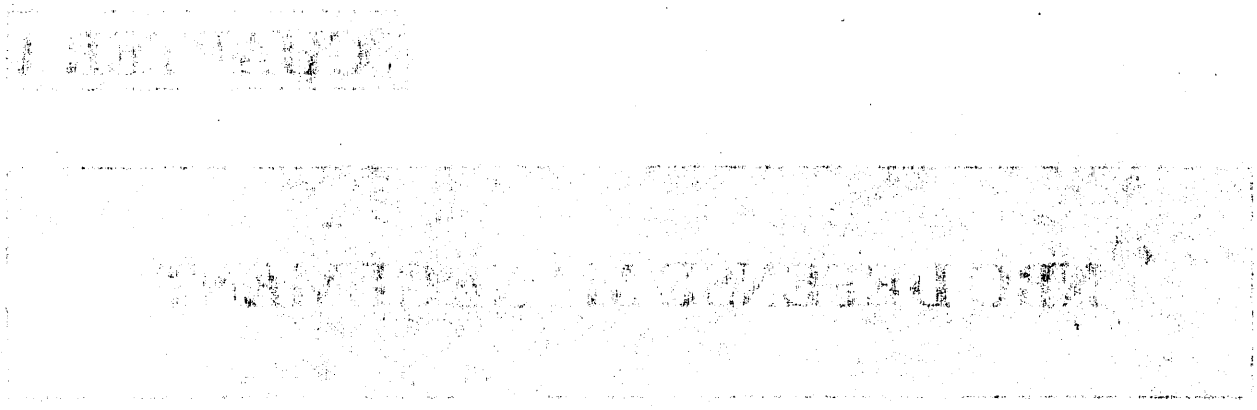
- *Chapter 5* assesses the status of NBC defense training and readiness conducted by the Services. Each of the Services training standards and programs is reviewed.

- *Chapter 6* provides information on the planning and preparations by the Department of Defense for implementation of the Chemical Weapons Convention.

- Annexes provide detailed information on all Joint and Service unique NBC defense equipment. In addition, Annexes E and F provide information on the CB defense program required by Congress. Annex E provides the FY95 Annual Report to Congress on Research, Development, Test and Evaluation conducted by the Department of Army for the Purpose of Medical Biological Defense. This report is a Section 2370, U.S. Code 10 requirement. Annex F provides the Department of Defense, Annual Report to Congress on the Research, Development, Test and Evaluation of the Chemical/Biological Defense Program, 1 October 1994 through 30 September 1995. This report is a Section 1511, U.S. Code 50 requirement.

CHAPTER 1

NBC DEFENSE MANAGEMENT



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1.1 MANAGEMENT IMPLEMENTATION EFFORTS

In February 1994, The Secretary of Defense assigned the Office of the Assistant to the Secretary of Defense (Atomic Energy), ATSD(AE), as the single office responsible for management and oversight of the Department of Defense (DoD) Chemical and Biological Defense (CBD) program. In February 1996, ATSD(AE) was redesignated the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, ATSD(NCB), in accordance with Public Law 104-106, the National Defense Authorization Act for Fiscal Year 1996. To perform these responsibilities the ATSD(NCB) is tasked to:

- Ensure close and continuous coordination between the non-medical and medical chemical and biological defense programs.
- Provide an annual report to Congress on chemical and biological defense readiness, training and material.
- Direct the consolidation, coordination, and integration of the chemical and biological defense budget for the military departments.

1.1.1 Management Reviews

To exercise oversight of the program, DoD has initiated Defense Acquisition Board (DAB) reviews of CBD efforts. The most recent DAB review was in September 1995. The next review is scheduled for Spring 1996.

ATSD(NCB) schedules DAB program reviews as required but at least annually. On the basis of these reviews, the USD(A&T) provides direction for chemical/biological defense acquisition programs.

In addition, the ATSD(NCB) chairs an executive-level steering committee for medical and non-medical CBD matters. This committee provides a forum for Service, Joint Staff, and Office of the Secretary of Defense (OSD) representatives to make decisions to complement the DAB process.

1.1.2 Technology Base Review

ATSD(NCB), in coordination with the Director, Defense Research & Engineering (DDR&E), provides technical oversight for all Service science and technology base (S&T) programs and reviews these programs at least annually. The most recent review took place at the Edgewood Research Development and Engineering Center (ERDEC) August 29–30, 1995.

1.1.3 Coordination and Integration of the Program

In February 1994, the Secretary of Defense designated the Army as the Executive Agent for DoD to coordinate and integrate research, development, test, evaluation, and acquisition

activities, and the military construction requirements of the military departments for the CBD program. Subsequently, the Services agreed to a Joint Service Agreement (JSA) for Joint Nuclear, Biological and Chemical Defense Management. DoD implemented the JSA on 2 August 1994.

1.2 ORGANIZATIONAL RELATIONSHIPS

Figure 1-1. DoD CB Defense Program Management Structure

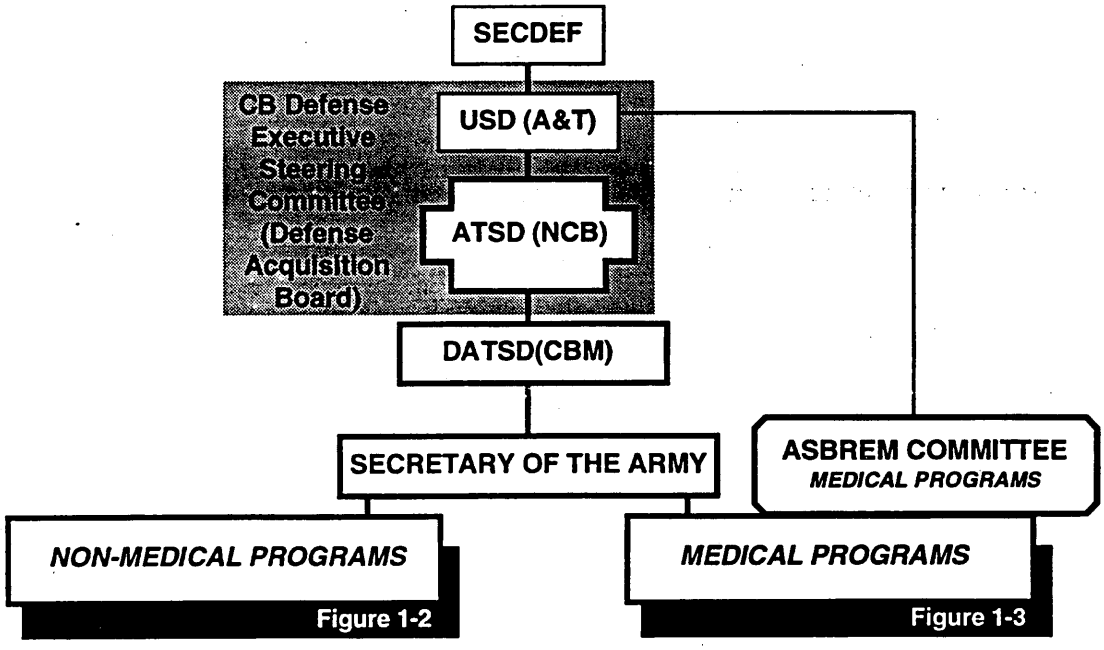


Figure 1-1 portrays the organizational relationships for the overall CBD program. The Deputy Assistant to the Secretary of Defense for Chemical and Biological Matters, DATSD(CBM) is the principal deputy to ATSD(NCB) and is responsible for the overall coordination and integration of all CBD research, development, and acquisition (RDA) efforts. DATSD(CBM) provides the overall guidance for planning, programming, budgeting, and executing the CBD program. He also retains approval authority for all planning, programming, and budgeting documents. In the case of medical CBD programs, DATSD(CBM) provides this approval by representing ATSD(NCB) on the Armed Services Biomedical Research, Evaluation and Management (ASBREM) Committee. He is then responsible for ensuring coordination between the medical programs and the non-medical CBD efforts. He directly approves all non-medical planning and programming documents which are provided by the Joint Nuclear Biological and Chemical (NBC) Defense Board.

The Secretary of the Army is the Executive Agent responsible for coordination, integration, execution and administrative support for Service CBD requirements and programs. The Secretary has delegated this responsibility to the Assistant Secretary of the Army, Research, Development and Acquisition, ASA(RDA) who also co-chairs the Joint NBC Defense Board.

- Non-medical CBD programs, are coordinated, integrated and executed through the Joint NBC Defense Board, as defined in the Joint Service Agreement for NBC Defense.

- Medical CBD programs are coordinated, integrated and executed through participation in the oversight activities of the ASBREM Committee. This medical oversight process is detailed in section 1.2.2 of this chapter.

The military departments' acquisition organizations manage the individual CB defense programs according to Service and DoD directives.

1.2.1 Non-Medical Programs – Management Structure

Figure 1-2. DoD Non-Medical CB Defense Management Structure

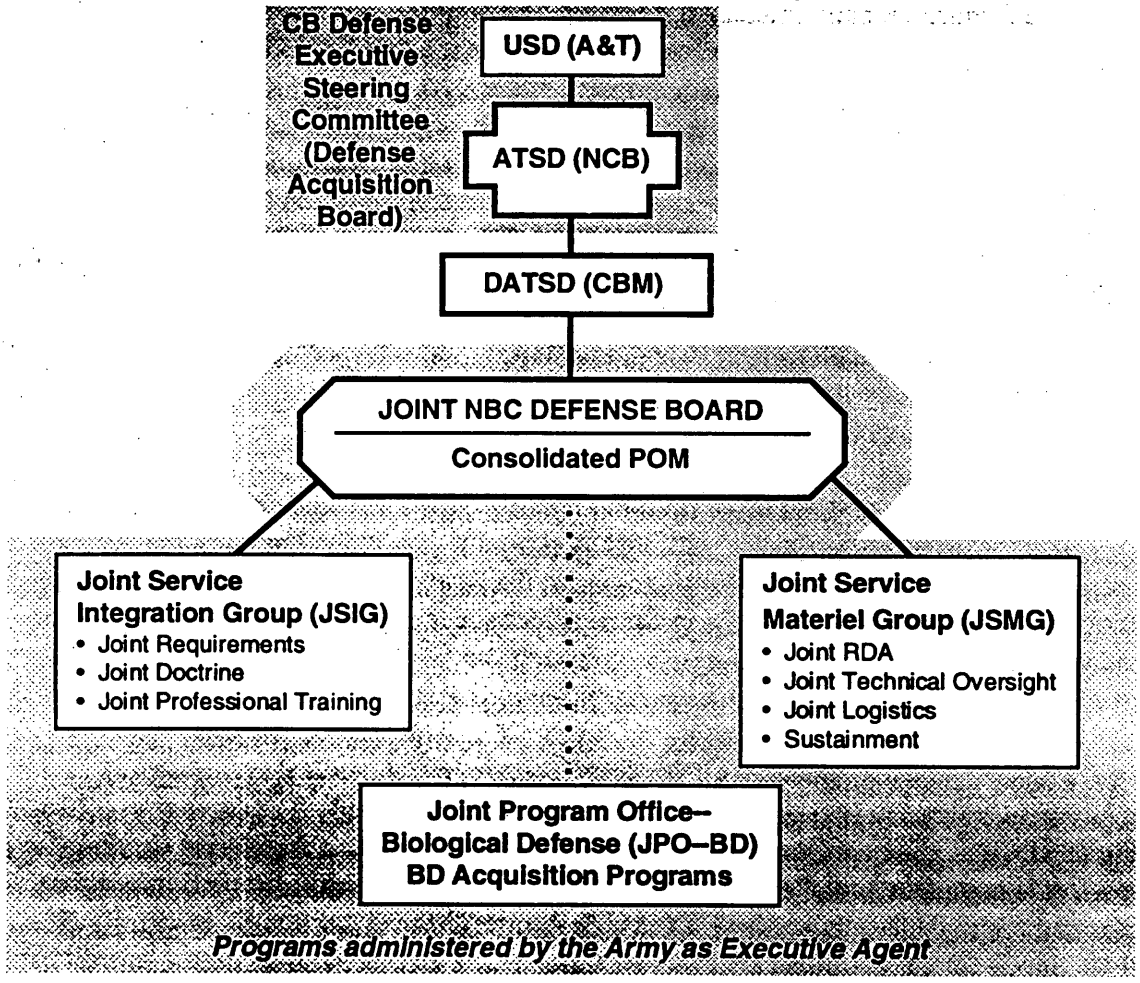


Figure 1-2 describes the organizational structures outlined in the JSA and being used by the Joint NBC Defense Board to perform planning and programming functions. The Joint Service Integration Group (JSIG) is responsible for joint CBD requirements, priorities, training, and doctrine. The Joint Service Materiel Group (JSMG) is responsible for coordinating and integrating all CBD research, development, acquisition, and logistics support efforts. These two groups perform the planning and programming functions for CBD.

The JSIG and the JSMG prepared the CBD FY97-01 Program Objective Memorandum (POM) strategy under the guidance of the Joint NBC Board Secretariat. The Joint NBC Defense Board Secretariat submitted the FY97-01 POM for Board approval and forwarding to DATSD(CBM). The consolidated FY97 budget was prepared by the JSMG and reviewed by the Joint NBC Defense Board Secretariat and submitted for approval to DATSD(CBM).

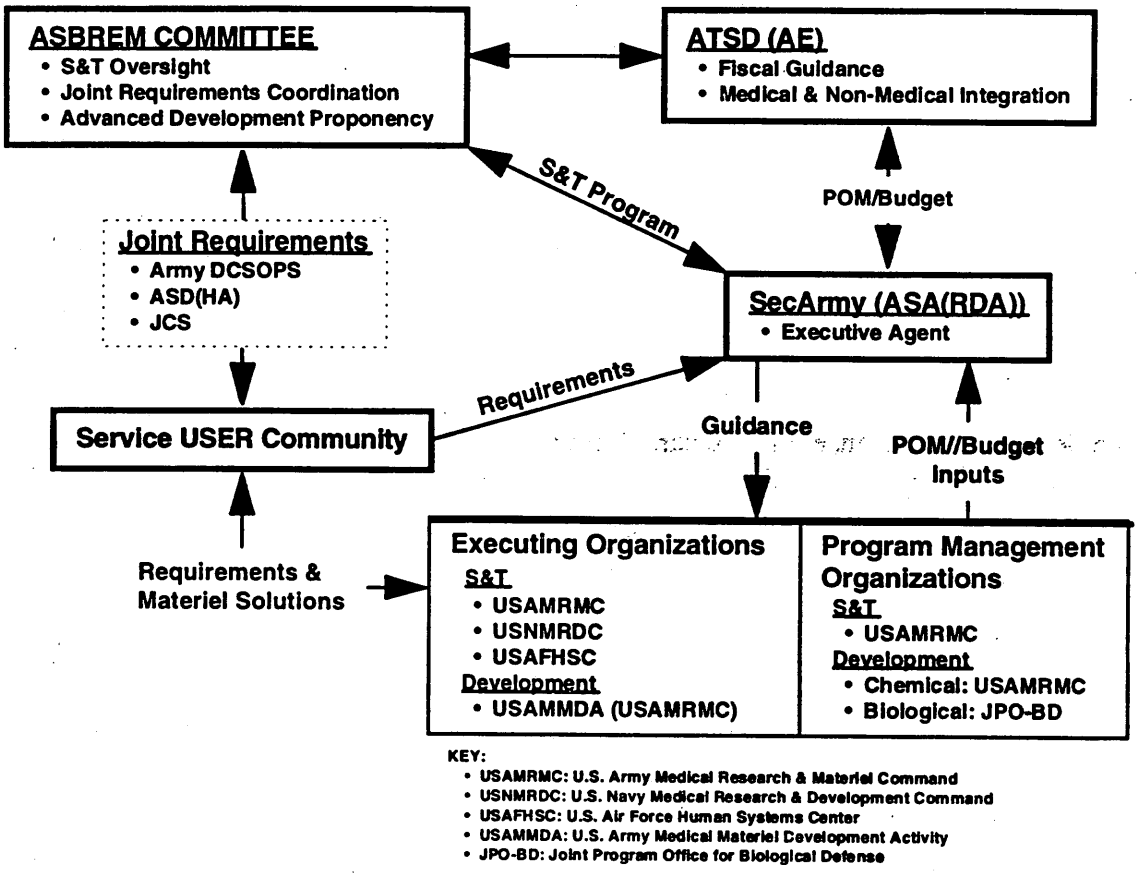
1.2.2 Medical Programs – Management Structure

For medical NBC defense programs the Army is the executive agent. The US Army Medical Research and Materiel Command (USAMRMC) is responsible for planning, programming, and budgeting for medical research requirements for all the military departments.

The Congressionally mandated ASBREM Committee was chartered in 1981. This committee is co-chaired by the Director, Defense Research and Engineering (DDR&E) and the Assistant Secretary of Defense (Health Affairs), ASD(HA). In recognition of the continuing need to facilitate management coordination, improve information exchange, and accomplish medical research, development, testing, and evaluation activities pertinent to the missions of the Army, Navy, and Air Force, the Commanders of the USAMRMC, the Naval Medical Command for Fleet Readiness and Support, and the Air Force Human Systems Center meet periodically in joint sessions. Key objectives of this committee are to increase cost effectiveness of resource utilization, address organizational roles, conduct management studies, resolve Service organizational/functional alignment issues, ensure program relevance, avoid duplication among DoD's and other agency programs, and to define Service issues which require resolution/coordination with other Federal agencies.

Figure 1-3 portrays the organizational relationships for medical CBD program management. Currently the medical CBD RDA program is managed through the ASBREM Committee for science and technology programs, the Army's Deputy for Medical Systems (ASA(RDA)) on behalf of the Surgeon General sponsor for each Service's medical chemical defense advanced development efforts, and through the Joint Biological Defense Program Office for advanced development and procurement of biological defense capabilities. The Army serves as the Executive Agent for administration, and the U.S. Army Medical Materiel Development Activity (a subordinate element of USAMRMC) serves as the medical systems advanced development execution organization. There is currently a DoD effort underway to consolidate medical RDT&E in a coordinated and integrated manner under the ASBREM Committee. Until this effort is complete, the planning and programming for the consolidated effort will be performed under the administration of the U.S. Army. The user communities identify and validate requirements for medical CBD capabilities. The ASBREM Committee coordinates with the JSIG to achieve requirements integration. The RDT&E execution organizations in coordination with the ASA(RDA), as the executive agent, then develop the Joint Medical RDA Plan and Medical Materiel Modernization Plan in coordination with the ASBREM Committee and the executing activities.

Figure 1-3. DoD Medical CB Defense Management Structure



ASA(RDA) will direct and coordinate POM and budget preparation activities and is responsible for ensuring appropriate coordination with the ASBREM Committee. Within the ASBREM Committee, ASD(HA) is the proponent for all medical advanced development programs and products. DATSD(CBM) will provide fiscal guidance and introduce any issues regarding coordination between the medical and non-medical programs. ASA(RDA) will be responsible for coordination with the ASBREM. DATSD(CBM) will receive the ASA(RDA) approved POM for medical CBD Programs and will integrate it with the non-medical POM. Any unresolved coordination issues will be addressed by the CBD Executive Steering Committee. ASA(RDA) will integrate the medical and non-medical budget estimate submissions and present budget issues to DATSD(CBM).

The US Army is the DoD EA for the Medical Chemical Defense Research Program (MCDRP) and Medical Biological Defense Research Program (MBDRP) as prescribed in DoD Directive 5160.5. As such, the Army is the lead requirements coordinator. The Joint Technology Coordinating Group (JTCG) 3 (MCDRP) and JTCG 4 (MBDRP) of the ASBREM Committee are responsible for the research program's consolidation, coordination, and integration. The ASBREM Committee maximizes efficiency by coordinated planning, and minimizing unnecessary program overlaps and costly materiel retrofits. The Joint Service Research, Development, and Acquisition Plan, the Army Technology Base Master Plan and the Medical Science and Technology Master Plan are the program drivers for MCDRP and MBDRP. The

science base is managed through the development and execution of Science and Technology Objectives (STO). The advanced development program (6.4 – 6.5) is directed by the US Army Medical Materiel Development Activity. Both programs are integrated between DoD in-house and contract efforts.

The Armed Forces Radiobiology Research Institute (AFRRI) is DoD's sole laboratory for conducting biomedical research to address military medical operational requirements for dealing with the prompt and delayed effects of radiation exposure. AFRRI, formerly a subordinate activity to the Defense Nuclear Agency, is currently assigned to the Uniformed Services University of the Health Sciences. An annual review of the AFRRI research program is conducted by the AFRRI Board of Governors (consisting of the Surgeons General of the Services, the Deputy Chiefs of Staff for Operations of the Services, the Under Secretary of Defense for Acquisition, the Assistant Secretary of Defense for Health Affairs, and the Assistant to the Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, and chaired by the Director of the Defense Nuclear Agency). Funding for AFRRI is provided through the Director, Defense Research and Engineering. Like the Biological and Chemical Defense Research Programs, the Medical Nuclear Defense Research Program is coordinated and integrated by the ASBREM.

The Medical Chemical and Biological Defense Research Programs depend upon comprehensive STOs and a mature and effective advanced development program. The maintenance of a strong technical base capability addresses current and future threats. It allows the DoD to exploit advances in the biotechnology and neuroscience field leading to novel advances in medical countermeasures. Next generation products and future systems development flow from the maintenance of a strong science and technology base. Therefore, it is imperative to adequately fund the medical chemical defense and medical biological defense science and technology base in conjunction with advanced development during the budget formulation process. Current management challenges include balancing resource allocation as DoD downsizes, coping with the loss of in-house resources and the rising costs for research, personnel and facilities. These challenges are being met by weighing the benefits of project success against the associated costs and risk, adopting realistic but aggressive schedules and milestones, applying success-failure criteria for project evaluation/continuation, and coordinating basic research, directed research, and development.

1.3 FUNDS MANAGEMENT

Figure 1-4 describes funds flow for the CBD program and coordination between funding and executing organizations. The key organizations in this process are: DATSD(CBM), ASA(RDA), and the Ballistic Missile Defense Office (BMDO). Participating organizations are the Service Headquarters staffs and the executing organizations. DATSD(CBM) issues instructions to the Army Acquisition staff as to how funds should be distributed. ASA(RDA) provides DATSD(CBM) recommended fund distribution information. DATSD(CBM) prepares funds suballocation instructions and submit them to BMDO to distribute the funds to the Services based on the approved President's Budget with appropriate revisions.

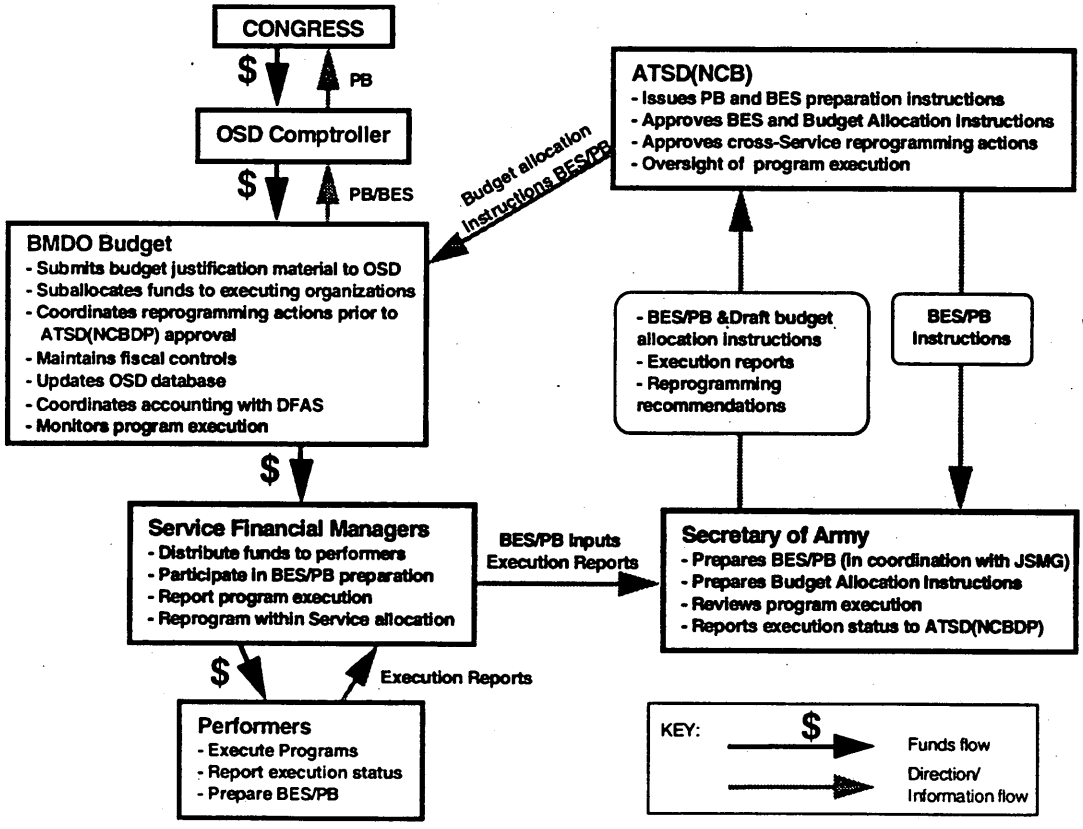
The Services' financial managers have authority to shift funds between projects within CBD projects but may not reprogram funds between program elements (PEs). Any

reprogramming between PEs and inter-Service reprogramming must be approved by the DATSD(CBM). BMDO on behalf of DATSD(CBM) issues execution and program status reporting instructions. The Services' financial managers report execution status to BMDO on a regular basis. BMDO reports execution status to the Army on a monthly basis. In turn, the Army reports execution status to ATSD(NCB) on a quarterly basis. In addition, it is the Executive Agent's responsibility to notify ATSD(NCB) when programs deviate from or are in danger of not meeting obligation and execution goals.

During the execution year for non-medical programs, the Joint NBC Defense Board's Secretariat will staff all actions resulting from the requirement to reallocate funds between the Services. During the execution year for medical programs, the Headquarters, U.S. Army Medical Research and Materiel Command (USAMRMC) will staff all actions resulting from the requirement to reallocate funds between the Services.

BMDO serves as the comptroller for prior year and current year execution of the CBD program with administrative support from ASA(RDA). ASA(RDA) updates OSD comptroller databases as necessary after the POM, Budget Estimate Submission (BES), and President's Budget (PB). BMDO ensures that DATSD(CBM) and ASA(RDA) are kept informed of all OSD comptroller guidance, directives, and schedules. In addition, BMDO issues the funding documents, per DATSD(CBM) direction and perform all required accounting functions, with the assistance of the Army staff.

Figure 1-4. Chemical and Biological Defense Funds Flow



1.4 NBC DEFENSE PROGRAM MANAGEMENT ASSESSMENT

*** Oversight and management of the DoD NBC defense program continue to improve. It is imperative that the management system produce joint NBC defense requirements and NBC defense equipment that can be used by all forces. The public law has provided a key tool for ensuring a jointly focused NBC defense program. The continued support of Congress and implementation of current plans will continue to improve jointness and improve readiness.**

ONGOING SOLUTIONS:

DoD continues to transition to a consolidated management approach as directed by Section 1702, Public Law 103-160 (50 USC 1522). Accomplishments during 1995 include:

- Establishment of OSD level oversight of research, development and acquisition of NBC defense equipment utilizing the Defense Acquisition Board (DAB) process. DAB reviews of the Chemical and Biological Defense and the Biological Defense Vaccine Acquisition Programs were held during the past year. Acquisition Decision Memoranda were issued following each program review DAB review directing resolution of management issues during FY96.

- Coordination and development of a consolidated NBC defense Program Objective Memorandum (POM) and Budget Estimate Submission that provide the basis for the FY97 President's Budget request to Congress, with overall funding consolidated as a Defense-wide program at the OSD level.

- For many technology areas within the NBC defense programs, most notably detection technologies, requirements for most programs have been consolidated or eliminated to leverage available funds on the most promising technologies.

- Creating Joint RDT&E programs and minimizing Service-unique programs.

In addition, we also have a number of initiatives underway in FY96 to further improve the chemical and biological defense program. These include:

- Establishment of a Joint Requirements Document process focusing on common needs between the Services.

- Solidifying plans to revise the medical CBD RDT&E program management structure.

CHAPTER 2

NON-MEDICAL NUCLEAR, BIOLOGICAL, CHEMICAL WARFARE DEFENSE REQUIREMENTS AND RESEARCH AND DEVELOPMENT PROGRAM STATUS

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2.1 INTRODUCTION

This chapter provides a consolidation of Joint and Service unique non-medical NBC defense requirements and an assessment of these programs to meet the needs of the Force. The discussion of both requirements and the status of research and development assessments are conducted within the framework of the three principles of NBC defense doctrine for the mission area, shown in Table 2-1.

Table 2-1. Principles of Chemical and Biological Defense Doctrine

• Contamination Avoidance
• Force Protection
• Decontamination

Continued proliferation of weapons of mass destruction creates continuous need to ensure that U.S. forces can fight and win in an NBC threat environment. The ever increasing danger from these weapons also demands that we look for every opportunity to avoid technological surprise. When doctrinal, training, or organizational solutions (non-materiel solutions) cannot be found, we seek new equipment through the materiel acquisition cycle. The evolving requirements of operations demand Joint forces progressively capture and leverage technological advances to provide the best NBC defense equipment for the forces. We must continue to build on the fundamentals of NBC defense doctrine.

As defined in Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical Defense,* contamination avoidance includes detecting, avoiding, and bypassing contaminated areas. Force protection consists of individual protection and collective protection. Decontamination restores combat power.

The key to successful implementation of research, development, and acquisition (RDA) strategy is the concept of continuous incremental investment. Our RDA goal is to equip the Force with world-class equipment in sufficient quantities, in the shortest possible time, to win decisively, quickly, and with minimum casualties. As authorized under the new Joint Service Agreement for non-medical programs and ASBREM for medical programs, the Army, as executive agent, coordinates, integrates, and reviews the DoD NBC defense program. The results of these reviews, conducted with all Services participating, are documented in the Joint Service Modernization and Joint Service RDA Plans. These documents form the basis for the consolidated NBC defense Program Objective Memorandum (POM).

Through the process of requirements identification and analyses, the Services in coordination with the CINCs, decide if a materiel solution will solve the requirement. If a valid requirement exists, then our research and development modernization process will identify improved technology approaches which may provide a new system, or upgrade an existing

system. Continuous modernization is the way we sustain our forces, their capabilities, and our entire acquisition system—its people, industrial base, infrastructure, and programs.

Given our national strategy of achieving and applying technological superiority, there are several underlying concepts that form the foundation of acquisition modernization. The first of these is the need for reducing cycle time in the acquisition of new systems or the integration of emerging technologies into older systems. The use of Advanced Concept Technology Demonstrations (ACTDs), open systems and architectures, and the new emphasis of commercial standards and practices should allow us to shorten the time necessary to field new equipment. Our programs must reduce the cost of ownership by the use of concepts such as design-to-cost and concurrent engineering to ensure that equipment is easy to maintain and repair even with the complexity seen in most new systems.

2.2 NBC DEFENSE MISSION AREA REQUIREMENTS AND RDA SUMMARY

The Services have been working closely over the past two years to increase the jointness in ongoing programs. This report highlights improvements over the last 12 months and discusses cooperative efforts for further Joint development of requirements. This section is a summary of the requirements in each of the mission area tenets. Tables 2-2 through 2-10 provide a consolidation of Joint and Service unique requirements and acquisition strategies. Since the focus of this chapter is on RDA efforts, fielded items are not included in these tables. Descriptions of fielded equipment can be found in the annexes at the end of this report and Appendix 1 of Chapter 4.

All programs described are either *Joint* or *Service unique*. A Joint program is any program with a requirement from more than one Service. A Service unique program is one that is required by only one Service. While the public law and several DoD Directive and Instructions emphasize the use and development of Joint programs whenever possible, there are many cases where a Service requires a program unique to the environment in which it operates.

2.3 CONTAMINATION AVOIDANCE (Detection, Identification and Warning)

NBC reconnaissance, detection, warning and reporting are the essential elements of contamination avoidance. Early warning is the key to avoiding NBC contamination. Sensors for the individual joint task force member and systems capable of detecting multiple agents and characterizing new agents are being developed. Technological advances are being pursued in standoff detection, miniaturization, lower detection limits, logistics supportability and biological detection capability. The following sections detail contamination avoidance science and technology efforts, modernization strategy, and Joint and Service unique programs.

2.3.1 Contamination Avoidance Science and Technology Efforts

2.3.1.1 Goals and Timeframes. The goal of contamination avoidance is to provide a real-time capability to detect, identify, locate, quantify, and warn against all CB warfare agent threats below threshold effects levels. See Table 2-2. Science and technology efforts currently

emphasize multi-agent sensors for biological agent detection and standoff CB detection. To meet near-term needs, a number of individual sensors are being developed while detection technology matures. Far term objective technologies will allow integration of chemical and biological point and standoff detection into a single system. The technology focus is on detection sensitivity across the evolving spectrum of CB agents; systems size/weight, range, signature and false alarm rate; and integration of CB detectors into various platforms, individual clothing, and command, control, communication, and intelligence (C^3I) networks.

Table 2-2. Contamination Avoidance Science and Technology Strategy

By 1996	By 2001	By 2006
• Demonstrate improved chemical standoff detection from ships • Define requirements for water monitoring • Demonstrate improved reconnaissance capability	• Demonstrate integrated point/standoff biodetection capability (ATD) • Complete fabrication of tunable, eyesafe laser for standoff detection • Demo Individual Soldier Chemical Detector weighing <8 oz. and measuring 2"x1"x1" • Equipment contamination scanner, handheld • In-line water CM monitor • Improved biological air particle counter • Air Base / Port Bio Detection ACTD	• Demonstrate integration of chemical and biological agent detection into a single sensor suite • Wide Area CB Scanner with 5–10 km hemispherical radius and agent discrimination

2.3.1.2 Potential Payoffs and Transition Opportunities. The future CB detection system will provide the capability to detect, identify, map and track all CB contamination in the theater of operations. This will enable commanders to avoid CB contamination or to assume the appropriate protection required to continue fighting and sustain their mission with minimal performance degradation and casualties. Small, lightweight chemical detectors can be incorporated into clothing ensembles to provide an individual CB detection capability. CB detection technologies have dual use potential in monitoring air pollution, noxious fumes inside enclosed areas and municipal water supplies.

2.3.1.3 Major Technical Challenges. The major technical challenges are in the areas of biological detection and identification, including standoff sensing, improved agent discrimination and quantification, sampling efficiency, interferent rejection and antibody/probe development. Size reduction of detectors, development of integrated biological and chemical detection systems, and the fusion of sensor data with mapping, imagery and other data for real-time display of events are also challenges. Finally, detector technologies based on olfactory-like chemical sensing and molecular approaches to optical sensors offer long term opportunities.

2.3.2 Contamination Avoidance Modernization Strategy

The increased lethality and heightened operational tempo of the future battlefield demand responsive NBC detection and warning capabilities to reduce force degradation caused by contamination. These capabilities, which also encompass NBC reconnaissance, identification and reporting, have the strongest urgency for force readiness and will continue to be emphasized by

the DoD community in the near and distant future. Table 2-3 shows the roadmap of DoD requirements for contamination avoidance.

Early detection and warning is the key to avoiding NBC contamination. As a result, DoD is concentrating RDA efforts on providing its warfighters real-time capabilities to detect, identify, quantify, and warn against all CB warfare threats below threshold effects levels. Current emphasis is on multi-agent sensors for biological agent detection and early warning detection of chemical and biological agents. To meet the needs of the next three to five years, several stand-alone detectors and sensors are being developed. As detection technology matures, development efforts will focus on system miniaturization, improved sensitivity and range, and decreased false alarm rate. This focus will facilitate the integration of chemical detectors into personal warfighter gear, chemical and biological detectors onto various air, sea, and ground platforms, and integration of detectors into automated warning and reporting networks. Table 2-4 provides an overview of Joint and Service unique RDA efforts and Service involvement.

The detection and warning program area faces numerous technical and management challenges. The major technical challenge is the area of biological detection and identification. It encompasses the development of technologies for remote sensing, improved agent discrimination and quantification, sampling efficiency, and interferent rejection.

The management challenge involves the coordination and consolidation of dozens of detection and warning RDA efforts across the Services. This strategy resulted in the initiation of a number of RDA efforts which shared common technical goals, but were constrained to Service unique requirements. Recent management organizations and initiatives, such as the Joint Program Office for Biological Defense (JPO-BD) and the Joint NBC Defense Board are building Joint Service coordination across the mission area.

Over the past three years, JPO-BD has coordinated the development of two key projects—Biological Stand-off Systems and Joint Biological Point Detection System—to satisfy Services' biological defense needs. The requirements for the Joint Biological Point Detection System was developed by a Joint Service working group, and responsibilities for project execution have been clearly defined by the four Services to maximize their RDA effectiveness and to avoid duplication of effort. In the last year, the JSMG transformed and consolidated more than 40 separate detection and warning requirements into nine fully coordinated joint projects. Requirements, nomenclature, and program plans for these projects are maturing and will be complete by FY98. The Joint Programs are:

- Automatic Chemical Agent Detector Alarm/Automatic Vapor Agent Detector (ACADA/AVAD)
- Joint Service Chemical Miniature Agent Detector (JSCMAD)
- Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)
- Joint Service Chemical Warning and Identification LIDAR Detector (JSCWILD)
- Joint Biological Point Detection System (JBPDS)
- Joint Biological Remote Early Warning System (JBREWS)
- Joint Service Reconnaissance System (JNBCRS)
- Joint Warning and Reporting Network (JWARN)
- Joint Service Agent Water Monitor (JSAWM)

2.3.3 Joint Service Contamination Avoidance Programs

Completing the consolidation of Joint Service contamination avoidance programs has been a primary goal for the past year. Building upon the success of the prior year, all detection programs have been restructured to meet current multi-Service needs. Bolded entries in Table 2-3 highlight Joint programs. Detailed descriptions of Joint contamination avoidance programs are at Annex A.

Table 2-3. Contamination Avoidance Modernization Strategy (Joint & Service Unique)

	NEAR (FY96-99)	MID (FY 00-04)	FAR (FY 05-10)
Chemical point	**Joint-Programmable agent detection capability; surface sampling capability (CAM/ICAM)** **Joint-Capable of automatic, digital point detection of nerve and blister agents aerosols and vapor (ACADA/AVAD)** Navy-*improved automatic point detection of nerve/mustard (IPDS)*	**Joint-Improved, all-agent programmable automatic point detection; portable monitors, miniature detectors for aircraft interiors; ship holds; individual soldiers (JSCMAD)** Navy-*Automatically detect liquid agent (SALAD)*	**Joint-In-line detection of CB contamination in water supply systems (Agent Water)** **Joint-Wide area detection**
Biological point	**Joint-Capability to detect and identity biological agents: ground based (BIDS); ship-based (IBAD)**	**Joint-Capable of Automatic point/mobile biodetection, automatically detects and identifies bio-agents; programmable, automatic point bio agent detection; personal monitoring (JBPDS)**	**Joint-Automated detection of all known biological agents**
NBC Reconnaissance and C/B Stand-off Detection	**Joint-Stationary stand-off chemical vapor detection (M21)** **Joint-Mobile automatic integration of sensors and data; modeled chemical hazards (JSNBCRS)** **Joint-CB impact model; modeled CB hazard, micro met and terrain** **Long Range Stand-off detection of biological aerosol clouds (LR-BSDS)**	**Joint-remote biological detection and early warning identification capabilities (BSDS)** **Joint-Lightweight ground-mounted short-range stand-off detection for chemical agent vapors (JSLSCAD)** **Joint-Integration of biological detection and identification capabilities (JSNBCRS)** **Joint-Light reconnaissance vehicle (JSNBCRS)** **Joint Automated detector of all known biological agents**	**Joint-Mobile stand-off detection, ranging, and mapping of chemical vapors and liquid (JSCWILD)** **Joint-Sensors for strategic recon; UAV mounted and long-range stand-off detection and identification of chemical liquid agents, wide area detection** **Joint-short-range (5 km) biological detection, ranging capabilities; air and ground platforms (BSDS)**
Warning and Reporting	**Joint -Initial automated warning and reporting interoperable with all Services, C4I (JWARN)**	**Joint-Integrated and automatic NBC warning and reporting: mission management (JWARN P3I)**	
Radiac	**Joint-Improved multi-function digital radiacs (MFR Set)** **Joint-Portable dose-rate gamma/beta radiation meter (AN/VDR-2)** Army-*Improved accuracy; digital radiation monitoring (AN/PDR-75; AN/PDR-77)* Army-*Compact, digital whole body radiation measurement (AN/UDR-13)*		Army-*Stand-off radiation detection and measurement* Army-*Airborne radiation detection and measurement*

1. Joint Service programs are highlighted in **BOLD**; Service unique efforts are *italicized.*
2. Where applicable, systems which meet requirements are listed following the entry.

Table 2-4. Contamination Avoidance RDA Efforts (Joint & Service Unique)

Category	Nomenclature	Status	USA	USAF	USMC	USN
Automatic Detectors and Monitors	- XM22 Automatic Chem Agent Detector (ACADA) /Automatic Vapor Agent Detector (AVAD)	RDTE	Rqmt	Rqmt	Rqmt	Interest
	- Shipboard Liquid Agent Detector (SALAD)	RDTE				Rqmt
	- Improved Point Detection System (IPDS)	RDTE				Rqmt
	- Chemical Agent Monitor (CAM)/ Improved CAM (ICAM)	Production	Rqmt	Fielded	Rqmt	Interest
	- JS Agent Water Monitor (JSAWM)	RDTE				
	--In-Line CB Detector (IL CBDWS)/Chemical Agent Water Monitor (CAWM)/CB Agent Water Monitor (CBAWM)	*	*Rqmt*	*Rqmt*	*Rqmt*	*Interest*
	- Joint Service Chemical Miniature Agent Detector (JSCMAD)	RDTE				
	--Individual Soldier Detector (ISD)/SOF Chemical Agent Detector (SOFCAS)/Individual Vapor Detector (IVD)/ Aircraft Interior Detector (AIDET)/Shipboard Chemical Agent Monitoring Portable (SCAMP)/CW Interior Compartment Systems (CWICS)/Improved Chemical Detection System (ICDS)/	*	*Rqmt*	*Rqmt*	*Rqmt*	*Rqmt*
	- Biological Point Detection					
	--Interim Biological Agent Detector (IBAD)	*				
	--Joint Bio Point Detection System (JBPDS)	RDTE		*Rqmt*		*Rqmt*
	--Biological Integrated Detection System (BIDS)	*	*Production*			*Rqmt*
	---Bio-Detector and Warning (BDWS)/ CB Agent Sample Kit (CBASK)/CB Mass Spectrometer	*	*Rqmt*	*Rqmt*	*Rqmt*	*Rqmt*
Stand-off	- M21 Remote Sensing Chemical Agent Alarm (RSCAAL)	Production	Rqmt		Fielded	
	- Joint Service Lightweight Stand-off Chemical Agent Detector (JSLSCAD)	RDTE				
	--Lightweight Stand-off Chemical Agent Detector (LSCD) /M21 Moving Background/Chemical Agent Remote Detection System (CARDS)/Stand-off Detector for Armor System Modernization (SD/ASM)	*	*Rqmt*	*Rqmt*	*Rqmt*	*Rqmt*
	- Joint Service Chemical Warning and Identification LIDAR Detector (JSCWILD)	RDTE				
	--Laser Stand-off Chemical Detector (LSCD)/Area Detection System (ADS)/Stand-off Detector (SD)/CB Stand-off detector (CBSD)	*	*Rqmt*	*Rqmt*		
	- Biological Stand-off	RDTE				
	--Long-Range Bio Stand-off Detection System (LRBSDS)	Production	*Rqmt*	*Interest*		*Interest*
NBC Recon	- Joint Service NBC Reconnaissance System (JSNBCRS)	RDTE				
	--XM93E1 NBCRS/CB Mass spectrometer (See BIDS)	*	*Rqmt*		*Rqmt*	
	--Light NBCRS/Lightweight Recon System (LWRS)	*	*Rqmt*		*Rqmt*	
Warning and Reporting	- Joint Warning and Reporting Network (JWARN)					
	- NBC Hazardous Warning System (HAZWARN)	RDTE	Interest	Interest	Rqmt	Interest
	- Multipurpose Integrated Chemical Agent Detector (MICAD)	RDTE	Rqmt	Interest	Rqmt	
	- ANBACIS	RDTE	Rqmt	Interest		Interest
Radiacs	- Multi-Function Radiac Set (MFR)	Fielded		Fielded		Rqmt
	- AN/UDR-13 Pocket Radiac	RDTE	Rqmt	Interest	Rqmt	
	- Stand-off Radiac	RDTE	Rqmt			
	- AN/VDR-2 Radiac Set	Production	Rqmt		Rqmt	
	- AN/PDR-75 Radiac Set	Production	Rqmt			

Rqmt= Service requirement Project XYZ= Consolidated Joint Service project
int-NIR= Service interest, no imminent requirement = Imminent Joint Service Effort
Rqmt, Interest= sub-product requirement or interest *= Sub-product(s) of a Joint project

Chemical Warfare Agent Contamination Avoidance

In the near-term, the Army and Air Force are pursuing an NDI Automatic Chemical Agent Detector (ACADA) for point detection of low level chemical agent vapors. ACADA is suitable for many vehicle mounted and man-portable applications. In the mid-term, the Army and Marine Corps have agreed to focus upon development of a Joint Service Light NBC Reconnaissance System (NBCRS). The proposed system will consist of a suite of detectors required for a specific mission which could be easily integrated into the platform of choice. Currently two configurations are proposed: a light and a medium version, to fulfill expeditionary and armored mission profiles, respectively. The FOX NBCRS would fulfill heavy requirement. The FOX NBCRS is being upgraded to include a chemical stand-off detection capability and other electronic improvements.

In the mid- to far-term, all four Services will develop the Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD). The system will be designed for standoff, on-the-move detection (5 km) of chemical agent vapors. The core system will weigh approximately 13 pounds and occupy approximately 1.3 cubic feet. The system may be modified to accommodate a variety of requirements. To date, a 360° x 60° scanner was developed for Armored Systems Modernization applications (tracked and wheeled vehicles), and the system was integrated into a gimbal for Marine Corps helicopters and UAV contamination avoidance roles. This system is also being considered by the Navy for shipboard use. The Army, Navy, and Air Force have also agreed to a Joint Service Chemical Warning and Identification LIDAR Detector (JSCWILD). The JSCWILD is a laser-based standoff detection system being developed to meet the requirements for the detection of chemical aerosols and vapors. Although this system is much heavier than its passive counterpart (JSLSCAD), it does provide the ability to detect chemical agents in all forms (liquids, vapors, aerosols) as well as mapping and ranging information. The Navy will be conducting a test for shipboard use. The Air Force's primary use for this system will be air base defense.

In the mid-term, the four Services are focusing chemical point detection requirements on the Joint Service Chemical Miniature Agent Detector (JSCMAD). The JSCMAD will represent a family of chemical point detection systems. This system will be considerably smaller and lighter than the ACADA and be configured for a variety of applications such as individual soldier detectors, shipboard chemical agent monitoring, special operations forces (SOF)applications, and aircraft interior detection. A requirement for an agent water monitor has been identified by the Army and Air Force. Joint program plans are being developed.

Biological Warfare Agent Contamination Avoidance

Currently, there are four efforts being conducted under the Joint Program Office for Biological Defense (JPO-BD): (a) the Interim Biological Agent Detector (IBAD); (b) the Joint Biological Point Detection System (JBPDS); (c) the Biological Integrated Detection System (BIDS); and (d) the Long Range Biological Stand-off Detection System (LR-BSDS). In the near-term, the Joint Bio Point Detection System (JBPDS) will meet each of the four Services' needs for a biological point detector. This system will be integrated on Service designated

platforms. IBAD is a sea-based detection system, while the BIDS is a ground -based system. The LR-BSDS is a helicopter mounted LIDAR system for the detection, ranging and tracking of biological aerosol clouds.

In the mid-term, the JPO-BD will develop Joint Biological Remote Early Warning capability to gain advanced warning of biological warfare attacks. In the far-term, the JPO-BD will develop an automated detector which can be used as a point or early warning detector to detect all Chairman, Joint Chiefs of Staff (CJCS) validated biological threat agents.

2.3.4 Warning and Reporting

Warning and reporting is a critical issue in contamination avoidance. The Services have agreed to expedite development of this capability by integrating ongoing hardware (MICAD) and software (HAZWARN and ANBACIS) into a Joint Warning and Reporting Network (JWARN). This network will be compatible with, but not duplicate, all C^4I equipment both current and developmental. Initial urgent requirements of software will be fielded. In FY99 a Warning and Reporting Network of hardware and software will be fielded. The system will then be continuously improved to provide increased management and control functions, as well as to integrate features of the emerging Global Command Control System (GCCS).

2.3.5 Service Unique Contamination Avoidance Programs

Various detection and warning requirements have unique mission profiles and technical specifications. While in some instances the development effort may leverage off the technical achievements of a closely related detection and warning project, the application beyond its intended mission is limited and accordingly has been designated as a Service-unique effort.

Navy

In the near-term, the Navy is developing the Improved (chemical agent) Point Detection System (IPDS). The detection system offers continuous operation and advanced detection sensitivities which do not respond to shipboard interferents and is not adversely effected by the high electromagnetic environment around ships. A Milestone III decision was achieved in 3QFY95. The Navy is also developing the Shipboard Automatic Liquid Agent Detector (SALAD). This shipboard system environment will be used to automatically detect and alarm in the presence of liquid chemical agents. By detecting automatically, it will minimize the sailor's exposure to contamination. As with the IPDS, it will offer continuous operation and advanced detection sensitivities which do not respond to shipboard interferents or interfere with naval electronics.

2.4 FORCE PROTECTION

When early warning is not possible or units are forced to occupy or traverse contaminated environments, protection provides life sustainment and continued operational

capability in the NBC environment. The two types of non-medical protection are individual and collective.

- ***Individual protection*** equipment (IPE) includes protective masks and protective clothing. Protective masks that improve compatibility with weapon sighting systems and reduce weight and cost are being developed. Technological advances are being pursued to produce mask systems that provide fully compatible vision capabilities, laser/ballistic protection, and further reduction in logistics burden. Protective clothing is being developed which will present less weight and heat stress burden than present equipment.

- ***Collective protection*** equipment includes shelters for command posts, rest and relief, vehicular collective protection, and safe zones aboard ship. Lightweight shelters with integrated environmental control and power generation capabilities are being developed. Technological improvements are being pursued to reduce weight and size to improve deployability. Technological improvements that reduce logistic and manpower requirements; *e.g.*, filter change frequency and shelter assembly and disassembly time are also being pursued.

2.4.1 Force Protection Science and Technology Efforts

2.4.1.1 Goals and Timeframes. The goals of the protection subarea are to maintain a high level of protection against CB warfare agents while reducing the physiological burden associated with wearing protective equipment; to integrate CB protection with protection from environmental, ballistic and other threats; and to provide a protective environment for personnel operating in aircraft, armored vehicles, ships, shelters and other large-area enclosures. See Table 2-5. To achieve these goals, physiological performance requirements key to the design and evaluation of clothing and respirators are being established. New barrier and filtration materials, and permeable fabrics to accommodate these performance requirements, are being developed and evaluated. Regenerative filtration materials and techniques that would virtually eliminate the need to replace collective filters are being explored.

Table 2-5. Force Protection Science and Technology Strategy

By 1996	By 2001	By 2006
• Demo mask with 50% reduced breathing resistance and 50% improved field of vision • Demo Joint Service Battle Dress Overgarment	• Demonstrate regenerative filter prototype • New chemical protective clothing, handware and footware materials transition to 21 CLW • Personal air conditioner backpack weighing less than 10 pounds	• Continuous Operations filter technology

2.4.1.2 Potential Payoffs and Transition Opportunities. Individual investments will result in improved respiratory and percutaneous protection with reduced physiological and psychological burden to the individual warrior. Improved air purification systems for collective protection applications will allow for extended operations enclosures in a CB contaminated environment

and reduce the logistics burden of filter exchange. Filtration technology has commercial application to the chemical industry and for automotive applications.

2.4.1.3 Major Technical Challenges. Integrating CB protection into future warrior systems necessitates tradeoffs between performance requirements and limitations of materials and designs. Integral respiratory protection requires tradeoffs between physiological performance parameters such as pulmonary function, field of view, speech intelligibility and anthropometric sizing against cost, size/weight, agent life and interfacing with other equipment. Integral CB protective clothing requires tradeoffs between minimizing thermal stress and moisture buildup against agent resistance, weight/bulk and power requirements of cooling systems. Air purification systems require tradeoffs with respect to size, weight and power requirements, as well as longer life and minimal environmental impact.

2.4.2 Force Protection Modernization Strategy

Forces cannot always avoid NBC hazards, therefore individual warfighting units must be provided materiel to protect them from the effects of these lethal agents. Protection must be effective against all known threats and not measurably degrade the performance of personnel, weapons, or equipment. Total NBC protective measures, which consist of individual and collective protection, allow our forces to maintain combat superiority in a contaminated environment. A summary of protection modernization requirements is provided in Table 2-6.

The goal of the protection RDA area is to provide equipment which allows US forces to operate in a contaminated NBC environment with minimal degradation of the warfighters' performance. The near-, mid-, and far-term project efforts are aimed at maintaining current protection levels while reducing physiological and logistical burdens. Table 2-7 provides an overview of Joint Service and Service unique individual and collective protection RDA efforts and Service involvement.

IPE consists of eye/respiratory and percutaneous protection: a mask with hood and protective garments, boots, and gloves. The IPE issued to US forces protects against all threat chemical agents. Its capabilities are routinely demonstrated with actual chemical agents in the Chemical Defense Training Facility (CDTF), US Army Chemical School, Ft. McClellan, Alabama.

Protective masks will be improved to provide greater user comfort and to reduce the breathing resistance currently encountered. Mask systems will require increased NBC survivability and compatibility with combat or personal equipment. Future respiratory systems, such as the A/P23P-14(V)N and the XM45, will require enhanced compatibility with both life support and tactical systems on fixed and rotary wing aircraft. In the future, the focus will be on integrated respiratory protective ensembles which offer optimal compatibility with personal, tactical and crew support systems.

Table 2-6. Force Protection Modernization Strategy (Joint & Service Unique)

	NEAR (FY96-99)	MID (FY00-04)	FAR (FY05-10)
Individual Eye/ Respiratory	**Joint -voice amplification; laser/ballistic eye protection; improved decontaminability, better comfort (M40A1/M42A1)** **Joint -Lightweight, expendable protection system (DERP) compatible with air crew life support systems** Army -*Aircrew mask compatible with sighting systems and night vision goggles (M48/49)* Army -*Improved compatibility with aviation sighting/night vision systems; protection against future threats agents (ACPM)(XM45)*	**Joint -Reduced physiological burden, improved comfort, enhanced optical and communications cooling** Navy -*Improved complete protection for all aircrews (A/P 23P-14(V)N)* Marine corps -*Light forces protective mask*	**Joint -Advanced Integrated Individual Soldier Protection system (Future Soldier System)** **Joint -Improved multiple agent protection** Army -*Integrated eye/respiratory protection with soldiers system (RESPO 21)*
Individual Clothing	**Joint -Advanced protective suit technology; lighter, improved agent and flame protection; reduced heat stress integrated with all respiratory and micro-climatic cooling systems (JSLIST)** **- Joint -Improved foot protection (MULO)** **- Joint -Improved hand protection (Improved GB Glove)** Army -*Improved protection with self contained breathing capability for special purposes (STEPO-I)*	**Joint -Improved protection, less burdensome protective suits; improved foot and hand protection/less burdensome (JSLIST II)**	**Joint -Integrated multiple threat modular protection (chemical, biological, environmental, ballistic direct energy and flame)** **Joint -Improved protection, less burdensome protective suits; improved foot and hand protection/less burdensome (JSLIST II P3I)**
Collective Systems	**Joint -Higher entry/exit rates, airlock for litter patients (M28)** **Joint -NBC protection for supplies (NBC Covers)** **Joint -CB Protection for tactical hospitals (DEPMED)** Air Force -*CB hardening for air transportable medical hospitals* (CHATH) Navy -*Backfit ships with contamination free protected zones (SACPS)* Navy - *Improved filters to extend filter life, reduce maintenance and reduce logistical burden* Marine Corps -*Protection for all combat vehicles and unit shelters* Army -*NBC protection for tactical Medical units (CBPS)*	**Joint -regenerable protective filtration (fixed & mobile platforms); reduces logistics burden, size, weight, power needs protects against future threat agents** Army -*Modular, reduced size, weight and power for vehicle/shelter collective protection (AICPS)* Army -*NBC protection for Integrated Command Post*	**Joint -Advanced protective filtration systems for Low Observable vehicles; light forces** Army -*Integrated regenerable filtration for vans, vehicles and shelters*

1. Joint Service programs are highlighted in **BOLD**, Service unique efforts are *italicized*.
2. Where applicable, systems which meet requirements are listed following the entry.

Table 2-7. Force Protection RDA Efforts (Joint & Service Unique)

Category	Nomenclature	Status	USA	USAF	USMC	USN
	INDIVIDUAL PROTECTION:					
Integrated	- 21st Century Warrior Land Warrior (21 CLW)	RDTE	Rqmt	Interest	Interest	Interest
Eye/ Respiratory	- MBU-19/P Aircrew Eye/respiratory Protection (AERP)	Production	Interest	Fielded	Interest	Rqmt
	- Disposable eye respiratory Protection (DERP)	RDTE	Interest	Rqmt	Interest	Interest
	- M48/49 Aircraft Mask	RDTE	Rqmt			
	- A/P 23P-14(V)N	RDTE			Rqmt	Rqmt
	- XM45 Aircrew Protective Mask (ACPM)	RDTE	Rqmt	Interest	Interest	Interest
	- RESPO 21	RDTE	Rqmt	Interest	Interest	Interest
	- M40A1/M42A1	Production	Rqmt		Rqmt	
	- MCU-2A/P	Production		Rqmt		Rqmt
Ancillary Equipment	- Protection Assessment Test System (PATS)	Production	Rqmt	Interest	Fielded	Interest
	- Voice Communication Adapter	Production	Rqmt	Rqmt	Fielded	Rqmt
Battlefield Productive Suits	- CB Protective Overgarment Saratoga	Production	Interest		Fielded	Interest
	- Chemical Protective Undergarment (CPU)	Production	Rqmt		Int-NIR	
	- Aircrew Uniform Integrated Battlefield (AUIB)	Production	Rqmt		Int-NIR	
	- Joint Service Lightweight Integrated Suit Technology (JSLIST)	RDTE				
	-- Enhanced AUIB	*	Rqmt			Interest
	-- Lightweight CB Protective Garment	*	Rqmt	Interest		Interest
	-- Vapor Protective Flame resistant Undergarment (VPFRU)	*	Rqmt		Interest	
	-- Advanced Battle Dress Overgarment (ABDO)	*	Rqmt		Rqmt	Interest
	-- Advanced Chemical Protective Garment (ACPG)	*				Rqmt
	-- Multipurpose Overboot (MULO)	*	Rqmt	Rqmt	Rqmt	Interest
	-- Improved CB Protective gloves	*	Rqmt	Interest	Rqmt	Interest
	-- Groundcrew Ensemble (GCE)	*	Rqmt	Rqmt	Rqmt	
	-- CB Protective Firefighter Ensemble (FFEN)	*	Rqmt	Rqmt		
	-- Firefighter suit-Combat (FIS-C)	*	Rqmt			
Specialty Suits	-Suit Contamination Avoidance Liquid Protection (SCALP)	Production	Rqmt			
	- Interim-Self Contained Toxic Environment Protective Outfit (STEPO -I)	Production	Rqmt			
	- Improved Toxicological Agent Protective (ITAP)	RDTE	Rqmt	Rqmt	Interest	Interest
	COLLECTIVE PROTECTION					
Collective Protection Equipment	- CB Protected Deployable Medical Systems (DEPMEDS)	Production	Rqmt	Rqmt	Interest	Int-NIR
	- Chemically Hardened Air transportable Hospital (CHATH)	RDTE	Int-NIR	Rqmt		
	- M20A1/M28 Simplified CPE	Production	Rqmt			Int-NIR
	- Standardized Integrated Command Post System and Tent (SICPS) and SICPS P^{3}I	RDTE	Rqmt			
	- CB Protected shelter (CBPS)	RDTE	Rqmt		Interest	
	- Advance Integrated Collective Protective System (AICPS) for Vehicle, Vans, and Shelters	RDTE	Rqmt		Interest	Interest
	- Selected Area Collective Protection System (SACPS)	Production				Rqmt
	- Shipboard Collective Protection System (CPS)	Production				Rqmt
	- Improved Shipboard CPS	RDTE	Interest	Interest		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

Future protective clothing ensembles will be required for land, sea, air, and marine forces to achieve reductions in bulk and weight without any loss of protection or durability. To satisfy these needs, the four Services have consolidated their mission specific requirements into a first truly joint evaluation program for the next generation chemical garments--the Joint Service Lightweight Integrated Suit Technology (JSLIST) program. New accessories, such as gloves and footwear, are also required to execute missions and tasks which require greater tactility and traction. Similarly, clothing systems for Explosive Ordnance Disposal (EOD) personnel are required to enhance existing cooling and chemical protection systems without undue physiological burdens.

Collective protection equipment (CPE) development efforts are focused on NBC protection systems at the crew, unit, ship, and aircraft level which are smaller, lighter, less costly and more easily supported logistically. New systems are required to make "clean" environments more available for critical operations (*i.e.*, where IPE otherwise places an unacceptable burden upon the Service member in performing duties) and for essential rest and relief. Modernization concentrates on: (1) improved air filtration methodologies, (2) advanced technologies integrated into power and ventilation for systems that offer a significant improvement in logistics, (3) applications on essential vehicles, vans and shelters (4) improvements to current shipboard filters to extend filter life, and (5) benefit applications on essential spaces on Navy ships. Efforts are in place to support major weapons systems developments such as the V-22 Osprey, the Comanche, and Armored Systems Modernization.

2.4.3 Joint Service Force Protection Programs

Joint programs are shown in Table 2-6 as bolded entries. A detailed description of Joint IPE and CPE programs is at Annex B.

Individual Protection

Eye/Respiratory. The M40 and M42 masks (for individuals and armored vehicle crewmen, respectively) are undergoing the final stages of fielding to replace their M17 and M25 series counterparts. The new masks offer increased protection, improved fit and comfort, ease of filter change, and better compatibility with weapon sights, and a second skin which is compatible with Army and Marine Corps protective ensembles. The second skin design also is being reviewed by the Navy and Air Force for potential adoption. The Army and Marines are also fielding the Protection Assessment Test Systems (PATS) to provide users of the M40 and M42 mask with a rapid and simple means for validating the fit and function of the mask to ensure readiness. The Navy and Air Force are evaluating the feasibility of utilizing PATS with its MCU-2/P series mask.

The Navy, in coordination with the Marine Corps, is leading an effort to equip all forward deployed fixed and rotary wing aircrew with improved chemical, biological, and radiological (CBR) protection. The CBR ensembles will feature off-the-shelf items, such as the A/P23P-14(V)N respirator assembly. The Army, in cooperation with the Marine Corps, has just completed a product improvement program for the M40 series mask. The Air Force continues to

field Aircrew Eye-Respiratory Protection (AERP) systems to protect aircrews from CB hazards. This system compliments the recently fielded lighter weight aircrew ensemble. Fielding of the M40 series masks for the Army and Marine Corps is currently underway.

Mid- and far-term, research is focused on improved charcoals and filtering technologies, as well as improved masks for light and special operations forces (SOF). Far-term plans include the RESPO 21, which will provide improved eye-respiratory, and face protection against current and future agents. It will maximize compatibility with future weapon systems, be lightweight, and offer modular facepieces to accommodate a variety of mission profiles.

Clothing. In the area of full body protection, the JSLIST is underway to coordinate the selection of advanced technology chemical protective materials and prototype ensembles. The program originated as a US Marine Corps 6.2 and 6.3 demonstration of chemical protective materials and garment designs. In August 1992, the Service Project Managers for chemical protective clothing agreed to combine their programs, using the initial Marine Corps data base and other R&D efforts. Requirements for chemical protection, durability, heat stress reduction, launderability, concept of use and flame protection vary by Service and mission.

The clothing systems will utilize new material technologies from both domestic and foreign sources and material components used in the designs can be varied to support Service unique requirements. There will be one overgarment design, one design for a primary garment, and an undergarment design. The scheme will minimize the number of suits and maximize inter-Service compatibility.

Merging development efforts will eliminate unnecessary duplications and allow each Service to leverage those technologies which offer the best merit and performance. Materials which meet Services' requirements will be placed on a qualified materials list to encourage multi-source competition and to provide surge capability. Variations in suit design will be minimized to gain economies of scale in production and a vital industrial base.

The Army, in coordination with the other Services, and as a part of JSLIST, is conducting a development project for a Multipurpose Overboot to replace the current black vinyl overboot with a boot that has greater durability, better traction on all surfaces and improved protection. A similar effort is underway for an Improved CB Protective glove which will have better tactility and protection. Both project schedules are being executed in parallel with the JSLIST program.

In the mid-term, the Army in coordination with the other three Services, is developing an Improved Toxicological Agent Protective (ITAP) ensemble for EOD and depot operations in Immediate Danger to Life and Health (IDLH) contamination concentrations. The ITAP will incorporate improvements in material and design and includes a one-hour supplied air bottle systems which can be switched to a filtered air respirator when operators exit the area of high contamination. A Personal Ice Cooling System (PICS) is being developed for use with the ITAP. The ITAP and PICS will be Joint Service programs. In addition, the Army is working with the Air Force on a chemical protective firefighter's suit leveraging the technology from the

JSLIST program. Detailed system requirements and program plans are currently being coordinated among the Services.

In the far-term, efforts will focus on integrated protection for "The 21st Century Land Warrior System." This next generation technology will be directed toward integrating CB protection into a system which will also provide environmental, ballistic, directed energy and flame protection, as well as reduced physiological burden. A strong emphasis on supporting technologies must continue. Materials that detoxify a broad range of chemical and biological agents on contact, and can be incorporated into fibers, fabrics and semi-permeable membranes are being developed using biotechnology as well as the more conventional approaches.

Collective Protection

The Services are fielding the NBC Protective Shelter for Tactical Medical Unit (DEPMEDS) to significantly improve our medical readiness (Chapter 3) and developing the Chemical/Biological Protective Shelter (CBPS) to provide clean areas for selected combat and combat support personnel.

Near-term collective protection efforts, such as the Advanced Integrated Collective Protection System (AICPS) will provide protection against future CB threats and offer size, weight, and energy reduction. They will also provide transportability and maintainability enhancements and decrease system set-up times. The Navy ICPS will increase the shipboard filter life (from the current one or two years) to at least a three year Service life, providing millions of dollars of cost savings over the next five years.

2.4.4 Service Unique Force Protection Programs

Service unique programs are shown in table 2-6 as italicized entries. A detailed description of the Service Unique IPE and CPE projects is presented in Annex B.

Individual Protection

Eye/Respiratory. The Army is developing the M48/49 protective masks to replace the M24 aviator mask as a product improvement to the M43 mask. The M48 will be for Apache pilots and the M49 for general aviator use. They will be lighter and offer enhanced protection and compatibility with night vision and aircrew system. The Air Force has developed the Disposable Eye/Respiratory Protective (DERP) Mask for short term and emergency uses.

In the mid-term, the Army will replace the M43 mask for the general aviator with the Aircrew Protective Mask, XM45. The XM45 will be lighter and less expensive than the M43 and feature CB protection without the aid of force ventilated air.

Clothing. The Aircrew Uniform Integrated Battlefield (AUIB) and the Chemical Protective Undergarment (CPU) are approved for procurement. The AUIB is a flame resistant

CB protective uniform which is lighter and less bulky than previous ensemble configurations. The CPU, which has been adopted by armor crews, is worn under the Nomex coverall.

The Army has also completed fielding the Interim-Self-Contained Toxic Environment Protective Outfit (STEPO-I). The STEPO-I was introduced for limited EOD and depot operations in contamination concentrations which are of Immediate Danger to Life and Health (IDLH).

Collective Protection

The ***Air Force*** has recently introduced the Chemically Hardened Air Transportable Hospital to enhance medical readiness. The ***Army*** has introduced the M20A1/M28 Simplified CPE to provide CB protection and environmental control to existing structures. The new simplified CPE provides liquid agent resistance and allows for expansion of the protected area.

The ***Navy*** now includes the Collective Protection System (CPS) on all new construction ships. Currently the DDG-51, LHD-1, AOE-6 and LSD-41 ship classes are being built with CPS. The Navy also has the capability to backfit CPS on ships already in Service. The Selected Area Collective Protective Systems (SACPS) is currently being installed on selected LHA-1 class ships. CPS utilizes special filters to remove NBC contaminants from the atmosphere. Air inside the zone is maintained at a higher pressure than the outside air to prevent leakage of contaminants into the protected zone. In the mid-term, the Navy is designing the V-22 Osprey to be the first Naval aircraft to incorporate CBR protection for both aircrew and passengers. The ability to provide a pressurized, contamination free environment is a design requirement.

2.5 DECONTAMINATION

When contamination cannot be avoided, personnel and equipment must be decontaminated to reduce or eliminate hazards after NBC weapons employment. Decontamination systems provide a force regeneration capability for units that become contaminated. Modular decontamination systems are being developed to provide decontamination units with the capability to tailor their equipment to specific missions. Technological advances in sorbents, coatings, catalysis, and physical removal will reduce logistics burden, manpower requirements and lost operational capability associated with decontamination operations. The following sections detail CB decontamination science and technology efforts, modernization strategy, and Joint and Service unique programs.

2.5.1 Decontamination Science and Technology Efforts

2.5.1.1 Goals and Timeframes. The goal of decontamination RDA is to develop technologies that will eliminate toxic materials without performance degradation to the contaminated object and with being environmentally safe. See Table 2-8. This area includes decontamination of personnel, individual equipment, tactical combat vehicles, and facilities. The current decontamination technologies being pursued include enzymes, catalysts that improve reactivity, decontaminants that are effective in both fresh and brackish water, reactive coatings, and

improved reactive sorbents. Contamination control involves investigating procedures that minimize the extent of contamination pickup and transfer, and maximize the ability to eliminate the contamination pickup on-the-move as well as during decontamination operations.

Table 2-8. Decontamination Science and Technology Strategy

By 1996	By 2001	By 2006
• Demo improved sorbents • Aircraft Interior Decon procedures (non-system)	• Sensitive Equipment Decon Systems • Improved decon material to replace DS 2	• Demonstrate environmentally safe, sensitive equipment and decon materials • Demonstrate enzymatic decon • New self-decontaminating materials

2.5.1.2 Potential Payoffs and Transition Opportunities. The payoff from enhanced decontamination materials and systems will be new non-corrosive, non-toxic, non-flammable, and environmental safe decontamination systems suitable for a timely elimination of CB agents from all materials and surfaces. This ability will allow the forces to reconstitute personnel and equipment more quickly to increase combat efficiency and lessen the logistic burdens. Reactive coatings may, in the future, allow the continuation of combat operations without the need to disengage for decontamination. Dual use potential for environmental remediation, especially those dealing with pesticide contamination, is being exploited.

2.5.1.3 Major Technical Challenges. There is no suitable technology to decontaminate avionics or electronics. The technical difficulties associated with this effort have been increasing the activity of the decontaminants and developing systems that effectively clean all surfaces and materials, are non-corrosive, and are environmentally safe. Reduction of the manpower and logistics burden of decontamination also remains a significant challenge.

2.5.2 Decontamination Modernization Strategy

Decontamination systems provide a force regeneration capability for units that become contaminated. 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, and safety burdens. To improve capabilities in this functional area, the Joint Services place emphasis upon new decontaminating technologies which reduce existing manpower and logistics requirements. They are safer on the environment, the warfighter, and equipment. Table 2-9 shows the roadmap for modernizing decontamination systems in DoD.

The goal of the NBC decontamination program area is to provide technology which removes and detoxifies contaminated material without damaging combat equipment, personnel, or the environment. Research and development of non-corrosive, all-agent multipurpose decontaminants and decontaminating systems for combat equipment, aircraft, personal gear, and skin remains a priority. Alternative technologies, such as sensitive equipment decontamination methods and large scale automated decontamination systems, and catalytic coatings and

sorbents, attract strong interest across the four Services. Table 2-10 provides an overview of Joint Services and Service Unique RDA efforts and Service involvement.

Table 2-9. Decontamination Modernization Strategy (Joint & Service Unique)

	NEAR (FY96-99)	MID (FY00-04)	FAR (FY05-10)
Skin and Equipment Decontam-inants	**Joint -Less Caustic and Damaging to Equipment (M291/M295)**	**Joint -Non-caustic, non corrosive decontaminate for personnel and equipment** Army-*Higher efficiency decon methods (Sorbent Decon)* Navy- *Less caustic capability*	
Bulk Decontam-inants	**Joint -Non-caustic, non-corrosive easy to store multipurpose decontaminants**	Army -*environmentally acceptable replacement for DS-2* Navy -*Enzymes for chemical agent decontamination*	Navy -*Contamination resistant shipboard materials*
Expedient Delivery Systems		**Joint -Auto-releasing coatings; reduces skin contact hazard & labor requirements**	**Joint -Self-decontaminating auto releasing coatings; reduces man-power and logistic requirements eliminates skin, contact hazard** Army -*Advanced non-aqueous self-strip coating to reduce water and labor requirements*
Deliberate Delivery Systems	**Joint -High pressure water wash; mechanical scrubber; improved decontaminate dispenser (increased vehicle throughput)** Army -*High pressure hot water washing and decontaminate scrubber capability; reduced water, labor, and logistic burden (Modular Decon System)*	**Joint - Non-aqueous capability for electronics, avionics and other sensitive equipment**	**Joint -Rapid large scale automated decon capability; reduced manpower and logistic burden** **Joint -Vehicle interior decon capability** Army -*Waterless decon capability for electronics and avionics*

1. Joint Service programs are highlighted in **BOLD** while Service unique are *italicized.*
2. Where applicable, systems which meet requirements are listed following the entry.

Table 2-10 Decontamination RDA Efforts (Joint & Service Unique)

Category	Nomenclature	Status	USA	USAF	USMC	USN
Personnel	- M295 Individual Equipment Decontaminating Kit	Production	Fielded	Interest	Interest	Interest
Combat Equipment, Vehicles, and Aircraft	- M17A2/A3 Lightweight Decontamination System	Production	Fielded	Interest	Fielded	Interest
	- XM21/XM22 Modular Decontamination System (MDS)	RDTE	Rqmt	Int-NIR	Int-NIR	Int-NIR
	- M17 Diesel Lightweight Decontamination System	RDTE		Int-NIR	Rqmt	Interest
	- Decontamination of Sensitive Equipment	RDTE	Rqmt	Interest	Interest	Interest
Decontaminant Solutions and Coatings	- Sorbent Decontamination System	RDTE	Rqmt	Interest	Rqmt	Interest
	- Joint Chem-Bio Decon	RDTE	Rqmt	Interest	Interest	Interest

Rqmt = Product Requirement
Interest = Product Interest
Int-NIR = Product Interest, No Imminent Requirement

* = sub-Product(s) of a Consolidated Joint Service Project
Rqmt, Interest = Sub-Product Requirement or Interest

2.5.3 Joint Service Decontamination Programs

The Army has developed the M291 skin decontamination kit as a replacement to the M258A1 decontamination kit for all Services, and is currently introducing the M295 for improved personal equipment decontamination. The M295 provides the warfighter a fast and non-caustic decontamination system for personal gear. The Army and Marine Corps will be the first Services to field the M295.

In the near- and mid- term, DoD continues to research new multi-purpose decontaminants as a replacement for bulk caustic Decontamination Solution 2 (DS2) and corrosive Super Tropical Bleach (STB). New technologies, such as sorbents and enzymatic foams are being explored and may offer operational, logistics, cost, safety, and environmental advantages over current decontaminants. It should be noted that present shipboard chloride based decontaminant solutions pose an unacceptable corrosion risk to Naval aircraft. Current procedures require the use of fresh water and normal aircraft detergent solutions.

In the far-term, the Services are seeking non aqueous decontamination systems to provide for sensitive equipment decontamination at mobile and fixed sites. Additionally, there is interest and research in self-stripping coatings which can reduce or eliminate the necessity of manual decontamination. A detailed description of the Joint Service decontamination projects is presented in Annex C.

2.5.4 Service Unique Decontamination Programs

In the near- and mid- term, the Army is developing the Modular Decontamination Systems (MDS) to enhance vehicle and crew weapon decontamination. The MDS will support deliberate decontamination for ground forces and possess mechanical scrubbing and improved decontaminant dispensing capabilities. It will also offer a reduction in size, weight, logistics burden, and workload requirements over existing decontamination systems. Similarly, the Marine Corps is exploring alternative man-portable decontamination systems and is considering the feasibility of converting the gasoline powered M17 Lightweight Decontamination System (LDS) with a lightweight diesel engine. A detailed description of the Service Unique decontamination project efforts is presented in Annex C.

2.6 NON-MEDICAL CB DEFENSE REQUIREMENTS ASSESSMENT

*** No technologies or methods are currently available for large area decontamination. Investigations are planned over the next year to determine whether large area decontamination is feasible, and if so, whether it is required. Over the past year, the Services have worked together to improve the Joint orientation of NBC defense requirements. The work being accomplished will positively impact the equipment fielded in the near future. More emphasis needs to be placed on the Warfighting CINCs' requirements as input for equipment research and development. This is necessary to ensure that future equipment meets the needs of the Joint battlespace environment.**

Areas of concern which are addressed under the management improvement initiatives include the following:

- Focusing and prioritization of chemical and biological detector programs to ensure that resources are leveraging the most promising technologies and are not diluted by excessive Service unique requirements.

- Developing advanced individual protection ensembles which minimally degrade an individual's performance for all tasks performed in contaminated environments.

- Identifying Joint and Service unique requirements for collective protection programs.

- Determining adequacy of funding for advanced decontamination systems, and review of requirements for large scale decontamination systems.

CHAPTER 3

MEDICAL NUCLEAR, BIOLOGICAL, CHEMICAL WARFARE DEFENSE REQUIREMENTS AND RESEARCH AND DEVELOPMENT PROGRAM STATUS

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3.1 REQUIREMENTS

DoD maintains a robust medical research and development program for NBC defense. This program has resulted in the fielding of numerous products to protect and treat service members. The DoD program to stockpile biological defense products has been smaller than the chemical defense effort, but has received greater emphasis in the past two years.

Specific initiatives programmed to improve NBC medical readiness include:

- **Continued emphasis on NBC medical countermeasures research**
- **A biological defense immunization policy**
- **Medical collective protection**
- **Enhanced medical diagnosis of exposure to agents**

Chemical warfare agents include vesicants, nerve, blood and respiratory agents, while biological agents include bacteria, viruses, rickettsia, toxins, and physiologically active compounds. The nuclear threat includes the use of a single or small number of crude nuclear weapons as well as conventional explosive devices mated with intensely radioactive sources.

Technology Barriers: It is not always possible to evaluate the efficacy of countermeasures for CB agents in personnel. Future threats may involve genetically engineered biological weapons that may be easily produced, highly lethal, difficult to detect, and resistant to conventional therapies.

Challenges in the Medical NBC Warfare Defense Programs

Medical prophylaxis, pretreatment, and therapies are necessary to protect personnel from the toxic or lethal effects of NBC threat agents. DoD has fielded a number of medical countermeasures, which greatly improve individual medical protection and treatment, and diagnosis.

DoD complies with all Food, Drug and Cosmetic Act requirements. The Food and Drug Administration (FDA) has traditionally required large-scale field trials in man to demonstrate efficacy of drugs and biologicals prior to licensure. There are, however, legal and ethical constraints that preclude such efficacy studies for CW and BW countermeasures. Field studies of efficacy cannot be performed, since exposure to CBW agents does not occur naturally. The high lethality and/or toxicity of CB agents also makes it unethical to perform the controlled human efficacy studies usually required by the FDA for product licensure (*e.g.*, tests of effectiveness of the product against the threat in humans). For these reasons, many CB countermeasures are likely to remain in Investigational New Drug (IND) status. IND products must be administered under provisions of an approved protocol and with written informed consent. In contingency situations, the DoD can request a waiver from the FDA from the requirement for written informed consent. DoD continues to work with the FDA to ensure that all DoD products are safe, efficacious, and available to the soldier when needed.

The medical NBC defense research programs discussed in this section are divided into chemical, biological, and nuclear areas of research. Table 3-2, at the end of this chapter, provides a summary of the medical NBC defense programs and planned modernization program over the next fifteen years.

3.2 MEDICAL CHEMICAL DEFENSE RESEARCH PROGRAM

The mission of the Medical Chemical Defense Research Program (MCDRP) is to preserve combat effectiveness by timely provision of medical countermeasures in response to Joint Service CW defense requirements. Detailed descriptions of the MCDRP are in Annex D (Section D.1).

3.2.1 Goals

- **Maintain technological capability to meet present requirements and counter future threats:**
  - Determine sites, mechanisms of action, and effects of exposure to chemical warfare agents with emphasis on exploitation of neuroscience technology and dermal pathophysiology
  - Identify sites and biochemical mechanisms of action of medical countermeasures
  - Exploit molecular biology and biotechnology to develop new approaches for medical countermeasures
  - Exploit molecular modeling and quantitative structure-activity relationships supporting drug discovery and design

- **Provide individual-level prevention and protection to preserve fighting strength:**
  - Develop improved prophylaxis, pretreatment, antidotes, and therapeutic countermeasures
  - Develop skin protectants and decontaminants
  - Identify factors that influence safety and efficacy properties of candidate countermeasures
  - Develop and maintain preformulation, formulation, and radiolabeling capabilities

- **Provide medical management of chemical casualties to enhance survival and expedite and maximize return to duty:**
  - Develop concepts, and recommend therapeutic regimens and procedures for the management of chemical casualties
  - Develop diagnostic and prognostic indicators for chemical casualties
  - Develop life-support equipment for definitive care

3.2.2 Objectives

The objectives of the program differ with the varying threats:

- For **vesicant agents** the objective is to develop a pathophysiological data base on vesicant chemical agents and develop a working hypothesis on how damage occurs at the cellular level. Used with associated technologies, this approach will enable the formulation of definitive pretreatment and treatment strategies, and is expected to produce a realistic concept for medical prophylaxis, immediate post exposure therapy and topical protection.

- For **nerve agents** the objective is to field a safe and effective advanced anticonvulsant nerve agent antidote, and develop and field a more effective enzyme reactivator for use with the Mark I kit.

- For **blood agents** the objective is to develop and field a safe and effective cyanide pretreatment.

- For the **respiratory agents** the objective is to develop approaches to prophylaxis and therapy by understanding pathophysiological changes after agent exposure.

3.2.3 Threats, Countermeasures, Technical Barriers, Status, and Accomplishments

The classical threat categories include: blister/vesicant agents (*e.g.*, sulfur mustard [HD] and lewisite), nerve agents (*e.g.*, soman [GD], VX), blood agents (*e.g.*, cyanide), and respiratory agents (*e.g.*, phosgene). The threats, however, are not restricted to commonly accepted classical agents. Novel agents may be developed by potential adversaries. Additionally, current threats include the possibility of the use of combinations of chemical agents with other chemical agents, biological agents or nuclear weapons. The ability to provide timely and effective medical countermeasures to new threats depends upon maintaining a high level of technological capability.

The countermeasures 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 to preserve and sustain combat effectiveness in the face of combined threats from chemical and conventional munitions on the integrated battlefield by:

- Prevention of the effects of chemical agents (*e.g.*, pretreatments, prophylaxis, topical protectants);
- Far-forward treatment upon exposure to chemical warfare threats (*e.g.* antidotes),
- Chemical casualty care (*e.g.*, diagnosis, therapy and management).

3.3 MEDICAL BIOLOGICAL DEFENSE RESEARCH PROGRAM

The mission of the Medical Biological Defense Research Program (MBDRP) is to develop medical countermeasures to deter, constrain, and defeat the use of biological agents against US Forces (DoD Directive 5160.5, May 1985). Annex D (Section D.2) and Annex E contain detailed descriptions of the MBDRP.

3.3.1 Goals

- Protecting U.S. forces' war fighting capability during a biological attack.
- Reducing vulnerability to validated and novel threats by maintaining a strong technology base. The program is directed against agents of biological origin that are validated military threats, but can adapt to newly identified threats.
- Providing medical management of biological warfare casualties.

3.3.2 Objectives

In accomplishing the goals of the MBDRP, efforts are focused on three objectives (see also Table 3-1 for descriptive summaries of medical biological defense countermeasures):

- Prevent casualties with medical countermeasures (through the use of vaccines, toxoids, drugs, and other medical treatments);
- Diagnose disease (through the use of forward deployable diagnostic kits and confirmation assays); and
- Treat casualties to prevent lethality and maximize return to duty (through the use of antitoxins drugs, and other medical treatments).

In addition to requirements derived from Army sources, the MBDRP must respond to requirements of other Services as specified in the Joint Service Agreement.

3.3.3 Threats, Countermeasures, and Technical Barriers

A biological threat agent is defined as a living micro-organism or toxin that can cause disease or death in humans and be intentionally disseminated. Principal threats include protein toxins, bacterial agents, viral agents, and neuroactive compounds. The ease and low cost of producing a biological agent; the difficulty in detecting its presence and protecting (and treating) its intended victims; and the potential to selectively target humans, animals, or plants conspire to make defense against this class of weapon particularly difficult. Biological agents can produce casualties over an area of thousands of square kilometers. Biological agents can also be used with devastating effect in combination with nuclear, chemical, or conventional weapons.

Table 3-1. Medical Biological Defense Countermeasures

VACCINES

- *Live, attenuated vaccine.* A vaccine produced by altering the genetic information controlling infectivity or replication of the threat organism. The altered organism can be safely inoculated into humans when formulated into a vaccine.
- *Vectored vaccine.* A portion of the genetic information of a biological threat agent is introduced into an organism (the vector) that does not cause disease in man. A vector organism may provide protection against both the vector and the biological threat agent.
- *Synthetic vaccine.* A bioengineered protein or naked gene from a threat organism that is not toxic nor capable of replication. The bioengineered product will provide protective immunity similar to the natural agent.
- *Microencapsulated vaccines.* Vaccines incorporated into a chemically defined matrix that allows for vaccine time release and vaccine delivery to target organs within the body.

TREATMENT

- *Human monoclonal antibodies.* Use molecular genetics to produce large quantities of human monoclonal antibodies (the body's natural defense against disease) against biological threat agents. The human monoclonal antibodies will be used to treat battlefield casualties.
- *Cytokine strategies.* Cytokines are biologically active soluble factors which modulate the behavior of other cells in the body. The ability to control the cytokine response will allow medical personnel to treat some biological threat agents.

DIAGNOSTIC TECHNOLOGIES

- *Immunological technologies.* These tests are easy to use, compact, rapid (minutes) and require no logistic support. These tests are currently used in out-patient clinics and doctor's offices.
- *Nucleic acid technologies.* Nucleic acid tests, specifically the polymerase chain reaction (PCR), are extremely sensitive and specific. Nucleic acid tests identify the disease causing organism by its genetic signature.

Critical elements of Medical Biological Defense include the ability to rapidly identify an agent and the ability to provide prophylactic and/or therapeutic protection from the agent. Often, the most effective countermeasure is pre-deployment active immunization.

The current MBDRP includes the following research areas for the development of medical countermeasures:

- Characterize biochemistry, physiology and morphology of biological threat agents;
- Define the molecular biology of the threat agent;
- Investigate the pathogenesis and immunology of the disease;
- Determine the mechanism of action of the threat agent in a model system;
- Define the sites and mechanisms of action of candidate solutions;
- Establish safety and efficacy data for candidate solutions;
- Demonstrate the validity of candidate solutions.

Technical deficiencies in the private sector include the lack of highly regulated containment facilities to support biological defense research and scientific expertise in biological defense. These factors restrict the depth of expertise, facilities and support available. This has become a critical issue in light of personnel and programmatic downsizing initiatives, and the additional emphasis that is being placed on out-sourcing MBDRP work. The technological and scientific basis for biological defense can be quickly eroded.

3.4 MEDICAL NUCLEAR DEFENSE RESEARCH PROGRAM

The mission of the Medical Nuclear Defense Research Program (MNDRP) is to conduct research in the field of radiobiology and related matters essential to the support of the Department of Defense and the Military Services.

3.4.1 Goals

- Sustain combat capability, increase survival, and minimize short- and long-term health problems associated with ionizing radiation alone and in combination with other weapons of mass destruction.
- Address operational requirements that require expertise in either radiation biophysics or biology.
- Maintain core of expertise to meet current research requirements and to counter future threats.

3.4.2 Objectives

The objectives of this program are to maintain a coherent radiobiology research program that addresses every aspect of military medical operational requirements for dealing with radiation injuries. This includes programs in casualty management, prevention of radiation injury, maintenance of performance, and radiation hazards assessment.

3.4.3 Threats, Countermeasures, and Technical Barriers

The most likely nuclear scenarios are those involving the deployment of relatively low-yield nuclear devices targeted at either a military installation or a sensitive political target (*e.g.*, the seat of government or large population center). In such scenarios, personnel can be expected to be exposed to the prompt radiation of the initial event as well as to chronic exposures resulting from the residual radioactive contamination. Because the nuclear weapons inventories of our adversaries are expected to be small, it is possible that the number of nuclear weapons deployed will be small and that they will be augmented by the use of larger stockpiles of biological or chemical agents.

A fundamental limitation to an effective medical response on a nuclear battlefield has historically been the incompatibility between the requirements of sophisticated medical response strategies and the huge scale of the casualties expected in massive exchange. However, if the attack is limited to one or at worst, a small number of events, the ability to provide intensive,

sophisticated medical and other support is highly credible because of the availability of uncompromised treatment/research centers and medical evacuation capabilities.

The ability to provide a credible medical response to a nuclear event depends on the availability of appropriate therapeutic strategies, trained medical personnel, and advanced treatment facilities; all of which are currently available. The ability to sustain and improve these capabilities within DoD depends on maintaining a core of scientific radiobiology talent that continues to address these issues.

The primary technical barriers are:

- extending advanced treatment strategies from blood-forming organs to the gut;
- examining dose rate effects, with an emphasis on chronic exposures associated with operations in heavily contaminated areas;
- addressing combined effects scenarios such as the toxicological and radiological effects of depleted uranium munitions wounds.

Table 3-2. Medical NBC Defense Programs and Modernization Strategy

	NEAR (FY96-98)	MID (FY99-03)	FAR (FY04-09)
Medical - Biological Defense	Polyclonal antibody therapy Genetically engineered vaccines	Mouse-Human monoclonal antibody therapy Drug therapy for toxins Proteosome delivery	Nucleic acid therapy Multi-agent vaccines
Medical - Chemical Defense	Multi-chambered Autoinjector Topical Skin Protection Establish feasibility of Catalytic Pretreatments for Nerve Agents	Advanced Anticonvulsant Nerve Agent Antidote System (NAAS) Cyanide pretreatment	Catalytic Scavengers for Broad Range of CW Agents Reactive Topical Skin Protectant
Medical - Nuclear Defense	Identification of cytokine for platelets Improved anti-emetic strategies Pharmacological approach to synapse deficits	Combination immunomodulator therapies New generation immunomodulators for multi-organ injuries Cognitive performance enhancing pharmaceuticals	Molecular strategies to reduce radiation-induced cancer/ mutation

3.5 MEDICAL R&D REQUIREMENTS ASSESSMENT

*** DoD lacks adequate vaccines to protect US military forces.**

***SOLUTION*:** Procure and stockpile sufficient quantities of vaccines needed to inoculate US forces in accordance with DoD Directives. In FY96, DoD will release a request for proposal to obtain a prime systems contract for the acquisition of vaccines. In addition, DoD will complete an assessment of vaccine requirements and update vaccination policy for U.S. forces in order to define the cost and scope of the program.

CHAPTER 4

NUCLEAR, BIOLOGICAL AND CHEMICAL WARFARE DEFENSE LOGISTICS STATUS

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4.1 INTRODUCTION

Nuclear, biological and chemical (NBC) defense logistics support is a critical area that requires extensive coordination and integration. Two Joint organizations exist to coordinate actions in this area: the Joint Services Coordination Committee for Chemical Defense Equipment (JSCC-CDE) and the Joint Service Materiel Group (JSMG). The JSCC was chartered under the Joint Priorities and Allocations Board (JMPAB) during Operation Desert Shield/Storm. The JSMG was established by the Joint Service Agreement (JSA) of August 1994. While both the JSCC and the JSMG have been chartered to address NBC defense logistics issues, there are differences in their emphasis. The JSCC is primarily a war-time agency, charged with recommending allocations of NBC defense equipment among the four Services in time of war. It last met in January 1995. The JSMG's emphasis is on ensuring a smooth transition from research and development through production to fielding, sustainment, and retirement. It is also charged with developing and maintaining the Joint Service NBC Defense Logistics Support Plan.

During 1995, the Assistant to the Secretary of Defense (Atomic Energy) tasked the JSMG, through the Army as Executive Agent, to develop plans to consolidate NBC supply depots and maintenance facilities. The plans are scheduled for completion by March 1, 1996. This effort requires substantial data regarding DLA and Service facilities used to store and maintain NBC defense equipment, in addition to the data gathered for this report.

DoD has consolidated the procurement of Joint Service Lightweight Integrated Suit Technology (JSLIST) from the Army and Marine Corps O&M accounts to the DoD CBD program investment accounts, to be consistent with the previous transfer of Air Force and Navy funds to the same accounts.

Three problems remain from last year regarding the accountability and management of NBC defense item inventories. (1) The Services continue to have very limited asset visibility of consumable NBC defense items below the wholesale level. This remains a problem, and has the full attention of the senior managers in this community. (2) The Defense Acquisition Board (DAB) tasked the Joint NBC Defense Board to recommend secondary item procurement policy. The Services still procure consumable NBC defense items through multiple, separate, and distinct funding authorizations, as discussed in section 4.6, Funding, of this chapter. (3) The Air Force and the Army continue to divide the responsibility for accountability and management of NBC defense equipment between two offices. For example, in the Air Force, requirements are a responsibility of the Office of the Civil Engineer, while inventory status is a responsibility of the Deputy Chief of Staff for Logistics. This division of responsibility continues to hinder data collection of data for this and other reports. Within the Army, program management of NBC defense items that are classified as major end items is a responsibility of the Deputy Chief of Staff for Operations and Planning, whereas management of items classified as secondary items and inventory status is a responsibility of the Deputy Chief of Staff for Logistics. Automated systems allow accurate inventory management of the Army major end items, but not yet for consumable, secondary items at retail level.

4.2 NBC DEFENSE LOGISTICS MANAGEMENT

Currently, NBC defense logistics management is in transition. The Joint NBC Defense Board has only recently begun to exercise full authority in this area. The JSMG, which reports to the Joint NBC Defense Board, has been charged with coordination and integration of logistics readiness and sustainment. Although the JSMG and its Secretariat have been established, the lack of a dedicated budget and dedicated manpower in the logistics area continues to hinder this office in fully exercising their responsibilities.

The DoD NBC defense community is in transition, it continues to rely heavily on the Defense Logistics Agency (DLA) and the Army Materiel Command (AMC). DLA and AMC are the inventory managers or National Inventory Control Points (NICP) for the vast majority of NBC defense items in all four Services. They have responsibility for industrial base development, acquisition and storage of wholesale peacetime and sustainment wartime stocks. They remain responsible for maintaining dedicated Service wholesale war reserve sustainment stockpiles. Stocks in wholesale accounts would back-up unit-held Service stocks. Both DLA and AMC will remain key players in the future NBC defense logistics management system. The Joint NBC Defense Board, through the JSMG, will provide coordination and integration, based upon all Services' and Commanders-in-Chiefs (CINC)s' inputs. DLA and AMC will continue to provide services such as raw data collection, inventory control, and a distribution infrastructure. Exact details of this endstate have not been articulated, but will be addressed in a JSMG study to be conducted in FY96.

Service inventories of NBC defense items are maintained at unit level using either manual records or a subordinate headquarters- or installation-level automated system. Stocks held at wholesale level are maintained using a separate automated system. Currently, there is little connectivity between the two systems.

For example, the Air Force uses an automated system called Standard Base Supply System (SBSS) to track and monitor supply transactions and stockage at installation level. This system does not provide for connectivity to other installations to link logistics databases. When items are issued to gaining units at an installation, they are generally transferred from SBSS records to non-automated unit records. Additionally, accountability of only selected NBC defense items (*i.e.*, protective masks) is entered and routinely tracked on SBSS. Other NBC defense items, because of reduced logistics coding requirements, are maintained only on non-automated unit records. To correct this deficiency, the Air Force established the Mobility Automated Inventory Tracking System (MAITS) to provide a semi-automated tracking system for Chemical Warfare Defense Equipment (CDE) items. MAITS has provided for increased Air Force Staff asset visibility for installation CDE stocks; but it does not provide information flow directly into the wholesale data bases. This system will, however, provide an interim Air Force CDE logistics tracking net until current Air Force automated databases are linked under the DoD Total Asset Visibility (TAV) program. While other Services sub-automated databases have different names, their problems are similar. As a result, there is limited Service-level asset visibility for NBC defense items. However, the Services are addressing this deficiency under the auspices of TAV, a long-term initiative, which will link existing DoD logistics automated

systems. Again, the intended endstate envisioned by the JSMG will address this issue in an effort to display a "big picture" of the inventory status.

DoD is in the process of updating the Joint Service Industrial Base Assessment of the NBC Defense Sector. This study, which was last conducted in 1993, will be updated and published in 1996. This effort is currently gathering data prior to assessing the health of the sector. The last sector study confirmed that the NBC defense industrial base sector is composed of primarily small to medium-sized companies. The continued reductions in overall DoD NBC defense equipment procurements have had a severe impact on this sector. Many firms have left the defense market or restructured since the last sector study. We are beginning to see some diversification; however, many of these companies are still dependent on military requirements and sales for their survival. Hence, this sector remains fragile. One measure the DoD is using to sustain this base is the "War Stopper" program. Selected NBC defense items, to include the Battle Dress Overgarment (BDO) and atropine autoinjectors, continue to be included in the "War Stopper" program, for which Congress provides specialized funding to sustain designated industrial base capabilities.

4.3 QUANTITIES, CHARACTERISTICS, AND CAPABILITIES

The results of the data collection efforts are compiled in Appendix 1 at the end of this chapter, Logistics Readiness NBC Report Data. The data in the tables in the appendix are shown jointly and by Service (and DLA-owned stocks). The numbers in Appendix 1 reflect the efforts of the Services over the last several years under the past system of individual Service procurements and Cold War-era war requirements. Table 4-2-1, therefore, represents a roll-up of individual Service requirements rather than an integrated and consolidated DoD NBC defense effort. The ideal endstate we envision is using the Joint NBC Defense Board coordinating a top-down procurement based on the Services' requirements. Table 4-2-2 reflects those stocks acquired by DLA and AMC for the purposes of replenishing service requirements in the event of short-term contingencies. Because they represent stocks for replenishment rather than for readiness, quantities detailed in Table 4-2-2 are not included in total figures of Table 4-2-1. Also, Table 4-2-2 contains less items than Table 4-2-1 because DLA and AMC do not stock all items that are in Table 4-2-1; they stock only those items listed in Table 4-2-2.

Under the provisions of Title X of the FY95 Defense Authorization Act, Service Secretaries are responsible for, and have the authority to conduct, all affairs of their respective Departments. Some of the Service Secretaries' functions are supplying, equipping (including research and development), training, and maintaining. Hence, the Services develop quantitative and qualitative requirements for NBC defense items independently.

The items listed under *Nomenclature* are the currently fielded NBC defense items in one or more of the Services. The *Wartime Requirement* quantities in Table 4-2-1 are those computed by the Services based on DoD's initial strategy for responding to two nearly simultaneous major regional conflicts (MRC). These quantities DO NOT represent the total requirements to execute a two MRC scenario, but a risk-assessed initial stockage level needed until industrial base suppliers can ramp up production to fill the difference. The Army figures

include the Army War Reserve, Operational Project stocks, and major subordinate command (MACOM)-directed unit level contingency stocks. The *Wartime On-hand* quantities are wartime stocks being held by the Services. Table 4-2-2 presents the quantities of stocks held by AMC and DLA at the wholesale level for peacetime and wartime use. Quantities *On Contract* are those quantities for which a Service or agency has submitted a requisition or purchase order but has not received the requisitioned items. Finally, the quantities depicted as *Estimated Procurements* are quantities the Services have forecast for procurement, if sufficient funds are available. These procurements at first appear to exceed the requirements. In fact, the quantities represent estimated requirements needed to replace wartime *and* peacetime consumption of NBC defense assets, to include training use and shelf-life expiration. It must be emphasized that these are based on major command estimates of requirements. Actual procurements will be based on funding available during the appropriate time frame.

4.4 LOGISTICS STATUS

During data collection for the FY95 report, information on the inventory status of the same list of fielded NBC defense equipment was compiled. From this data, 80 items this year were reviewed extensively. NBC defense items such as batteries, mask hoods, and filters were considered as a subset of the primary item for risk assessments, and hence not reviewed separately. Quantities required for wartime needs were then compared to quantities currently on-hand. The wartime requirement was based on the strategy for responding to two nearly simultaneous major regional conflicts. These numbers are taken from Table 4-2-1 and its associated tables. Characteristics and capabilities of selected fielded NBC defense items are discussed in detail in Appendix 2 of this chapter. The following items have been added to the FY95 report:

- MBU-19/P AERP (Mask)
- Auto Liquid Agent Detector
- Tetracycline
- M90 Automatic Mustard Agent Detector
- M21 RSCAAL (formerly XM21 RSCAAL)
- CWU-66/P Protective Ensemble
- Belt, CB agent resistant

A number of programs were deleted due to replacements and obsolescence. These included the Navy Chemical Protective Overgarment and Mark V mask, the C1 filter canister, and the M18 general purpose filter. All gloves, from 7 mil through 25 mil, are assessed in the FY95 requirements under "Gloves, 25 mil". Trainers were taken out of the assessment process since they do not reflect wartime service requirements. Batteries and power supplies for chemical agent detectors were not assessed as separate items; any issues involving batteries will be reflected as part of their associated parent agent detectors. Other subcomponents of end items (such as nitrogen cylinders, mask carriers, the multiman intermittent cooling system (MICS) vest) were removed from the assessment and included with the parent end item.

Of the 80 items extensively reviewed, 49 items were assessed. Assessed items were ranked as low, moderate, or high risk based on Service data as of September 30, 1995. "Risk" is defined as the probability that a shortage in the wartime requirement would exist which would severely impact a Service's capability to respond to a contingency. Shortages were calculated by comparing wartime requirements to wartime on-hand quantities in Table 4-2-1. Low risk is assessed if less than a 15% shortage existed or at least 85% of the wartime requirement was

currently on-hand in service inventories. Moderate risk is assessed if a 15–30% shortage in the wartime requirement existed or the percentage of the wartime requirement of on-hand quantities is between 70–84%. An item is assessed as high risk if the quantity on-hand is less than 70% of the wartime requirement. Table 4-1 contains exhibits which provide the complete results of the assessment. Programs rated as high or moderate risk are discussed in greater detail at Appendix 3 to this chapter. A comparison between the years is shown in Figure 4-1.

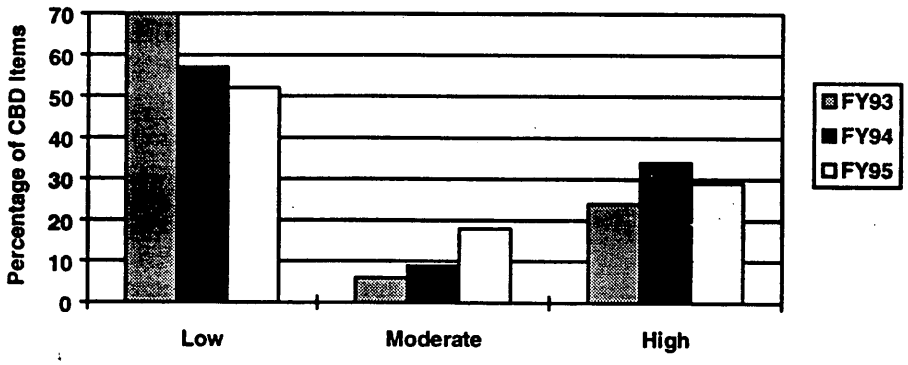

Figure 4-1. Fielded Chemical and Biological Defense Items Data Assessment

In comparison to FY94 report data, the percentage of the FY95 report's items in the low risk category dropped from 57% to 52%. The percentage of items in moderate risk increased from 9% to 18%, while the percentage of items in the high risk category decreased from 34% to 29%. *These changes reflect two general trends: (1) from low to moderate risk, and (2) from high to moderate risk items.* Masks, gloves and boots moved from high to moderate and low risk in general due to increased fieldings of the mask modernization program of the four Services in addition to decreasing inventory requirements due to smaller manpower. Two exceptions are the M43A1 aviator mask, which increased from low to moderate risk due to increased requirements; and the Air Force's MBU-19/9 PIHM aviator mask, which is still being fielded. Decontamination apparatuses (the M11 and M13) moved from moderate and high risk to low risk, respectively, due to increased inventories.

BDOs moved from low to moderate risk. The shelf life of much of the BDO inventory is reaching its end. There are insufficient procurement funds planned for future replacements, which threatens a smooth transition to the JSLIST program. M256A1 detection kits and M8 paper rose from low to high risk, due to increased (revised) requirements and no corresponding increase in procurement orders.

Medical NBC defense items have risen from low to high risk. Both shelf life issues and increasing the inventory to accommodate the Reserves and Guard units has increased the risk. A more in-depth discussion on these items is included at Appendix 3.

Table 4-1. Logistic Assessments: Major NBC Defense Items

Risk Assessment:
Low – Services have at least 85 percent of wartime requirement on-hand to support two nearly simultaneous major regional contingencies (see note)
Moderate – Services have between 70 to 84 percent of wartime requirement on-hand to support two nearly simultaneous major regional contingencies
High – Services have less than 70 percent of wartime requirement on-hand to support two nearly simultaneous major regional contingencies

Contamination Avoidance/Detection Equipment

Items	Assessment	Remarks
Detection Kit, M256A1	High	Replacing expired shelf life items
M8 paper	High	Replacing expired shelf life items
Individual Chemical Agent Detector	Moderate	Modernization Item; still fielding
Chemical Agent Alarm, M8A1	Moderate	Procurement curtailed
Chemical Agent Monitor	High	Modernization Item; still fielding
Chemical Agent Protective Detection System (CAPDS)	Low	
M90 Automatic Mustard Agent Detector	High	Modernization Item; still fielding
Chemical Warfare Directional Detector, AN/KAS-1	Low	Modernization Item; still fielding
M21 Remote Sensing Chemical Agent Alarm (RSCAAL)	High	Procurement curtailed
NBC Reconnaissance System "Fox", M93	High	Procurement curtailed
Water Testing Kit, M272	High	Procurement curtailed
NBC Marking Set, M274	High	Low demand by Services

Individual Protection

Items	Assessment	Remarks
Masks		
M17 Series, General Purpose	Low	Being replaced by M40 (USA/USMC); Replaced by MCU-2A/P (USAF/USN)
M40, General Purpose	Low	
M42, Tank	Low	Replaces M25A1 mask
Mask, MCU-2 series	Low Moderate	
Mask, M43A1, Apache	Moderate	Modernization Item; still fielding
Mask, MBU-19/9 AERP	Low	Replacing MBU-13/P; still fielding
Mask, AR-5/AP22-P2		
Suits		
Battle Dress Overgarment (BDO)	Moderate	End of shelf life approaching
Saratoga Suit	Moderate	Modernization Item; still fielding
Chemical Protective Undercoverall	Low	
Navy CPO/Mark III	Low	
CWU-66/P	Not Assessed	
Gloves/Overboots		
Chemical Protective Gloves (7/14/25-mil)	Low	
Green/Black Vinyl Overshoes (GVO/BVO)	Low	
Chemical Protective Footwear Covers	Low	Being replaced by GVO/BVO
Disposable CP Footwear Covers	Low	
CP Socks	Low	Phase-out item

Note - Only selected Low Risk programs are displayed for information purposes.

Table 4-1. Logistic Assessments: Major NBC Defense Items (Continued)

Collective Protection

Items	Assessment	Remarks
Shelter, Collective Protective, M51	High	Risk increased due to maintenance
Shelter, Collective Protective, M20	High	Procurement curtailed
Portable Collective Protective System	Low	
Survival Collective Protective System-2	Low	Risk lowered due to small requirement

Decontamination Equipment

Items	Assessment	Remarks
Skin Decontamination Kit, M258A1	Low	Being replaced by M291
Skin Decontamination Kit, M291	High	Modernization item; prod. difficulties
Individual Equipment Decontamination Kit, M295	High	Low demand by Services
Decontaminating Apparatus, M11	Low	
Decontaminating Apparatus, M13	Low	
Lightweight Decontamination System, M17A2	Moderate	Modernization Item; still fielding
Power Driven Decontamination Apparatus, M12A1	Moderate	Risk increased due to maintenance
A/E32U-8 Decontamination System	Low	

Medical Defense

Items	Assessment	Remarks
Nerve Agent Antidote Kit (NAAK)	Low	
Atropine Autoinjector	High	Low inventory for Reserve/Guard units
2-PAM Chloride Autoinjector	Low	
Nerve Agent Preventative Pyridostigmine (NAPP) Tablet	High	Low inventory for Reserve/Guard units
Convulsant Antidote Nerve Agent (CANA)	High	Low inventory for Reserve/Guard units
Biological Warfare Vaccines	High	Prime contract for development, production, FDA licensure, and storage planned

Note - Only selected Low Risk programs are displayed for information purposes.

4.5 PEACETIME REQUIREMENT

In peacetime, NBC defense equipment is necessary to conduct training so that personnel are familiar with the use of the equipment and are confident that it will provide the necessary protection when used correctly.

Individual protection items are maintained at the unit level. For the most part, items are used in peacetime for training and are drawn from contingency stocks. This requires units to maintain both training and contingency stocks. For selected items such as chemical clothing, contingency utility is lost when the item is used for training. Because peacetime training requirements are met in this manner, major commands do not track training equipment separately from wartime stocks. The Services, however, have indicated that adequate NBC defense equipment is on-hand to conduct training.

Individual medical chemical defense items (*i.e.*, Nerve Agent Antidote Kits (NAAK), Convulsant Antidote Nerve Agent (CANA), Nerve Agent Preventative Pyridostigmine (NAPP) tablets, or more commonly Pyridostigmine Bromide (PB) Tablets) are no longer stored at the unit level (with the exception of those items in Sets, Kits, and Outfits). The Army and the Air Force centrally fund and manage those items through the U.S. Army Medical Materiel Agency (USAMMA). At the start of FY96, consolidated packs known as Division Ready Brigade (DRB) Sets will be shipped to Installation Medical Supply Activities or Medical Logistics Battalions for storage. Upon deployment, the set will be issued to the deploying unit, which will contain NAAK, CANA, and PB tablets for each soldier. One DRB Set contains the appropriate items for 5000 soldiers. The DRB Set components will be stored separately, since the PB tablets must be refrigerated and CANA requires controlled substance storage requirements. Due to the current "investigational new drug" status held by the PB tablets, this component will continue to be centrally stored for issue only upon approval of Headquarters, Department of the Army.

4.6 FUNDING

In accordance with the NBC defense management initiatives outlined in Chapter 1, funding of RDT&E and procurement has been centralized in a Defense procurement line defense-wide account beginning in FY96. However, operations and maintenance (O&M) funding for NBC defense materiel has **NOT** been consolidated at the DoD level. Therefore, for non-major (secondary) end items (*i.e.*, much NBC defense equipment, including individual protective clothing, decontamination kits, detection kits, and filters for protective masks and collective protection systems), each Service continues to separately fund replenishment and sustainment of NBC defense equipment. Depot maintenance and contractor logistics support for some of the low density major items, including the NBC Reconnaissance System, are O&M funded. These appropriations are not included in the Joint NBC Defense Program in accordance with the JSA.

Funding of NBC defense items in War Reserves that are classified as secondary items is a significant issue. The funding of these items in War Reserves is not in the Joint NBC Defense Program. The requirements for these items are developed by each Service. Funding of War

Reserves Secondary Items (WRSI) is made from Congressional appropriations made into the Defense Business Operations Fund (DBOF) from transfer of Services' O&M funds. The Services choose not to release their Total Obligation Authority (TOA) to fund the DBOF for these items. For example, replenishment of NBC defense items in Army War Reserves will require substantial funding from 1999 through 2006 as these items reach their maximum extended shelf lives. To replace the Army's current required inventory of BDOs with the Joint Service Lightweight Suit Technology (JSLIST) Advanced Battle Dress Overgarment (ABDO) will require funding of $120 million annually to replace its existing BDO inventory and to build required initial stockage and minimum sustainment (War Reserve) stock to meet the current Defense Planning Guidance; however, only $50.3 million has been programmed in the FY 97-01 Program Objective Memorandum (POM) for limited unit level wartime stocks to high priority units.

In FY95, the Joint Service Materiel Group (JSMG) conducted an assessment to determine the most effective means to consolidate the different funding approaches of the Services. This assessment successfully addressed procurement programs, and some programs previously resourced using O&M are undergoing funding transfers to the DoD procurement line.

Under the current acquisition procedures and DoD guidance to minimize wholesale stockpiles, procurements are based on funded Service requisitions. The Services remain responsible for program funding to replace NBC defense equipment wartime stocks. Procurement is usually based on economic buy quantities (a consolidation of all Service requisitions) to provide the best value to the government. Some procurements of non-critical items, however, result in significant delays in delivery to the requisitioner because of the time required to produce economic buy quantities.

4.7 INDUSTRIAL BASE

In 1993, DoD conducted the first ever joint service industrial base assessment of the NBC defense sector. This report, titled *Nuclear, Biological and Chemical Defense Sector Study: A Joint Service Industrial Base Assessment*, was published in February 1994. This study concluded that the composition of that portion of the industrial base supporting NBC defense was unstable. In June 1994, DoD published an action plan to correct problems identified in the report. The JSMG is currently conducting an update to the Nuclear, Biological, and Chemical Defense Sector Study to be completed in FY96. This study will evaluate the effects of earlier DoD actions and determine if there are, and will be, sufficient industrial base capabilities to meet DoD's NBC defense requirements.

Preliminary results of the forthcoming show that the industrial base has not significantly strengthened in the past two years. There is a potentially strong base for NBC defense materiel; however, actions need to be initiated to offset firms that have ceased production of critical components because of reduced requirements and a downsized DoD.

These assessments indicate that the NBC defense industrial base sector is primarily supported by small- to medium-sized highly specialized companies dedicated to producing

military unique products with little or no commercial utility. These companies have become dependent on Service demands and sales for their financial survival. Selected NBC defense items (BDOs, chemical gloves, and nerve agent autoinjectors) have been designated as critical to combat operations because of low peacetime demand, high wartime use, and the fragile supporting industrial base. As a result DLA established, with OSD approval, a "War Stopper" program to sustain key industrial base capabilities, utilizing industrial preparedness funding under PE 07080110.

Recent changes in the NBC warfare threat and reduced DoD requirements are severely threatening the viability of this sector. DoD is reviewing its industrial base strategies regarding this sector. DLA and AMC, in conjunction with the Services, are developing industrial base approaches which will ensure sustainment of key or critical manufacturing processes and capabilities. From the review of these cited documents, the industrial base can provide the NBC defense items needed on the battlefield. Industry representatives have reviewed the Joint Service Sector Study and commented favorably upon the plan. As a result, a genuine partnership has been initiated. Industry has developed an extensive list of recommendations to secure that partnership. Some of these recommendations are achievable, while others may be too optimistic. It is important to emphasize the need to move quickly and confidently into partnerships that offer both best value to the government and sound logistic planning for the future. Further delays imperil a defense sector that is only barely stable.

4.8 NBC DEFENSE LOGISTICS SUPPORT ASSESSMENT

*** DoD lacks a joint, integrated system to maintain asset visibility of NBC defense equipment below wholesale level, and lacks a standardized war reserve program for NBC defense equipment. Resourcing the procurement and sustainment of wartime stocks of individual protective equipment, decontamination kits, and detector kits remains the responsibility of the Services.**

SOLUTION: DoD established the requirement for asset visibility and reviewed existing systems and procedures, both for peacetime reporting and war time reporting. The Services and DLA are addressing the NBC defense asset visibility deficiency under the auspices of the Total Asset Visibility initiative. Little progress occurred in 1995.

Progress has been made in 1995 in the transfer of resourcing procurement programs for new NBC defense equipment, previously resourced using Services' Operations and Maintenance (O&M) accounts, to the DoD procurement line for some programs.

Though the Services continue to be responsible for determining war reserve requirements and managing their inventories, the sustainment of these stocks is a significant resourcing issue. The Services are reluctant to program scarce O&M funds for the DBOF to replenish WRSI, including NBC defense items. Considering these secondary items collectively as a single principal item would allow funding to be transferred to a procurement appropriation under the DoD Financial Management Regulation. It also would allow resource management of this significant portion of NBC defense items to come under the purview of the Joint NBC Defense Program.

There are a number of initiatives under study in the FY96 Joint Service NBC Defense Industrial Base Assessment that should lead to closer ties with industrial partners. These actions are vital toward improving the overall NBC defense sector of the DoD industrial base. Support from DoD and Congress will be an important issue in implementing these recommendations and in stabilizing the NBC defense sector of the DoD industrial base.

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APPENDIX 1.
BREAKOUT OF SERVICE WAR RESERVES AND FUTURE PROCUREMENTS

The following charts represent the four Services and Defense Personnel Support Center (DLA) requirements, on-hand quantities, quantities on contract, and the next three years of planned procurement. In the US Navy's case, there is no data for the projected three year procurement or on contract. This is due to that service's desire to purchase the majority of its equipment and supplies from other services on a year-to-year basis.

Table 4-2-1. Joint Logistics Readiness NBC Report Data

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY 97	FY98	COMMENTS
OVERGARMENTS								
SUIT, CP CAMO (BDO)	8415-01-137-1700-07	5,150,265	4,173,550	16,708	393,207	281,677	280,608	Shelf Life end approaching
SUIT, CP CAMO-DESERT	8415-01-132-7534-37	4,376,097	3,920,742	0	292,600	167,919	171,548	
CP, UNDERCOVERALL	8415-01-040-3141	11,711	37,223	0	12,114	11,336	11,336	Replace by JSLIST in FY97
SUIT, BRIT, MK IV	8415-99-130-6921	0	1135	0	0	0	0	One time purchase for ODS
SUIT, CP, SARATOGA	8415-01-333-7573-76	654,000	459,013	328,990	0	20,000	20,000	Replace by JSLIST in FY97
SUIT, CP, OG MK3	8415-01-214-8290(M)	247,952	404,561	0	0	0	0	Replace by JSLIST in FY97
SUIT, CWU-66/P	8475-01-328-3454	88,000	37,828	40,000	0	0	0	Delivery completed May 96
MARK I (UNDER COVERALL)	8415-01-040-3136-44	60,000	167,617	0	0	0	0	90% Expired, tesing in progress
AIRCREWMAN CAPE	8415-01-040-9018	101,797	115,940	0	113,691	111,811	114,175	
OVERBOOTS/GLOVES								
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85	4,577,916	5,429,190	0	620,700	512,378	510,375	
CP SOCKS	8415-01-040-3169	14,989	455,711	0	19,667	19,025	19,025	Phase-out item
CP FOOTWEAR COVERS	8430-01-021-5978(L)	391,943	3,124,114	0	25,898	19,025	18,314	Replaced by B/GVOs
DISP FOOTWEAR COVER	8430-00-580-1205-03	13,042	135,366	0	754	254	254	
CP GLOVES 25 MIL	8415-01-033-3517-20	7,682,595	12,319,647	0	324,441	268,923	260,085	
CP GLOVES 14 MIL	8415-01-138-2497-00	2,153,772	3,758,429	0	136,864	105,542	101,660	
CP GLOVES 7 MIL	8415-01-138-2501-04	595,048	657,374	0	47,927	33,242	29,609	
CB MASK								
MASK, CB, M17A2	4240-01-143-2017-20	524,250	1,034,646	0	20	0	80	Replaced by M40
MASK, M24, AVIATOR	4240-00-776-4384(M)	15,747	40,111	0	22	0	0	Replaced by M43A1or MCU-2/AP
MASK, M25A1, TANK	4240-00-994-8751-52	42,300	160,122	0	0	0	0	Replaced by M42
MASK, CB, M40	4240-01-258-0061-63	920,568	1,056,614	0	135,348	130,896	0	
MASK, M42, TANK	4240-01-258-0064-66	93,038	128,079	0	11,666	0	0	
MASK, M43, APACHE	4240-01-208-6966-69	5057	3981		0	0	17,000	
MASK, MCU-2/P	4240-01-175-3443	14,840	15,928	0	488	474	474	
MASK, MCU-2/AP	4240-01-284-3615	44,950	65,109	0	18,224	0	0	
MASK, MCU-2/AP(WR)	4240-01-327-3299	391,032	399,415	0	20,183	12,891	13,063	
MBU-19/9 PIHM	8475-01-339-9782	9409	5173		1301	3147	506	Replaces MBU-13
MASK, MBU-13, AERP	NOT AVAIL	1192	2456	0	1210	0	0	
MASK, SECOND SKIN	NOT AVAIL	277,333	0	35,000	0	100,000	100,000	
MISC PROTECTION								
CP HELMET COVER	8415-01-111-9028	5,932,744	5,993,312	193,110	419,523	367,841	368,513	
MASK, COMM, ADAPTOR	NOT AVAIL	50,000	3900	25,000	0	10,000	10,000	
HOOD, M6A2 (FOR M17)	4240-00-999-0420	1,068,232	1,280,229	0	107,935	45,938	42,005	
HOOD, M7 (FOR M24)	4240-00-021-8699	57,650	55,747	0	6024	3873	4156	
HOOD, M5 (FOR M25A1)	4240-00-860-8987	156,670	103,128	0	9665	8253	2725	
HOOD, FOR MCU-2A/P	4240-01-189-9423	1,476,377	1,330,497	0	90,045	53,572	53,219	
HOOD, M40	4240-01-260-8723	1,396,088	379,526	0	194,426	170,514	169,952	

Table 4-2-1. Joint Logistics Readiness NBC Report Data (Continued)

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 95	FY 96	FY97	COMMENTS
MISC PROTECTION								
FILTER SET, M13A2	4240-00-165-5026	1,436,968	1,221,034	0	105,834	66,466	68,750	
FILTER CAN, M10A1	4240-00-127-7186	167,698	92,728	0	23,192	5751	5237	
FILTER CAN, C2	4240-01-119-2315	3,774,703	2,759,803	0	539,304	464,260	458,303	
MICS (COOL SYSTEM)	4240-01-298-4140YR	37	80	0	0	0	0	
BELT, CB RESIST	8465-01-322-1966	35,810	29,309	0	0	0	0	
CHEMICAL DETECTION								
DET KIT, M256A1	6665-01-133-4964	322,938	137,189	0	36,649	26,883	26,050	
DET PAPER, M9	6665-01-049-8982	194,946	253,116	0	77,512	64,000	64,000	
DET PAPER, M9	6665-01-226-5589	222,128	518,492	0	113,382	52,713	58,701	
DET PAPER, M8	6665-00-050-8529	1,689,901	1,124,723	0	64,714	48,377	8347	
TUBE PHOSGENE	6665-01-010-7965	946	1496	0	3	0	0	
ALARM, CAA, M8A1	6665-01-105-5623	41,688	30,245	0	8	8	8	
CWDD, AN/KAS-1	5855-01-147-4362	830	838	0	0	0	0	
DET, AUTO LIQUID AGENT	6665-01-314-2086	0	0	0	0	0	0	
CHEM AGENT MONITOR	6665-01-199-4153	18,091	10,551	167	1	2005	5	
CAPDS	6665-01-294-2556	347	371	0	0	0	0	
NBC RECON SYSTEM	NOT AVAIL	225	123	0	0	0	0	
NBC MARK SET, M274	9905-12-124-5955	3745	1016	5	0	0	0	
WATER TEST KIT, M272	6665-01-134-0885	6898	611	0	1	0	0	
IND CHEM AGENT DET	NOT AVAIL	13,091	10,040	0	0	0	0	
M21 RSCAAL	6665-01-334-6637	239	125	0	0	0	0	

Table 4-2-1. Logistics Readiness NBC Report Data (Continued)

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 95	FY 96	FY97	COMMENTS
DECONTAMINATION EQUIPMENT								
DECON KIT, M258A1	4230-01-101-3984	646,955	985,250	0	162,000	116,776	101,315	
DECON KIT, M291	4230-01-276-1905	2,146,312	1,091,142	0	236,058	112,425	96,707	
DECON APPAR, M11	4230-00-720-1618	125,625	136,805	0	17,528	9666	9316	
DECON APPAR, M13	4230-01-133-4124	132,347	153,677	0	19,541	13,470	13,247	
DS2, 1 1/3 QT	6850-00-753-4827	134,222	164,701	0	1479	614	476	
DS2, 5 GAL	6850-00-753-4870	319,519	221,236	0	1917	1762	1834	
DS2, M13CAN	NOT AVAIL	32,897	36,364	0	0	0	0	
SUPER TROP BLEACH	6850-00-297-6653	4249	5706	0	4	0	0	
SODIUM HYPOCHLORITE	6810-00-598-7316	394	204	0	26	18	18	
CALCIUM HYPOCHLORITE	6810-00-255-0471	719	309	0	0	0	0	
DRY SORBENT POWDER	4230-01-262-0484	20	20	0	0	0	0	
L/WT DEC SYS, M17	4230-01-303-5225	4123	3457	0	39	0	0	
A/E32U-8 DECON SYS	4230-01-153-8660	88	101	0	19	0	0	
PDDA, M12A1	4230-00-926-9488	1519	1472	0	0	0	0	
COLLECTIVE PROTECTION								
SHELTER, CO/P, M51	4240-00-854-4144	715	777	0	0	0	0	
PORTABLE CO/P SYS	NOT AVAIL	200	200	0	0	0	0	
SURVIVAL CO/P SYS-2	4230-01-184-7913	1	0	0	0	0	0	
SURVIVAL CO/P SYS-2A	4230-01-315-7465	11	1	0	0	0	0	
KMU-450 SHEL MOD KIT	4240-01-044-7659	18	1	0	0	0	0	
SHELTER, CO/P, M20	4240-01-166-2254	2625	1166	0	0	0	0	
MEDICAL EQUIPMENT								
NAAK, MKI	6705-01-174-9919	2,525,766	1,531,249	643,306	0	0	0	
ATROPINE AUTOINJ	6505-00-926-9083	3,684,901	2,278,041	56,060	54,199	42,500	42,500	
2-PAM CHLORIDE,AUT	6505-01-125-3248	1,479,774	1,814,866	46,557	45,339	38,700	38,700	
PYRIDOSTIGIMINE TAB	6505-01-178-7903	1,032,002	550,198	291,085	4485	3400	3400	
CANA	6505-01-274-0951	1,391,872	633,080	242,686	2200	2200	2200	
TETRACYCLINE	NOT AVAIL	25,702	507,902	0	0	0	0	

Table 4-2-2. Logistics Readiness NBC Report Data: Stocks Held by DLA and AMC

NOMENCLATURE	NSN	DLA Inventory O/H	DLA On Contract	AMC Inventory O/H	COMMENTS
OVERGARMENTS					
SUIT, CP CAMO (BDO)	8415-01-137-1700-07	67,578	16,708	1,472,472	
SUIT, DESERT	8415-01-327-5346	2017	0	2,327,715	
SUIT, DESERT	8415-01-324-3084	452	0	0	
CP UNDERCOVERALL	8415-01-040-3136	22,682	0	0	
SUIT, CP, SARATOGA	8415-01-333-7573-76	0	178,990	0	
AIRCREWMAN CAPE	8415-01-040-9018	12,906	0	0	
SUIT, CP, OG MK3	8415-01-214-8289	47,780	0	0	
OVERBOOTS/GLOVES					
BLK/GRN VINYL O/BOOTS	8430-01-317-3374	686,648	0	2,354,596	
CP SOCKS	8415-01-040-3169	455,711	0	0	
CP FOOTWEAR COVERS	8430-01-021-5978	232,457	0	954,668	
DISP FOOTWEAR COVER	8430-00-580-1205	109,710	10,920	0	
CP GLOVES 25 MIL	8415-01-033-3517	1,427,631	0	5,314,186	
CP GLOVE INSERTS	8415-00-782-2809	0	0	0	
CP GLOVES 14 MIL	8415-01-138-2497	962,518	0	0	
CP GLOVES 7 MIL	8415-01-138-2501	222,877	0	125,995	
GLOVES LINER	8415-01-138-2494	75,200	34,280	0	
MISC PROTECTION					
CP HELMET COVER	8415-01-111-9028	232,776	0	2,654,000	
HOOD, M6A2 FOR M17	4242-00-999-0420	0	0	735,326	
HOOD,M7 (AIR)	4240-00-021-8699	0	0	12,544	
HOOD, M5 (TANK)	4240-00-860-8987	0	0	50,831	
FILTER SET, M13A2	4240-00-165-5026	0	0	586,970	
FILTER SET, M10A1	4240-00-127-7186	0	0	4548	
FILTER CAN, C2	4240-01-119-2315	0	0	126,245	
MICS VEST	8415-01-217-5634	14,120	0	0	
CHEMICAL DETECTION					
DET KIT, M256A1	6665-01-133-4964	0	0	0	
DECONTAMINATION EQUIPMENT					
DECON KIT, M258A1	4230-01-101-3984	0	0	31,900	
DECON KIT, M291	4230-01-276-1905	0	0	86,300	
DECON APPAR, M11	4230-00-720-1618	0	0	21,413	
DECON APPAR, M13	4230-01-133-4124	0	0	87,517	
COLLECTIVE PROTECTION/ MEDICAL EQUIPMENT					
SHELTER, CO/P, M20	4240-01-166-2254	0	0	0	
NAAK MARK I	6505-01-174-9919	25,259	272,168	0	
ATROPINE AUTOINJECTOR	6505-00-926-9083	5408	199,669	0	
2-PAM CHLORIDE, AUT	6505-01-125-3248	19	190,509	0	
PYRIDOSTIGIMINE TAB	6506-01-178-7903	7961	66,000	0	
CANA	6505-00-274-0951	0	0	0	

Table 4-2-1a. Army Logistics Readiness NBC Report Data

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY 97	FY98	COMMENTS
OVERGARMENTS								
SUIT, CP CAMO (BDO)	8415-01-137-1700-07	3,058,758	2,287,555	0	338,978	243,145	246,921	End of shelf life approaching
SUIT, CP CAMO-DESERT	8415-01-327-5347/5353	2,101,803	2,795,503	0	292,400	167,869	171,498	
OVERBOOTS/GLOVES								
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85	3,000,447	2,486,948	0	341,621	321,158	321,020	
CP FOOTWEAR COVERS	8430-01-021-5978	0	1,230,780	0	21,896	16,929	16,218	Replaced by B/GVOs
CP GLOVES 25 MIL	8415-01-033-3517-20	5,037,466	6,122,244	0	318,312	268,175	259,505	
CP GLOVES 14 MIL	8415-01-138-2497-00	282,500	1,269,524	0	81,100	81,100	81,100	
CP GLOVES 7 MIL	8415-01-138-2501-04	170,821	125,995	0	22,640	22,640	22,640	
CB MASK								
MASK, CB, M17A2	4240-01-143-2017-20	519,252	962,000	0	0	0	0	Being replaced by M40
MASK, M24, AVIATOR	4240-00-776-4384	15,487	35,615	0	0	0	0	Being replaced by M43A1
MASK, M25A1, TANK	4240-00-994-8751-52	42,300	158,838	0	0	0	0	Being replaced by M42
MASK, CB, M40	4240-01-258-0061-63	651,568	876,614	0	135,438	130,896	0	
MASK, M42, TANK	4240-01-258-0064-66	85,101	122,376	0	11,666	0	0	
MASK, M43, APACHE	4240-01-208-6966-69	5,057	3,981	0	0	0	17,000	
MISC PROTECTION								
CP HELMET COVER	8415-01-111-9028	3,728,657	3,192,101	0	301,277	252,033	252,705	
HOOD, M6A2 (FOR M17)	4240-00-999-0420	964,230	1,082,937	0	67,324	45,938	42,005	
HOOD, M7 (FOR M24)	4240-00-021-8695	57,115	53,998	0	6,024	3,873	4,156	
HOOD, M5 (FOR M25A1)	4240-00-860-8987	148,733	102,190	0	9,665	8,253	2,725	
HOOD, M40	4240-01-376-3152	1,396,088	379,526	0	194,426	170,514	169,952	
FILTER SET, M13A2	4240-00-165-5026	1,330,530	1,030,490	0	105,834	66,466	68,750	
FILTER CAN, M10A1	4240-00-127-7186	167,698	92,782	0	23,192	5,751	5,237	
FILTER CAN, C2	4240-01-119-2315	1,367,441	569,992	0	449,070	409,565	404,014	

Table 4-2-1a. Army Logistics Readiness NBC Report Data (Continued)

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY 97	FY98	COMMENTS
CHEMICAL DETECTION								
DET KIT, M256A1	6665-01-133-4964	303,544	129,312	0	36,442	26,818	25,973	
DET PAPER, M9	6665-01-049-8982	90,971	178,571	0	70,000	60,000	0	
DET PAPER, M9	6665-01-226-5589	0	165,068	0	0	0	0	
DET PAPER, M8	6665-00-050-8529	1,170,820	579,488	0	40,000	40,000	0	
ALARM, CAA, M8A1	6665-01-105-5623	41,308	30,108	0	0	0	0	
CHEM AGENT MONITOR	6665-01-199-4153	17,254	9,849	0	0	0	0	
NBC RECON SYSTEM	6665-01-372-1303	215	113	0	0	0	0	
NBC MARK SET, M274	9905-12-124-5955	2,412	758	0	0	0	0	
WATER TEST KIT, M272	6665-01-134-0885	3,269	41	0	0	0	0	
DECONTAMINATION EQUIPMENT								
DECON KIT, M258A1	4230-01-101-3984	0	438,638	0	132,824	99,268	83,933	Replaced by M291 decon kit
DECON KIT, M291	4230-01-276-1905	1,170,820	390,603	0	136,526	78,791	78,542	Shortage supplemented by M258
DECON APPAR, M11	4230-00-720-1618	103,110	87,912	0	17,525	9,666	9,316	
DECON APPAR, M13	4230-01-133-4124	116,344	134,762	0	19,538	13,470	13,247	
DS2, 1 1/3 QT	6850-00-753-4827	117,945	136,051	0	1,479	614	476	
DS2, 5 GAL	6850-00-753-4870	314,364	210,998	0	1,917	1,762	1,834	
DS2, M13CAN	4230-01-133-4124	32,897	36,364	0	0	0	0	
DECON KIT, M295	4230-01-357-8456	35,937	7,485	0	25,831	5,390	5,039	
L/WT DEC SYS, M17	4230-01-303-5225	2,497	2,085	0	0	0	0	
PDDA, M12A1	4230-00-926-9488	919	1097	0	0	0	0	
COLLECTIVE PROTECTION								
SHELTER, CO/P, M51	4240-00-854-4144	714	776	0	0	0	0	
SHELTER, CO/P, M20	4240-01-166-2254	2,283	1,054	0	0	0	0	
MEDICAL EQUIPMENT								
NAAK, MKI	6705-01-174-9919	2,499,204	1,527,271	643,306	0	0	0	
ATROPINE AUTOINJ	6505-00-926-9083	2,669,416	798,585	0	0	0	0	
2-PAM CHLORIDE, AUT	6505-01-125-3248	864,463	963,255	56,060	0	0	0	
PYRIDOSTIGIMINE TAB	6505-01-178-7903	914,211	424,484	291,085	0	0	0	
CANA	6505-00-137-5891	1,320,941	614,587	242,686	0	0	0	

Table 4-2-1b. Air Force Logistics Readiness NBC Report Data

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY 97	FY98	COMMENTS
OVERGARMENTS								
SUIT, CP CAMO (BDO)	8415-01-137-1700-07	850,921	794,898	0	59,299	38,532	33,687	
SUIT, CP CAMO-DESERT	8415-01-132-7534-37	11,462	21,400	0	200	50	50	
CWU-66/P COVERALLS	8475-01-328-3454	88,000	37,828	40,000				Delivery completed May 96
CP, UNDERCOVERALL	8415-01-040-3141	11,711	14,187	0	778	0	0	Replaced by JSLIST in FY97
MARK 1 (UNDER COVERALL)	8415-01-040-3136-44	60,000	167,617	0	0	0	0	90% Expired, tesing in progress
AIRCREW CAPE	8415-01-040-9018	101,675	115,940	0	3571	1691	4055	
OVERBOOTS/GLOVES								
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85	856,132	858,514	0	104,079	16,220	14,355	
CP SOCKS	8415-01-040-3169	14,979	0	0	757	115	115	
CP FOOTWEAR COVERS	8430-01-021-5978(L)	230,050	295,130	0	4002	2096	2096	
DISP FOOTWEAR COVER	8430-00-580-1205	13,042	25,656	0	754	254	524	
CP GLOVES 25 MIL	8415-01-033-3517-20	91,392	180,923	0	6129	748	580	
CP GLOVES 14 MIL	8415-01-138-2497-00	1,486,318	1,278,737	0	55,764	24,442	20,560	
CP GLOVES 7 MIL	8415-01-138-2501-04	164,570	182,507	0	25,287	10,602	6969	
CB MASK								
MASK, CB, M17A2	4240-01-143-2017-20	4998	9061	0	20	0	80	
MASK, M24, AVIATOR	4240-00-776-4384(M)	260	144	0	0	0	0	
MASK, MCU-2/P	4240-01-175-3443	14,449	15,772	0	488	474	474	
MASK, MCU-2/AP	4240-01-284-3615	44,950	65,109	0	18,224	0	0	
MASK, MCU-2/AP(WR)	4240-01-327-3299	193,045	185,577	0	20,183	12,891	13,063	
MASK, MBU-19/9 PIHM	8475-01-339-9782	9409	5173	0	1301	3147	506	
MASK, AERP	NOT AVAIL	1192	2456	0	1210	0	0	Replaced by MBU-19
MISC PROTECTION								
CP HELMET COVER	8415-01-111-9028	122,025	63,544	0	2755	1192	1192	
HOOD, M6A2 (FOR M17)	4240-00-999-0420	104,002	192,256	0	40,611	0	0	
HOOD, M7 (FOR M24)	4240-00-021-8699	535	520	0	0	0	0	
HOOD, FOR MCU-2A/P	4240-01-189-9423	1,476,377	2,241,232	0	90,045	53,572	53,219	
FILTER SET, M13A2	4240-00-165-5026	106,438	0	0	0	0	0	
FILTER CAN, M10A1	4240-00-127-7186	644	0	0	0	0	0	
FILTER CAN, C2	4240-01-119-2315	1,551,784	1,450,989	0	90,234	54,695	54,289	
FILTER CAN, C1	4240-00-218-0779	0	0	0	0	0	0	Replaced by C2 Canister
MICS (COOL SYSTEM)	4240-01-298-4140YR	37	80	0	0	0	0	

Table 4-2-1b. Air Force Logistics Readiness NBC Report Data (Continued)

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY97	FY98	COMMENTS
CHEMICAL DETECTION EQUIPMENT								
DET KIT, M256A1	6665-01-133-4964	2880	1783	0	207	65	77	
DET PAPER, M9	6665-01-049-8982	42,736	42,733	0	7512	40,000	40,000	
DET PAPER, M9	6665-01-226-5589	209,348	244,585	0	113,382	52,713	58,701	
DET PAPER, M8	6665-00-050-8529	391,424	510,557	0	24,714	8337	8347	
TUBE PHOSGENE	6665-01-010-7965	1	0	0	3	0	0	
ALARM, CAA, M8A1	6665-01-105-5623	244	91	0	8	8	8	
DET, AUTO LIQUID AGENT	6665-01-314-2086	0	0	0	0	0	0	
CHEM AGENT MONITOR	6665-01-199-4153	191	258	0	1	5	5	
NBC MARK SET, M274	9905-12-124-5955	1137	180	0	0	0	0	
WATER TEST KIT, M272	6665-01-134-0885	24	111	0	1	0	0	
DECONTAMINATION EQUIPMENT								
DECON KIT, M258A1	4230-01-101-3984	614,085	420,708	0	29,176	17,508	17,382	
DECON KIT, M291	4230-01-276-1905	436,658	122,925	0	99,532	33,634	18,165	
DECON APPAR, M11	4230-00-720-1618	4	4	0	3	0	0	
DECON APPAR, M13	4230-01-133-4124	3	3	0	3	0	0	
SODIUM HYPOCHLORITE	6810-00-598-7316	394	204	0	26	18	18	
CALCIUM HYPOCHLORITE	6810-00-255-0471	207	200	0	0	0	0	
DRY SORBENT POWDER	4230-01-262-0484	20	20	0	0	0	0	
L/WT DEC SYS, M17	4230-01-303-5225	56	27	0	39	0	0	
A/E32U-8 DECON SYS	4230-01-153-8660	88	101	0	19	0	0	
COLLECTIVE PROTECTION								
SHELTER, CO/P, M51	4240-00-854-4144	1	1	0	0	0	0	
SURVIVAL CO/P SYS-2	4230-01-184-7913	1	0	0	0	0	0	
SURVIVAL CO/P SYS-2A	4230-01-315-7465	11	1	0	0	0	0	
KMU-450 SHEL MOD KIT	4240-01-044-7659	18	1	0	0	0	0	
SHELTER, CO/P, M20	4240-01-166-2254	1	1	0	0	0	0	
MEDICAL EQUIPMENT								
NAAK, MKI	6705-01-174-9919	26,562	3978	0	0	0	0	
ATROPINE AUTOINJ	6505-00-926-9083	192,132	326,636	0	54,199	42,500	42,500	
2-PAM CHLORIDE,AUT	6505-01-125-3248	211,144	321,666	0	45,339	38,700	38,700	
PYRIDOSTIGIMINE TAB	6505-01-178-7903	50,758	43,702	0	4485	3400	3400	
CANA	6505-00-137-5891	54,325	3695	0	2200	2200	2200	

Table 4-2-1c. Navy Logistics Readiness NBC Report Data

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY 97	FY98	COMMENTS
OVERGARMENTS								
SUIT, CP, OG MK3	8415-01-214-8290(M)	247,952	356,781	0	0	0	0	Replaced by JSLIST in FY97
OVERBOOTS/GLOVES								
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85	67,337	60,637	0	0	0	0	
CP FOOTWEAR COVERS	8430-01-021-5978(L)	161,893	201,630	0	0	0	0	
CP GLOVES 25 MIL	8415-01-033-3517-20	231,613	273,524	0	0	0	0	
CB MASK								
MASK, MCU-2/AP(WR)	4240-01-327-3299	197,987	213,838	0	0	0	0	
MISC PROTECTION								
FILTER CAN, C2	4240-01-119-2315	301,232	374,478	0	0	0	0	
BELT, CB RESISTENT	8465-01-322-1966	35,810	29,309	0	0	0	0	
CHEMICAL DETECTION								
DET KIT, M256A1	6665-01-133-4964	9,268	10,049	0	0	0	0	
DET PAPER, M9	6665-01-049-8982	17,619	19,662	0	0	0	0	
DET PAPER, M9	6665-01-226-5589	12,780	20,472	0	0	0	0	
DET PAPER, M8	6665-00-050-8529	66,243	22,318	0	0	0		
TUBE PHOSGENE	6665-01-010-7965	945	1,496	0	0	0	0	
ALARM, CAA, M8A1	6665-01-105-5623	136	46	0	0	0	0	
CWDD, AN/KAS-1	5855-01-147-4362	830	838	0	0	0	0	
CHEM AGENT MONITOR	6665-01-199-4153	323	222	0	0	0	0	
CAPDS	6665-01-294-2556	347	331	0	0	0	0	
NBC MARK SET, M274	9905-12-124-5955	98	39	0	0	0	0	
WATER TEST KIT, M272	6665-01-134-0885	582	348	0	0	0	0	
IND CHEM AGENT DET	NOT AVAIL	91	47	0	0	0	0	
M21 RSCAAL	6665-01-334-6637	42	0	0	0	0	0	
DECONTAMINATION EQUIPMENT								
DECON KIT, M258A1	4230-01-101-3984	32,870	25,858	0	0	0	0	Being replaced by M291
DECON KIT, M291	4230-01-276-1905	393,834	405,398	0	0	0	0	
DECON APPAR, M11	4230-00-720-1618	1,818	1,392	0	0	0	0	
COLLECTIVE PROTECTION								
SHELTER, CO/P, M20	4240-01-166-2254	341	111	0	0	0	0	
MEDICAL EQUIPMENT								
ATROPINE AUTOINJ	6505-00-926-9083	463,353	556,152	0	0	0	0	
2-PAM CHLORIDE, AUT	6505-01-125-3248	250,167	324,607	0	0	0	0	
PYRIDOSTIGIMINE TAB	6505-01-178-7903	45,833	60,812	0	0	0	0	
CANA	6505-01-274-0951	2,606	798	0	0	0	0	
TETRACYCLINE	NOT AVAIL	25,702	507,902	0	0	0	0	

Table 4-2-1d. Marine Corps Logistics Readiness NBC Report Data

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY 97	FY98	COMMENTS
OVERGARMENTS								
SUIT, CP CAMO (BDO)	8415-01-137-1700-07	0	219,090	0	0	0	0	Replaced by JSLIST in FY97
SUIT, BRIT, MK IV	8415-99-130-6921	0	1135	0	0	0	0	One-time buy for ODS
CP, UNDERCOVERALL	8415-01-040-3141	0	350	0	0	0	0	Replaced by JSLIST in FY97
SUIT, CP, SARATOGA	8415-01-333-7573-76	654,000	459,013	150000	0	0	0	Replaced by JSLIST in FY97
OVERBOOTS/GLOVES								
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85	654,000	250,197	0	0	0	0	
CP FOOTWEAR COVERS	8430-01-021-5978(L)	0	269,441	0	0	0	0	Replaced by B/GVOs
CP GLOVES 25 MIL	8415-01-033-3517-20	195,820	415,097	0	0	0	0	
CB MASK								
MASK, CB, M17A2	4240-01-143-2017-20	0	63,585	0	0	0	0	Replaced by M40
MASK, M24, AVIATOR	4240-00-776-4384(M)	0	4352	0	0	0	0	Replaced by MCU-2/AP
MASK, M25A1, TANK	4240-00-994-8751-52	0	1284	0	0	0	0	Replaced by M42
MASK, CB, M40	4240-01-258-0061-63	269,000	180,000	0	0	0	0	
MASK, SECOND SKIN	NOT AVAIL	277,333	0	35000	0	100000	100000	
MASK, M42, TANK	4240-01-258-0064-66	7937	5703	0	0	0	0	
MASK, MCU-2/P	4240-01-175-3443	391	156	0	0	0	0	
MISC PROTECTION								
CP HELMET COVER	8415-01-111-9028	0	0	0	0	0	0	
HOOD, M6A2 (FOR M17)	4240-00-999-0420	0	5086	0	0	0	0	
HOOD, M7 (FOR M24)	4240-00-021-8699	0	1229	0	0	0	0	
HOOD, M5 (FOR M25)	4240-00-860-8987	0	938	0	0	0	0	
HOOD, FOR MCU-2A/P	4240-01-189-9423	0	87	0	0	0	0	
MASK, COMM, ADAPTOR	NOT AVAIL	50,000	3900	25000	0	10000	10000	
FILTER SET, M13A2	4240-00-165-5026	0	54,194	0	0	0	0	
FILTER CAN, M10A1	4240-00-127-7186	0	0	0	0	0	0	
FILTER CAN, C2	4240-01-119-2315	554,246	364,344	0	0	0	0	

Table 4-2-1d. Marine Corps Logistics Readiness NBC Report Data (continued)

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS FY 96	FY 97	FY98	COMMENTS
CHEMICAL DETECTION								
DET KIT, M256A1	6665-01-133-4964	7246	7108	0	0	0	0	
DET PAPER, M9	6665-01-049-8982	43,620	12,150	0	0	0	0	
DET PAPER, M9	6665-01-226-5589	0	88,367	0	0	0	0	
DET PAPER, M8	6665-00-050-8529	61,414	12,360	0	0	0	0	
TUBE PHOSGENE	6665-01-010-7965	0	0	0	0	0	0	
ALARM, CAA, M8A1	6665-01-105-5623	0	0	0	0	0	0	
CHEM AGENT MONITOR	6665-01-199-4153	323	222	0	0	0	0	
NBC RECON SYSTEM	NOT AVAIL	10	10	0	0	0	0	
NBC MARK SET, M274	9905-12-124-5955	2286	438	0	0	0	0	
WATER TEST KIT, M272	6665-01-134-0885	3023	111	0	0	0	0	
IND CHEM AGENT DET	NOT AVAIL	13,000	9993	0	0	0	0	
M21 RSCAAL	6665-01-334-6637	197	125	0	0	0	0	
DECONTAMINATION EQUIPMENT								
DECON KIT, M258A1	4230-01-101-3984	0	100,046	0	0	0	0	Replaced by M291
DECON KIT, M291	4230-01-276-1905	145,000	172,216	0	0	0	0	
DECON APPAR, M11	4230-00-720-1618	20,693	47,497	0	0	0	0	
DECON APPAR, M13	4230-01-133-4124	16,000	19,100	0	0	0	0	
DS2, 1 1/3 QT	6850-00-753-4827	16,277	20,650	0	0	0	0	
DS2, 5 GAL	6850-00-753-4870	5155	10,238	0	0	0	0	
STB	6850-00-297-6653	4249	5706	0	0	0	0	
CALCIUM HYPOCHLORITE	6810-00-255-0471	512	109	0	0	0	0	
L/WT DEC SYS, M17	4230-01-303-5225	1570	1345	0	0	0	0	
PDDA, M12A1	4230-00-926-9488	600	375	0	0	0	0	
COLLECTIVE PROTECTION								
PORTABLE CO/P SYS	NOT AVAIL	200	200	0	0	0	0	
MEDICAL EQUIPMENT								
ATROPINE AUTOINJ	6505-00-926-9083	330,000	596,668	0	0	0	0	
2-PAM CHLORIDE,AUT	6505-01-125-3248	154,000	205,338	0	0	0	0	
PYRIDOSTIGIMINE TAB	6505-01-178-7903	21,200	21,200	0	0	0	0	
CANA	6505-01-274-0951	14,000	14,000	0	0	0	0	

Table 4-2-1e. DPSC Logistics Readiness NBC Report Data

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED REQUIREMENTS FY 96	FY 97	FY98	COMMENTS
OVERGARMENTS								
SUIT, CP CAMO (BDO)	8415-01-137-1700-07	1,240,586	872,007	16,708	0	0	0	
SUIT, CP CAMO-DESERT	8415-01-327-5347/5353	2,262,832	1,103,839	0	0	0	0	
CP, UNDERCOVERALL	8415-01-040-3141	0	22,686	0	11336	11336	11336	
SUIT, CP, SARATOGA	8415-01-333-7573-76	0	0	178,990	0	20,000	80,000	Est from JSLIST
SUIT, CP, OG MK3	8415-01-214-8290(M)	0	47,7801	0	0	0	0	
AIRCREWMAN CAPE	8415-01-040-9018	122	0	0	110,120	110,120	110,120	
OVERBOOTS/GLOVES								
BLK/GRN VINYL O/BOOTS	8430-01-317-3374-85	0	1,772,894	0	175,000	175,000	175,000	
CP SOCKS	8415-01-040-3169	10	455,711	0	18,910	18,910	18,910	
CP FOOTWEAR COVERS	8430-01-021-5978(L)	0	1,127,133	0	0	0	0	
DISP FOOTWEAR COVER	8430-00-580-1205-03	0	109,710	0	0	0	0	
CP GLOVES 25 MIL	8415-01-033-3517-20	2,126,304	5,327,859	0	0	0	0	
CP GLOVES 14 MIL	8415-01-138-2497-00	384,954	1,210,168	0	0	0	0	
CP GLOVES 7 MIL	8415-01-138-2501-04	259,657	348,872	0	0	0	0	
CB MASK								
NONE								
MISC PROTECTION								
CANTEEN W/Mt CAP	8465-01-115-0026	67,268	334,281	219,000	100,000	100,000	100,000	
CANTEEN COVER	8465-00-860-0256	65,991	6857	332,000	40,000	40,000	40,000	
CP HELMET COVER	8415-01-111-9028	2,082,062	2,737,667	193,110	115,491	114,616	114,616	
CHEMICAL DETECTION								
NONE								
DECONTAMINATION EQUIPMENT								
NONE								
COLLECTIVE PROTECTION								
NONE								
MEDICAL EQUIPMENT								
NONE								

(INTENTIONALLY BLANK)

APPENDIX 2.
CURRENTLY FIELDED NBC DEFENSE ITEMS: CHARACTERISTICS AND CAPABILITIES

1. Individual Protection Equipment

a. BATTLE DRESS OVERGARMENT (BDO)

The BDO is a camouflage patterned (desert or woodland), two piece, air permeable overgarment that is typically worn over the duty uniform. The overgarment material consists of an outer layer of nylon cotton, and an inner layer of charcoal impregnated polyurethane foam. The BDO provides protection against chemical agent vapors and liquid droplets, biological agents (to include toxins), and radioactive alpha and beta particles. The BDO is issued in a sealed vapor-barrier bag that protects the garment from rain, moisture and sunlight. The BDO provides chemical protection for 22 days (extendible by commanders with increased risk to wearer) and should be replaced within 24 hours of contamination with liquid chemical agents.

b. Chemical Protective (CP) SUIT, OG MK3 (NAVY SUIT)

The Mark III chemical, biological, radiological (CBR) suit protects against chemical agent vapors, aerosols, droplets of liquid, and biological agents. The suit consists of separate smock and trousers in addition to gloves and overboots.

c. CP SUIT, SARATOGA (USMC)

Like the BDO, the SARATOGA is an air permeable, camouflage patterned overgarment. But instead of carbon impregnated foam, SARATOGA uses spherical, activated carbon adsorbers immobilized in the liner fabric. This system allows for a lighter, cooler garment. The carbon spheres are also specially treated to minimize water absorption. This means that the SARATOGA is practically insensitive to humidity and perspiration, and allows for repeated laundering of the garment.

d. GREEN/BLACK VINYL OVERBOOTS (GVO/BVO)

The GVO/BVO is a fitted vinyl overshoe that can be used by the wearer for protection against nuclear, biological, chemical agents, or foul weather. The impermeable GVO/BVO provides protection against all known chemical agents for up to 14 days and should be replaced within 12 hours of contamination with liquid agent (extendible by commanders to 24 hours with increased risk to wearer). The GVO/BVO may be decontaminated to extend their usefulness.

e. CP GLOVES

The CP glove set consists of a butyl-rubber, chemical protective outer glove, and a cotton inner glove for perspiration absorption. CP gloves come in three thickness': 7, 14, and 25 mil. The 7 mil glove is used by personnel who require a high degree of tactility, such as medical

and electronic repair personnel. The 14 mil glove is used by personnel such as aviators and mechanics where good tactility is necessary, and treatment is not too harsh. The 25 mil glove is used by personnel who perform close combat tasks and heavy labor, and require a durable glove. The 14 and 25 mil glove sets will provide protection for at least 24 hours, and can be decontaminated to extend their usefulness. The 7 mil glove set should be replaced within 6 hours after exposure to a chemical agent.

f. FIELD PROTECTIVE MASKS

(1) M17A2 PROTECTIVE MASK

The M17A2 Protective Mask consists of: a butyl rubber face piece; two activated charcoal filters that are mounted within cheek pouches; a voicemitter to facilitate communications, a drinking tube; eyelens outserts to protect the mask's integral eyelens and reduce cold weather fogging; an impermeable hood; and a carrier for the mask, its components, and medical items (such as the Nerve Agent Antidote Kit). The Army is replacing this mask with the M40 protective mask, and the Air Force and Navy have replaced it with the MCU-2A/P.

(2) ABC-M24 AIRCRAFT PROTECTIVE MASK, AND M25A1 TANK PROTECTIVE MASK

These protective masks provide the wearer protection from NBC aerosols/vapors both in their vehicle/aircraft, and on the ground. These masks consist of: wide view, clear plastic lens embedded in a butyl rubber face blank; an integral microphone; eyelens outserts; carrying case; anti-fog kit; and a hose mounted filter canister. There are two major differences between the M24 and M25A1 masks. The masks have different microphone connections to fit either armored vehicle or aircraft communications systems. The M25A1 has an adapter that allows it to be coupled to the tank's filtered and temperature controlled Gas Particulate Filtration Unit (GPFU); the M24 has a different adapter kit that allows coupling to the aircraft's oxygen supply system. The M24 is being replaced by the M43A1, while the M25A1 is being replaced by the M42 protective mask

(3) MCU-2A/P PROTECTIVE MASK

The MCU-2A/P provides eye-respiratory protection from tactical concentrations of CB warfare agents, toxins and radioactive fallout particles. It accommodates a canister that meets all NATO standards for interoperability. The filter is face-mounted and can be worn on either cheek. The mask consists of a uni-molded, silicone rubber face piece, a single polyurethane visor, drinking tube, and an improved voicemitter.

(4) M40/42 PROTECTIVE MASK

The M40/42 protective masks provide eye-respiratory face protection from tactical concentrations of CB warfare agents, toxins and radioactive fallout particles. The mask consists of a silicone rubber face piece with an in-turned peripheral face seal and binocular rigid lens

system. It accommodates NATO standard canisters which can be worn on either cheek of the mask. The M40 is designed for the individual while the M42 is designed for combat vehicle crewmen. Recent improvements include a second skin hood and laser-safe eye-lens outserts.

(5) M43/M43A2 PROTECTIVE MASK

The M43 Aviator Mask consists of a form-fitting face piece with lenses mounted close to the eyes; an integral CB hood and skull-type suspension system; an inhalation air distribution assembly for air flow regulation, lenses and hood; and a portable motor/blower filter assembly which operates on either battery or aircraft power. The M43 was developed for the AH-64 aviator and is compatible with the AH-64 Integrated Helmet and Display Sight System and the Optical Relay Tube. The M43A2 is intended for the general aviator.

(6) AIRCREW EYE/RESPIRATORY PROTECTION (AERP)

The AERP (replaces the MBU-13/P system for aircrews) is a protective mask which 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-mist. The blower is stowed during flight operations on a bracket that is mounted inside the aircraft.

(7) MASK FIT VALIDATION SYSTEM/PROTECTION ASSESSMENT TEST SYSTEM

The Mask Fit Validation System (MFVS) (or Protective Assessment Test Systems, PATS, for the Army) will enhance the operational capability by properly fitting the mask to the face of the individual. The MFVS/PATS is a new capability to provide a simple, rapid, and accurate means of validating the face piece fit of protective masks.

(8) VOICE COMMUNICATION ADAPTER

The Voice Communication Adapter (VCA) is a low risk program providing additional capability to the M40/42 mask. The VCA is a joint program between the USMC and USA.

(9) UNIVERSAL SECOND SKIN

The Second Skin is one of the components of a pre-planned product improvement. The Universal Second Skin program, a Joint US Army/US Marine Corps effort, was initiated to identify a second skin which would meet both the Marine Corps and Army requirements for use with the M40/M42 series masks. Both developed prototype designs and, after field user and human engineer testing, the Marine Corps design was selected as the best design. The Air Force is developing a second skin for the MCU-2A/P.

2. Contamination Avoidance Equipment

a. M256A1 CHEMICAL AGENT DETECTOR KIT

The M256A1 kit can detect and identify field concentrations of: nerve agents (sarin, tabun, soman and VX), blister agents (mustard, phosgene oxime, and lewisite), and blood agents (hydrogen cyanide and cyanogen chloride) in about 15–20 minutes. The kit consists of a carrying case containing 12 individually wrapped detector tickets, a book of M8 chemical agent detector paper, and a set of instructions. Each detector ticket has on it pretreated test spots and glass ampoules containing chemical reagents. In use, the glass ampoules are crushed to release the agents, 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 efficacy.

b. ABC-M8 VGH, AND M9 CHEMICAL AGENT DETECTOR PAPER

M8 and M9 are dye impregnated papers that change color when exposed to liquid chemical agent—these papers cannot detect chemical agents in vapor form. M8 paper comes in booklets that are 4" by 2 1/2" in size. Each booklet contains 25 sheets of detector paper that are capable of detecting G (sarin, tabun, soman) and 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 paper is issued as a 33 feet long, adhesive backed strip that is rolled into a 3" x 2 1/3" roll. M9 paper can detect G and V nerve agents, and H and L (lewisite) blister agents. However, it cannot distinguish the identity of the agent; it turns red, red-purple, or red-brown 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.

c. M8A1 AUTOMATIC CHEMICAL AGENT ALARM (ACAA)

The M8A1 is a system that continuously samples the air to detect dangerous concentrations of G and V type nerve agent vapors. The M8A1 may be employed in a number of configurations, but all configurations are built around the M43A1 detector, and the M42 alarm. The configurations differ primarily in their mountings and power supplies; for example, ground mounted and battery operated, or mounted on a vehicle and powered by the vehicle's electrical system. The M43A1 measures 6 1/2" X 5 1/2" X 11"; the battery used in ground mounted operations adds another 7 3/4" in height to the M43A1. The M43A1 uses a radio-isotope to ionize molecules in the air that is continuously pumped through the system, and detects electrical current changes that occur in the presence of nerve agents. The M43A1 will alarm within about 1-2 minutes from exposure to agent. The M42 is a remote visual and audible alarm that measures 7" X 4" X 2 1/3". The M42 may be placed up to 400 meters from the M43A1 detector to give users advance warning of an approaching agent cloud.

d. AN/KAS-1 CHEMICAL WARFARE DIRECTIONAL DETECTOR (CWDD)

The CWDD is a Navy system that allows stand-off detection of nerve agents during both day and night. The CWDD employs forward-looking, infra-red sensing technology to detect potential threats. The system consists of a sensor unit and a power conditioning unit. The total weight of the fully submersible CWDD is 46 pounds.

e. CHEMICAL AGENT MONITOR (CAM)

The CAM is a hand held instrument capable of detecting, identifying, and providing relative vapor concentration readouts for G and V type nerve agents and H type blister agents. The CAM uses ion mobility spectrometry (IMS) to detect and identify agents within 1 minute of agent exposure. A weak radioactive source ionizes air drawn into the system and the CAM then measures the speed of the ions' movement. Agent identification is based on characteristic ion mobilities, and relative concentrations based on the number of ions detected. The 3 pound, 15" long CAM can either be powered by an internal battery, or by an external source through the CAM's combination power/fault diagnosis plug. The CAM may be used for a variety of missions, to include: area reconnaissance and surveillance, and monitoring of decontamination operations.

f. M21 REMOTE SENSING CHEMICAL AGENT ALARM (RSCAAL)

The M21 RSCAAL is an automatic scanning, passive infrared sensor that detects nerve and blister 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.

g. M-90 AUTOMATIC LIQUID AGENT DETECTOR (AMAD)

The AMAD is an automatic mustard (HD) agent detector which detects various forms of mustard agent (thickened, vapor, *etc.*) This system is currently in use by the Air Force. It transmits its alarm by radio to a central alarm unit. Although the remote transmission is useful, the device only detects one type of agent and must be accompanied by other detectors to provide a complete detection capability.

h. AUTOMATIC LIQUID AGENT ALARM (ALAD)

The ALAD is a liquid agent detector which can detect droplets of GD, VX, HD, and L as well as thickened agents. It transmits its alarm by radio to a central alarm unit. Although the remote transmission is useful, the device only detects droplets of liquid agent. It must be used in conjunction with other point and/or stand-off vapor agent detectors to afford a complete detection capability.

3. Decontamination Equipment

a. M258A1 SKIN DECONTAMINATION KIT (SDK)

The M258A1 consists of a pocket-sized plastic case containing three sets of foil-packaged decontaminating wipes. The decontaminating sets consist of PACKET 1 containing an aqueous decon solution soaked gauze pad, and PACKET 2 containing a decon solution filled glass ampoule within a gauze pad. Personnel use the two wipes successively to remove and neutralize liquid chemical agents from their skin, clothing and personal equipment and weapons. The M258A1 is being replaced by the M291 decon kit.

b. ABC-M11 PORTABLE DECONTAMINATING APPARATUS

The 1 1/3 quart capacity M11 is used to spray DS2 decontaminating solution onto critical areas (*i.e.*, frequently used parts) of vehicles and crew served weapons. The M11 consists of a steel cylinder, a spray head assembly, and a small nitrogen cylinder (about 3" long). The refillable M11 can produce a spray 6 to 8 feet long, and cover an area of about 135 square feet. The M11 is currently used on tanks and other systems where the larger M13 DAP cannot be effectively stowed.

c. M13 DECONTAMINATING APPARATUS, PORTABLE (DAP)

The man portable M13 consists of: a vehicle mounting bracket, a pre-filled fluid container containing about 3 2/3 gallons of DS2 decontaminating solution, and a brush-tipped pumping handle connected to the fluid container by a hose. The fluid container and brush head are both disposable. The M13 can decontaminate 1,200 square feet per fluid container. The combination of spray pump and brush allows personnel to decontaminate hard to reach surfaces, and remove thickened agent, mud, grease and other material.

d. ABC-M12A1 POWER DRIVEN DECONTAMINATION APPARATUS (PDDA); SKID MOUNTED

The M12A1 consists of three main components: a pump unit, a 500 gallon tank unit, and a 600 gallon per hour liquid fuel water heater. The M12A1 is a flexible system that can be used for purposes such as de-icing, fire fighting with water or foam, water pumping/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 two 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.

4. Collective Protection Equipment

a. M51 PROTECTIVE SHELTER, CB

The M51 shelter is a trailer mounted system that consists of the following major components: a 10 man shelter, a protective entrance, and a support system. The shelter and protective entrance support themselves through air filled ribs. The protective entrance minimizes carry-over of vapor contamination from outside to inside the shelter, and paces entries to the shelter to prevent loss of shelter over-pressure. The air handling system is permanently mounted in the trailer, and provides forced, filtered, and environmentally conditioned air to the shelter. The M51 is mostly used by battalion aid stations and other medical units. It can also be used as a temporary rest and relief shelter.

5. Medical NBC Defense Equipment

a. NERVE AGENT ANTIDOTE KIT (NAAK), MARK I (INCLUDES ATROPINE AND 2-PAM CHLORIDE AUTOINJECTORS)

The NAAK consists of two auto-injectors held in a single plastic clip. The first auto-injector contains atropine, which counters the symptoms of nerve agent poisoning (*i.e.*, uncontrolled muscle contractions). The second auto-injector contains the oxime 2-PAM Chloride, which directly counters the nerve agent itself. The auto-injectors contain spring loaded hypodermic syringes that inject their contents when pressure is applied to the tips of the auto-injectors (auto-injectors must be free of the plastic clip). Each person is issued 3 NAAKs whenever use of chemical weapons is likely. Medical units have additional supplies of the two auto-injectors in their chemical agent treatment kits.

b. NERVE AGENT PRETREATMENT PYRIDOSTIGMINE (NAPP) TABLET

NAPP, also known as Pyridostigmine Bromide (PB) Tablets, enhances the effectiveness of the NAAK. Personnel are issued a packet containing 21 NAPP tablets, and will begin taking NAPP only when directed. NAPP is taken when chemical agent exposure is likely within the next several hours or days. One NAPP tablet is taken every 8 hours on a continuous basis until either directed to stop or all 21 tablets are consumed.

c. CONVULSANT ANTIDOTE, NERVE AGENT (CANA)

CANA is similar to the NAAK auto-injectors in operation, and contains 2 milliliters of the anti-convulsant drug diazepam. The CANA auto-injector is distinguished from the NAAK auto-injectors by the 2 flanges along the length of its barrel. Typically, only one CANA is issued per person. CANA is administered only as a part of buddy-aid; that is, when the nerve agent casualty has lost too much control to administer first aid, a buddy will administer the CANA.

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APPENDIX 3.
FIELDED NBC DEFENSE ITEMS - ISSUES AND CONCERNS

NBC defense items are generally used in combination to form a system or subsystem for a particular function. Therefore, this report will address items used as a system. These systems are categorized into five functional areas.

- Contamination Avoidance
- Individual Protection
- Collective Protection
- Decontamination
- Medical

1. Contamination Avoidance

Contamination Avoidance programs generally include those programs that conduct NBC agent reconnaissance, detection, and identification. This area represents approximately half of the annual DoD NBC defense RDT&E budget. Due to recent type-classification of several modernization programs, this area has a number of moderate risk and high risk programs. As procurements of the Chemical Agent Monitor (CAM), M21 RSCAAL, and the M93A1 Fox NBC Reconnaissance System continue, this area should improve. This assumes a constant level of funds with respect to past profiles of DoD funding.

The M8A1 Chemical Agent Alarm remains in the moderate risk category, due to a backlog of orders. There is no production contract for the M8A1 detector, and this backlog will continue to grow. The Services are reluctant to issue a new production contract in light of the soon-to-be fielding of the XM22 Automatic Chemical Agent Detector/Alarm (ACADA) and the continued procurement of the Individual Chemical Agent Detector (ICAD). The CAM, M93A1 NBCRS, M274 NBC Marking Kit and M272 Water Test Kit continue to be assessed in the high risk category because of low inventory levels in regard to high requirements. For the CAM, the high risk category assessment resulted from a significant increase in Service wartime requirements. The Air Force has fielded 231 of the 1200 required M90 Automatic Mustard Agent Detectors needed to meet two MRC requirements, resulting in a high risk assessment.

The M256A1 Detection Kit changed from a low risk to a high risk due to shelf life expiration, which threatens to lower the inventory. Other manual detection programs, to include M8 and M9 paper, are in low risk.

2. Individual Protection

Currently fielded NBC defense equipment items were primarily designed for use in the European environment against a Soviet threat. Equipment in this functional area provides protection against all known CB threat agents. Service unique requirements have led to Service-specific procurements and duplication in capability in this functional area. As a consequence, this has resulted in procurements of six different chemical protective suits and six

different masks. In the recent past, this has caused difficulties in meeting Service needs and exacerbated logistics planning. In FY97, the introduction of the JSLIST candidates should resolve much of these past difficulties.

The Battle Dress Overgarment (BDO) and Chemical Protective Overgarment (CPO) change from low risk to moderate risk, because these items are reaching their maximum extended shelf-life limits (12 years) and new production of these items is not planned. Their replacements, the Joint Services Lightweight Integrated Suit Technology (JSLIST) Advanced Battle Dress Overgarment (ABDO) and Advanced Chemical Protective Garment (ACPG), respectively, will begin procurement in FY97. However, programmed procurement quantities are not sufficient to replace expired BDOs and CPOs, and to maintain required wartime inventory levels.

The Services continue modernizing their chemical protective mask inventories. Different versions of the protective mask were developed to meet the requirements of different military occupational specialties (*e.g.*, aircrew, tank crew, *etc.*). For the Army and Marine Corps, the M40 and M42 are replacing the M17 and M25 masks. The M43A1 masks are used in Army aviation units. These newer masks provide increased protection, improved fit and comfort, and compatibility with most of these Services' weapons systems' optics and sights. The MCU-2/P is designed to meet the needs of the Air Force ground crews and Navy shipboard and shore-based support missions. The M40 and M42 masks are assessed as low risk; however funding constraints have delayed total replacement of the old masks. The M43A1 mask is assessed as moderate risk, but will improve to low risk upon receipt of quantities on contract.

Battle Dress Overgarment (BDO)

There is only one firm manufacturing the BDO. However, DLA's largest customer (the Army) has 3.2 million suits on hand in war reserves to sustain its requirements until 1999, when the new chemical defense suit is expected to be fielded. If any contingencies develop with their current on hand inventory, the Army will shift to the Saratoga suit. Related to the BDO, Duro, Inc. is the sole source for the inner layer of the charcoal slurry impregnated fabric (a key capability) used within the BDO suit. DLA presently has an Industrial Base Maintenance Contract (IBMC) with Duro to maintain this capability. This contract will be maintained until mid- 1996.

Chemical Protective (CP) Gloves

The CP Glove is made out of butyl rubber. Butyl rubber is the most cost effective material capable of withstanding all chemical agents with desirable mechanical properties over a wide range of environmental conditions. There are two current producers of the CP Gloves—Siebe North, Inc., Charleston, SC and Guardian Corp., Willard, Ohio. The Services have adequate stocks on-hand for contingency use. Recent DoD surveillance tests have validated the protective qualities of the existing stocks. The health of the Services on-hand inventories has allowed DLA to pursue an IBMC with both current manufacturers to sustain the industrial base with "War Stopper" funding.

3. Collective Protection

There are two general categories of collective protection; stand-alone shelters and integrated systems. Integrated collective protection equipment is component equipment to provide protection against CB agents through the use of filtered air under positive pressure to a variety of vans, vehicles, aircraft and ships. Collective protection programs continue to be an unsupported program sector. The increased emphasis on individual protection and contamination avoidance programs has resulted in a corresponding decrease in this area. Until the various military users establish a requirement for this capability, this sector will not show signs of improving in the near future.

The only collective protection shelter for Army medical units is the M51 shelter, which is assessed as high risk. Very few (less than 40) are mission capable because most are too old, and therefore, cannot be used for chemical collective protection. The M51 is being replaced by the new Chemical and Biological Protective Shelter (CBPS). The M20A1 shelter liner will be used as an interim replacement. The M20 shelter is also assessed as high risk, as it is no longer being procured. Continued difficulties in obtaining a strong industry leader in this field compound these problems.

4. Decontamination

Current decontaminants are highly effective against all CB agents, but most present environmental hazards and are manpower intensive. The services are attempting to find environmentally safe decontaminants which are less labor intensive.

The M258A1 Personal Decontamination Kit is the primary item used in personnel decontamination. The replacement for the M258A1 is the M291 Personal Decontamination Kit and the M295 Individual Equipment Decontamination Kit. All three kits are effective against nerve and blister agents. Both the M291 and M295 rely on a dry resin technology, which the current company (Rohm & Haas, Inc.) has announced they will no longer produce. There are a number of options being explored to retain this technology. Although the M291 and M295 are assessed as high risk, the quantities of M258A1 decon kits still in the inventory helps in steadying overall readiness stocks.

In the Army, the M12A1 Power-Driven Decontamination Apparatus (PDDA) is the primary piece of equipment in chemical companies used to mix and apply supertropical bleach (STB) to contaminated equipment. The M12A1 is assessed as moderate risk. Although the M12A1 on-hand stocks would result in an assessment as low risk, the maintenance requirements due to the age of this item limits full utilization as a decontamination device. The M17A2 Lightweight Decontamination System (LDS), is used to provide operational equipment decontamination in many battalion-level units and dual-purpose (smoke/decon) chemical companies. The M17A2 is assessed as moderate risk, again due to a low inventory and high demand. This risk should drop as more M17A2 LDSs are produced. Basic soldier skills for decontamination of vehicle and crew-served weapons are accomplished using the Portable

Decontamination Apparatus, M11, and Decontamination Apparatus, Portable, M13. These are assessed as low risk. The M13 Decontamination Apparatus and M11 Decontamination Apparatus have been downgraded to low risk based on improved reported inventory for these two items.

Decontamination Kit, Skin, M291
Decontamination Kit, Individual Equipment, M295

The M291 and M295 decon kits are not currently in production. The sole supplier of the resin, Rohm & Hass, Co., sold its mixing and packaging equipment used to manufacture the kit. They will not produce the components for the key component, XE-555 resin, after completion of the current contract (scheduled for completion in 1997). Pine Bluff Arsenal, Arkansas, has set up a production line to manufacture the kit and is preparing a proposal for a contractor to mix the XE-555 resin. The alternatives to produce a different kit that does not use XE-555 resin are being studied.

5. Medical

Medical CB defense items are used to counteract the effects of exposure to a chemical or biological agent, either through pre-treatments and vaccines or post-treatments. Three of five medical programs are at high risk due to the recomputation of requirements from the FY95 AWRAP, which includes items in National Guard and Army Reserve Sets, Kits, and Outfits (SKO). Active duty units are assumed to have their SKO requirements on hand, as required in Army Regulation 40-61. The MARK 1 Nerve Agent Antidote Kits (NAAK), even though it meets the threshold criteria for high risk, is not considered high risk since the atropine and 2-PAM autoinjectors can be combined to make MARK 1 kits. Changes in previous inventory figures and FY95 figures are based on year-end reconciliation of stocks at depots, disposal of stocks located at Survival Technology, Incorporated that failed extension approval by the FDA, and an increase of stock due-in to the Army owned account as a result of year-end buys.

The sole supplier to DoD for nerve agent antidote kits is Survival Technology, Inc. (STI) of St. Louis, Missouri. Although the sole source for nerve agent autoinjectors is a US company, STI, both atropine and pralidoxime chloride drugs used to fill the autoinjectors are obtained from German suppliers. Currently, there are no domestic sources for these drugs.

The U.S. Army Medical Materiel Development Agency (USAMMDA) added STI to their New Drug Application (NDA) for producing the Convulsant Antidote, Nerve Agent (CANA) autoinjector. The Army continues annual requests from the Defense Personnel Support Center (DLA) for CANA to replenish and maintain stocks and support for the industrial base. Because of the Service's confirmed minimal peacetime requirements for nerve agent antidotes, STI's nerve agent antidote production line is being maintained with an Industrial Base Maintenance Contract (IBMC). USAMMDA's centralized management initiative for medical CDE should also help maintain the health of STI's line. The shelf-life extension of nerve agent antidote kits is part of this initiative and will help keep STI active.

Additionally, pyridostigmine bromide (PB) tablets, a nerve agent pretreatment, and plague vaccine, should be considered "War Stopper" items, because they must be available to support worldwide troop deployment. These items have a limited commercial application and require a dedicated production base. The US Army and OSD (Health Affairs) have aggressively pursued FDA approval of PB tablets. Because of their limited production as NDI items, they are considered at high risk.

Medical research continues to develop medical countermeasures to deter, constrain, and defeat the use of biological warfare agents against U.S. forces. The Medical Biological Defense Research Program (MBDRP) was established to develop medical countermeasures against agents validated biological agent threats. These medical products are transitioned out of the research program to the Joint Program Office for Biological Defense (JPO-BD) for acquisition management. JPO-BD currently is developing a Request for Proposal for a prime systems integration contract for development, FDA licensure, and production of vaccines.

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CHAPTER 5

NUCLEAR, BIOLOGICAL, AND CHEMICAL DEFENSE READINESS AND TRAINING

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5.1 INTRODUCTION

For weapons of mass destruction (WMD) to provide an advantage to an adversary, they must degrade performance of an opponent's force. Performance degradation is a secondary effect of WMD; primary effects are mass casualties or destruction of materiel, or forcing personnel into a protective posture which reduces their capabilities. If these weapons do not ultimately degrade performance, an adversary may be deterred from employing WMD. A force that is trained, equipped, and ready to cope with the challenges of operating in a battlespace where WMD are used has been and will continue to be a critical element of deterrence.

The Services have done well in the exercise of their NBC defense responsibilities under Title X of the FY94 Defense Authorization Act. Our vision for Joint NBC Defense Management follows: **America's Armed Forces trained and ready for the 21st Century, protecting our nation and its forces against nuclear, biological and chemical threats.** We will build on the Service successes to develop a viable Joint orientation to NBC defense capabilities which includes Joint requirements documents; Joint doctrine and tactics, techniques, and procedures; Joint modeling, simulation and wargaming; and Joint professional training. The counter-proliferation acquisition initiative has provided funding necessary to begin this process under the new management of the Joint Services Integration Group (JSIG) discussed in Chapter 1.

5.2 JOINT NBC DEFENSE DOCTRINE

Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense*, continues to be the only Joint NBC doctrinal manual. This document provides a general overview of the strategic level of NBC defense operations. Solid operational Joint NBC defense doctrine and tactics, techniques, and procedures that integrate Service operations in the battlespace must be developed. Further, the program will provide a basis on which the CINCs can train and evaluate their Joint forces operations.

5.2.1 Joint NBC Defense Doctrine Program Management

The NBC defense program management strategy described in Chapter 1 provides the mechanism to provide assistance to the Joint Staff in the further development of Joint NBC defense doctrine program. The USACMLS Joint Doctrine Cell has begun coordinating with the Services to ensure the program is realistic and meets the needs of the joint community.

5.2.2 Joint NBC Defense Doctrine Development Program

The FY95 effort consisted of several initiatives to analyze and develop a requirements list for NBC defense doctrine programs that will be used to develop a strategy for recommending changes to the next generation of joint NBC defense doctrine. Work began on a multi-year NBC Defense Joint Doctrine Development Action Plan (NDJDDAP) that will serve as a road map for these recommended changes. The draft doctrine emerging from this process will be validated using simulations and then used to recommend a revision of Joint Pub 3-11.

During FY95, manning of a five member Joint Doctrine Cell was completed with the exception of an Air Force Technical Writer. This cell, however, was not manned until September because of the prolonged civilian hiring procedure. Also in FY95, a contract effort was awarded to EAI Corporation to perform the Service doctrine and open publication literature search and develop a data base and library to be used in preparing the JDDAP. This effort will identify existing doctrine, tactics, techniques and procedures used by the Services; correlate areas of commonality; identify voids; and ultimately prepare the road map (JDDAP) for joint doctrine efforts. Reference material has been delivered to the USACMLS and an IPR scheduled when the initial recommendations for the JDDAP will be presented to the school. The FY95 effort was hampered by late funding (received in March 95) and lack of personnel.

5.3 STANDARDS/PROFICIENCY AND CURRENCY

Each service establishes standards of proficiency and currency for NBC defense training.

5.3.1 Army

Army Regulation 350-41, *Training and Units*, establishes Army standards for proficiency for NBC defense training. NBC defense training is conducted at schools and in units.

Individual Training

At the initial training level, NBC defense tasks are taught to students wearing Mission Oriented Protective Posture (MOPP) gear during Basic Soldier Training and Warrant Officer Candidate Training to satisfy Military Qualifications Standards Level I. Qualification Standards Level II is achieved from NBC tasks training conducted during Officer (basic and advanced) and Warrant Officer (basic) training. NCOs train on leader NBC skills during Primary Leadership Development Courses (PLDC). Other Officer and NCO courses require training in NBC effects on AirLand operations. At the company level each unit has an NBC NCO specialist and at the battalion or higher level each unit has an NBC Officer/Senior NCO.

Unit Training

The Army is constantly challenged to improve its training of NBC battlefield hazards by integrating such training into unit mission training as well as individual and leader training. It is required that the NBC protective mask be worn during weapons qualification training up to twice a year, depending on the unit category within the Standards in Training Commission (STRAC). Additionally, essential Army civilians are trained in NBC survival skills. Because of today's battlefield complexities, the Army takes a systems approach to its training. NBC tasks for individuals are published in Soldiers' Training Publications and trained in the Army School System. Sustainment training occurs in the unit. NBC collective tasks are published in ARTEP Mission Training Plans. The highest level of NBC training recognizes NBC as a battlefield condition and units train to execute their mission-essential task list (METL) while under NBC conditions.

Mobilization Training

Fort McClellan is a major Reserve Component mobilization center for chemical units. As part of the mobilization process, these units receive individual and unit NBC defense refresher training. During Desert Shield/Storm, instructor personnel from the US Army Chemical School trained numerous units to ensure currency in NBC tasks prior to deployment.

5.3.2 Air Force

Air Force policy is to train and equip only personnel in or deployable to NBC threat areas. The Air Force standards of proficiency are based on two international standardization agreements: NATO Standardization Agreement 2150 (NATO Standards of Proficiency for NBC Defense), and Air Standardization Coordinating Committee (ASCC) Air Standard 84/8 (Initial, Continuation and Unit NBC Standards). Both agreements are implemented through Air Force Instruction 32-4001, Disaster Preparedness Planning and Operations. The Air Force ensures proficiencies and currency of NBC warfare defense training through classroom training, unit level training, and exercises. Chemical-Biological Warfare Defense Training (CBWDT) is required only for military personnel and emergency essential civilians in or deployable to chem-bio threat areas Major Commands (MAJCOMs), the Air Reserve Component, and Direct Reporting Units may tailor their CBWDT programs to meet their specific mission requirements. The subjects presented in the classroom follow the three principles of NBC defense (avoidance, protection and decontamination) as identified in Joint Doctrine. The classroom training is followed by unit level training on wartime mission critical tasks. Personnel are trained by supervisors in job tasks while wearing full chemical protective equipment. Exercises are used for training and evaluation purposes. Instructors at unit level receive their professional training through Air Force courses at Ft. McClellan, Alabama.

Individual Training

Individual training is of two types. The first is *general equipment and procedures training* to enable personnel to recognize and protect themselves and others from NBC hazards. The second is *task qualification training* to enable personnel to perform their wartime tasks in a NBC contaminated environment. Personnel entering the Air Force receive a two hour orientation on NBC defense. More detailed training comes with assignment to a threat area or to a deployable unit. Personnel receive four hours of initial equipment and procedures training plus one hour of mask confidence training within 30 days after arrival in a threat area or 90 days after assignment to a mobility position. NBC refresher training is at the discretion of the major commands, with the majority opting for annual refresher training through classroom training and exercise participation. Task qualification training occurs through on-the-job-training and exercise participation.

Unit Training

Units in or deployable to threat areas must conduct at least two attack response exercises per year, and overseas units often conduct such exercises more frequently. Air Force

major commands have reported significant increases over the last three years in the number of people receiving equipment and procedures training and the number of hours spent for that training. The Air Force requires installations to conduct attack response exercises, consistent with the threat, at least:

- twice annually at installations in NBC threat areas
- once annually at installations in NBC non-threat areas
- based on threat within the deployment area, an additional exercise for units with a mobility commitment. These exercises are graded.

5.3.3 Navy

The Navy's standards of proficiency are contained in several publications:

NWP 62.1	Surface Ship Survivability (Series)
NSTM 470	Shipboard BW/CW Defense
NSTM 070	Radiological Recovery of Ships After Nuclear Weapons Explosion
NSTM 077	Personnel Protection Equipment
FXP-4	Mobility, Logistics, Fleet Support Operations, Non-Combat Operations and Explosive Ordinance Disposal Exercises
S 5080	US Navy Chemical/Biological Defense AA-HBK-010 Handbook

Individual Training

The Navy provides initial entry level NBC defense training to all officers and enlisted personnel.

Unit Training

Proficiency training is conducted at the unit level by Navy instructors who are graduates of the NBC Defense course conducted by the Army at Fort McClellan, Alabama. Afloat units receive formal training at least once during each deployment cycle. Aviation personnel receive training in a classroom annually. In addition to classroom and shipboard training, graded exercises are conducted quarterly.

5.3.4 Marine Corps

The Marine Corps, like the Air Force uses the NATO Standardization Agreement 2150 as the cornerstone for establishing its own training standards. Marine Corps standards of proficiency are also included in the following:

FMFM 11-1	Nuclear, Chemical and Defensive Biological Operations
OH 11	MAGTF Nuclear, Chemical and Defensive Operations
MCO 3400.3	NBC Defense Readiness and Training Requirements

MCO 1510.71 Individual Training Standards for Occupational Field NBC Defense Specialists and NBC Defense Officers

MCWP 3-11 MAGTF NBC Defense Operations (under development, will be staffed in 2Q FY96)

The Marine Corps has four levels of training: individual training, unit training, major exercises/operations, and command level NBC defense courses (schools).

Individual Training

Individual training requires each individual Marine to be capable of performing specific tasks as required by MCO 1510 series and MCO 3400.3.

Unit Training

Unit level training includes classroom and field training and is included in unit training exercises and plans. Unit training requires that each unit be capable of performing its mission under NBC conditions. Unit NBC defense training is overseen by unit NBC specialists who are graduates of the Army's Chemical Defense Training Facility at Ft. McClellan, Alabama. (Shown below.) NBC evaluations are conducted annually for all Marine Corps units. Those units that are part of the Marine Corps' Unit Deployment Program and designated Marine Expeditionary Units are required to undergo an NBC evaluation prior to deployment.

The Marine Corps has various command level NBC defense schools. These schools conduct refresher training for unit NBC defense specialists and for unit NBC defense teams.

5.4 NBC DEFENSE PROFESSIONAL TRAINING

Public Law 103-160 requires all Services to conduct NBC defense professional training at the same location. Currently, training is co-located at the US Army Chemical School, Fort McClellan, Alabama. Each Service conducts their training with their own Service instructors.

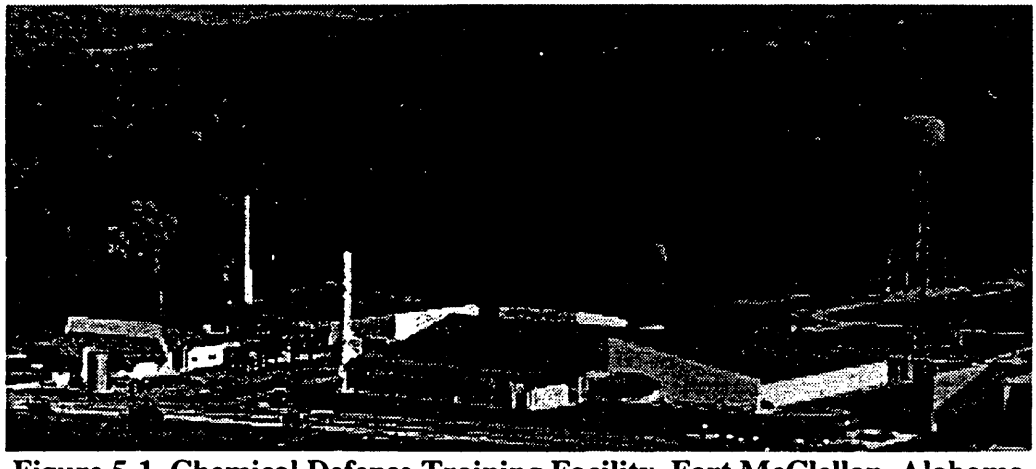

Figure 5-1. Chemical Defense Training Facility, Fort McClellan, Alabama

5.4.1 Joint NBC Defense Professional Training

The US Army Chemical School has established a Joint Training Steering Group (JTSG) as a forum to discuss issues that pertain to facilities and range scheduling and any other training issues that impact on the ability of the Services to conduct effective training.

We have begun to exchange information on Service equipment, doctrine and employment techniques to establish a baseline for development of future Joint doctrine and professional training. The concept is to consolidate classes that teach the same task to the Services using a Service instructor that has that skill. This exchange will grow once the JSIG is staffed to coordinate the effort.

Within the joint medical arena, a new course, "The Management of Chemical and Biological Casualties Course", has been established based on guidance contained in DoD Directive 6025.3, "Clinical Quality Management Program in the Military Health Services" (signed 20 July 1995). This directive requires that health care providers receive certification that documents preparation for assignments during military operations. This includes NBC defense training and provider courses, where applicable. Certification will be reviewed by the medical commander annually. In addition, on 20 December 1995 the DoD completed a Directive "Military Medical Readiness Skill Training" (number to be assigned) which implements policy, assigns responsibility, prescribes procedures for developing and sustaining comprehensive systems for providing, assessing, and monitoring military medical skills training essential for all military personnel, health care personnel, and medical units. NBC defense training, to include chemical and biological warfare defense measures and medical specialty training such as casualty management, are specifically articulated in the instruction.

5.4.2 Army NBC Defense Professional Training

US Army NBC Defense Professional Training at Fort McClellan, Alabama consists of three enlisted/noncommissioned officer courses and two officer courses. Initial entry enlisted soldiers receive training in agent characteristics and hazards, smoke and decontamination operations, chemical and radiological survey procedures and individual protective clothing and equipment. This one station unit training program provides 18 weeks of intensive training. It culminates with live/toxic agent training in the Chemical Defense Training Facility. Toxic agent training is an integral, mandatory component of all professional courses.

Chemical Corps sergeants attend the 15 week Chemical Basic Noncommissioned Officer Course (BNCOC) where they are trained to be an NBC company squad leader and a non-chemical company or battalion NBC NCO. Chemical BNCOC provides the NCO with the technical and tactical skills needed to advise company/battalion commanders in NBC operations and procedures, to train non-chemical soldiers in NBC avoidance, decontamination and protective measures and to lead smoke/decontamination squads.

Chemical Corps staff sergeants and sergeants first class attend the 13 week Chemical Advanced NCO Course (ANCOC) where they are trained to be an NBC platoon sergeant, an NBC NCO at brigade level, and an NBC NCO in a division or Corps level NBC element. They receive advanced technical operations, hazard estimates, logistics and maintenance management, combined arms operations, smoke and flame support, and training management.

Chemical Corps lieutenants attend a 19 week officer basic course which prepares them to serve either as a Chemical Corps smoke or decontamination platoon leader or as a non-chemical battalion chemical staff officer/assistant operations officer. This course provides them with a fundamental knowledge of NBC agent characteristics and hazards, NBC recon (non-FOX), decon and smoke operations, NBC staff functions, and individual/unit tactical operations. The course is a mixture of classroom instruction, hands-on equipment training, and field exercises. Completion of live/toxic agent training is a prerequisite for graduation.

Chemical Corps captains attend the 20 week officer advanced course where they are trained to serve as the commander of an NBC defense company and as NBC staff officers at the brigade and division level. Instruction focuses on leadership, Army operations, hazard prediction, planning and conducting NBC reconnaissance, decontamination, and smoke and flame operations in support of maneuver units. Additionally, officers receive training in nuclear target analysis/vulnerability analysis, operational radiological safety, and environmental management. Extensive use is made of computer simulations to reinforce the application of NBC assets in support of tactical operations.

Specialized professional training is conducted in stand-alone courses attended by DoD, Allied, and international students. These courses include:

- NBC Reconnaissance Operations (FOX) (5 weeks)
- Radiological Safety (Installation level) (3 weeks)
- Chemical Weapons Inspector/Escort (OSIA) (1 week)
- Chemical Weapons Convention Module II (6 weeks)
- Decon Procedures (Non-US) (GE, UK, NE) (1 week)
- RADIAC Calibrator Custodian (1 week)
- Biological Detection Specialist (7 weeks)

5.4.3 Navy NBC Defense Professional Training

The Naval Construction Training Center Detachment at Fort McClellan offers two courses of instruction for Navy Chemical, Biological and Radiological Defense (CBR-D) specialists. The courses are open to Navy, Coast Guard, Military Sealift Command and foreign personnel, E-5 and above. Courses are designed to provide both afloat and ashore commands with individuals who can successfully perform their requisite 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.

In the first quarter, FY96, CBR-D training for officers was moved to Ft. McClellan, with relocation of the Applied CBR-D for Damage Control Assistant Course from Newport, RI. The training capitalizes on the unique capabilities of the Army Chemical School. In addition to classroom instruction, the Navy Detachment utilizes the CDTF for live agent training and the Bradley Radiological/Laser Laboratory for training in theory and equipment operation for radiological defense. Approximately 600 students graduate annually from the Detachment's courses. In addition to being fully qualified to conduct training using the Army's facilities, the Navy Detachment actively participates as part of the Joint Training Steering Group.

5.4.4 Marine Corps NBC Defense Professional Training

The Marine Corps NBC Defense School at Ft McClellan consists of an Enlisted Basic NBC Defense Course, and a newly developed Officer Basic NBC Defense Course. In addition to the courses conducted by the Marine Corps NBC Defense School, Marines attend three other functional courses (Chemical Officer Advanced Course, NBC Reconnaissance Course, and the Radiological Safety Officer Course) conducted by the Army Chemical School.

The USMC Enlisted Basic NBC Defense Course trains approximately 200 NBC Specialists in a comprehensive 10 week program covering all the Individual Training Standards specified in MCO 1510.71. The course is divided into five blocks of instruction covering:

- Basic NBC Skills
- Chemical and Biological Defense
- Radiological Defense
- Equipment Maintenance
- Decontamination

The USMC Officer Basic NBC Defense Course will be scheduled once a year to coincide with the graduation of newly selected warrant officers from the Warrant Officer Basic Course. The first iteration will be conducted in June 1996. The six-week course will train about 24 students annually and provide instruction on all officer training standards specified in MCO 1510.71.

The Marine Corps NBC Defense School completed a course content review board (CCRB) in September 1995. The CCRB, composed of NBC Specialists and Operational Command representatives from throughout the Marine Corps, validated the current programs of instruction and ensures that Marine NBC specialists are meeting the operational requirements of Marine Corps Major Subordinate Commands.

5.4.5 Air Force NBC Defense Professional Training

The Air Force training detachment at Ft. McClellan offers eight separate in-residence courses designed to enhance the NBC proficiency of primary-duty AF Civil Engineer Readiness Flight personnel. These courses fulfill the differing needs of the total force, including Active Duty, Air National Guard, and Air Force Reserve. Further, the Air Force administers an

exportable course designed to prepare people for in-residence training, a career development course taken through correspondence, and two mobile courses in airbase operability and NBC cell operations.

Each course contains a wide range of materials; covering critical aspects of Readiness Flight operations in situations ranging from peacetime, military operations other than war, through wartime. The following is a synopsis of the NBC aspects of these courses.

- Training for personnel being assigned primary readiness duties includes comprehensive coverage of agent characteristics and hazards (to include determination of incapacitation/ lethality levels); nuclear weapons effects and other specific hazards associated with ionizing radiation; NBC detection and decontamination; contamination control and avoidance techniques; plotting and reporting procedures; detailed NBC persistency and duration of hazard calculations; the inter-relationship between NBC defense and other passive defense activities (*e.g.*, camouflage, concealment, and deception, (CCD), dispersal, and hardening, *etc.*); and systematic analysis procedures for assessing the hazard and providing credible advice to commanders.

- Air Force learning theory emphasizes hands-on training and the school makes extensive use of available training ranges and equipment. The school includes CDTF live agent training in most of their courses. Training is provided on every major piece of equipment available in the field today, including state-of-the-art items being fielded

- The Readiness Flight Officer and 7-level Craftsman courses provide flight leaders and mid-level NCOs with the background and technical information that is necessary for effective management of the Readiness Flight and contingency response operations.

Readiness is the key to successful Air Force operations. Consequently, the various aspects of Readiness Flight operations, including NBC defense, are also topics of instruction at Senior Officer Indoctrination Courses.

5.5 TRAINING IN A TOXIC CHEMICAL ENVIRONMENT

In 1987 the Army established a "one-of-a-kind" facility called the Chemical Defense Training Facility (CDTF) at Fort McClellan, Alabama. The CDTF allows personnel to train in a real toxic agent environment. Since its opening, the Army has utilized this valuable resource to train over 36,000 US and Allied members from all Services. Training philosophy demands that the military train the way it fights. The CDTF promotes readiness by providing realistic training in the areas of detection, identification, and decontamination of chemical agents. The training develops confidence in chemical defense tactics, techniques, procedures, and chemical defense equipment. Instructors ensure that trainees can adequately perform selected tasks on a chemically contaminated battlefield. To date, the CDTF has maintained a perfect safety and environmental record.

Enrollment at the Joint Senior Leaders Course and the Toxic Agent Leader Training Course at Fort McClellan continues to be in demand. Over 1,200 active and reserve commanders, service leaders, and toxic agent handlers from each of the services have attended. These experts become instructors for the Services for unit training. In addition to the training opportunity *per se*, toxic chemical environment training provides senior officers, commanders and future specialists confidence in their doctrine, warfighting techniques, and the equipment they fight with in the face of challenges presented by NBC contamination which may up to then have been purely theoretical.

There is growing international interest in CDTF training participation. The Germans have been taking advantage of the training opportunity for about five years. The United Kingdom now uses the facility for training. Law enforcement agencies have also participated in the training.

During FY95, the Base Realignment and Closure Commission (BRAC) placed Ft. McClellan on the base closure list and is planned for closure in FY99. The Chemical School and the CDTF will be closed and new training facilities are planned to be opened at Fort Leonard Wood, Missouri.

5.6 INTEGRATION OF REALISM/WARGAMES/EXERCISES

5.6.1 Wargames

Incorporation of NBC features into relevant simulations, including portrayal of NBC weapons effects is essential. Currently, several models which represent the fluid dynamics of NBC contamination are available. However, relatively few robust representations of NBC effects have been fully implemented in the wargaming and analytical models used by DoD. The Concepts Evaluation Model (CEM), used by the Army Concepts Analysis Agency, captures NBC effects off-line. Corps level models such as Vector-In-Command (VIC) and Division models such as Combined Arms and Support Task Force Evaluation Model (CASTFOREM) have some NBC capabilities and are continually being improved. JANUS, a division level model, has NBC capabilities that are being improved and updated. Force Evaluation Model (FORCEM) and Tactical Warfare (TACWAR) have been modified for theater level play. We are also modifying TACWAR so that developing and new items of NBC Defense equipment played to show their effects on the outcome of the theater battle; this effort will help quantify the benefits of NBC developmental items and help prioritize them.

Incorporation of WMD features in relevant models, including faithful portrayal of CB aerosolization and electromagnetic pulse (EMP) effects is essential. The incorporation of CB weapons into the base cases of the computer wargame Louisiana Maneuvers (LAM) versions of the combat development and training model Janus-A and the ongoing iteration of the Army's Total Army Analysis (TAA) process using FORCEM, mark the first time major decisions have considered CB weapons as a part of the standard battlefield. For the LAM Janus-A (CB), the next step is to adopt the CB improvements into the Army Standard Janus-A model. This will put CB effects into a widely used training simulation and provide a Janus-A training audience

the opportunity to understand the impacts of CB weapons. ACES, an Air Force Command Exercise System is a family of joint wargames which currently has robust nuclear simulations with chemical and biological planned for the near future. All existing models need to be modified in the biological area. To date, there has been limited model modification for biological play except for the current modifications ongoing to Janus.

Each of the services conducts wargames, which incorporate WMD in the scenarios, in their respective senior level service schools. The Joint Land, Aerospace, and Sea Simulation (JLAS), a joint exercise with all the senior service schools participating, hosted by the Air Force Wargaming Center at Maxwell AFB, Alabama, incorporates electronic simulation of the NBC environment. The Navy has conducted a Naval Battle Analysis to provide a tool to analyze the effects of CB agents on Naval operations and permit the incorporation of realistic assessments of CB warfare effects into Naval wargaming. As a result, the Vapor, Liquid, and Solid Tracking (VLSTRACK) Model has been integrated into selected war games and demonstrated to the participants.

5.6.2 Joint NBC Training/Joint and Combined Exercises

In an effort to improve NBC training and add realism to the training, the Joint Staff in Joint Pub 3-11, *Joint NBC Defense Doctrine*, formalizes the doctrine for Joint NBC training and exercises. Although individual training and exercises to test proficiency remain under the purview of the Services, NBC defense will be integrated into individual and collective programs at all levels and into higher echelon operational and tactical exercises, command post and other command, control, and communications system exercises, and joint and combined training exercises. The following discussion provides descriptions of the Joint Staff and Services' initiatives to ensure the integration of NBC defense in Joint training and exercises.

Chairman of the Joint Chiefs of Staff (CJCS) Exercise Program

Joint NBC defense training objectives have been incorporated into the CJCS Exercise Program. This program includes three different types of exercises

(1) **Positive Force** (PF) exercises are large scale Command Post Exercises that normally consider national level issues such as mobilization and deployment. During PF 97 (Mobilization) and PF 98 (Deployment), Atlantic Command (ACOM), in its role as the force provider, must ensure that deploying units and personnel are certified as combat ready. An integral part of this certification procedure is determining unit, personnel, and equipment operational readiness under NBC conditions.

(2) **Positive Response** (PR) exercises normally consider strategic nuclear level issues. In addition to considering command and control of nuclear forces, these exercises deploy, on an annual basis, backup national command and control personnel and systems. Capabilities of these redundant systems are equally applicable during chemical and biological scenario as they are during nuclear scenarios.

(3) The **No-Notice Interoperability Exercise** (NIEX) program continues to focus on our ability to indict the proliferation of nuclear, chemical, and biological weapons. In 1995,

the NIEX required the interagency process to respond to a foreign nation's request to interdict and recover three stolen nuclear weapons. National level forces were deployed in response to this crisis. The 1996 NIEX is planned to test our nation's ability to respond to a crisis involving biological weapons.

Army

The Army emphasizes integration of NBC defense training in unit rotations at the Combat Training Centers (CTCs). These centers include the National Training Center (NTC), Joint Readiness Training Center (JRTC), the Combat Maneuver Training Center (CMTC), and the Battle Command Training Program (BCTP).

The Army continues to see positive results in training based on external evaluation of unit Army Training and Evaluation Programs (ARTEPs) conducted at the NTC, JRTC, and other training locations world-wide. These results clearly show and emphasize that through continued training, soldiers can increase their ability to perform combat missions in spite of the degradation caused by the wear of the protective ensemble. Units which (1) have the necessary command support and equipment, (2) balance NBC within their overall training requirements, and (3) execute according to approved training plans perform their overall mission better in a simulated NBC environment. However, increasingly constrained training resources limit training to fundamentals; often this means training for operating in an NBC environment is not funded.

Air Force

Chemical warfare defense preparedness is an integral part of periodic Operational Readiness Inspections conducted by Major Command Inspectors General. Realism is injected into these scenarios using a simulated wartime environment including the use of bomb simulators, smoke and attacking aircraft. Personnel are tasked to perform war skills while in MOPP 4. Additionally, Air Force units participate in major joint and combined exercises which incorporate realistic NBC situations. Following are selected examples from the Pacific Air Force (PACAF); Central Air Force (CENTAF) and US Air Force Europe (USAFE) are also incorporating NBC situations into exercises:

- TEAM SPIRIT - Joint/combined large scale air, sea, land exercise to demonstrate US resolve in South Korea.
- ULCHI FOCUS LENS - Joint/combined command and control exercise conducted in conjunction with the Republic of Korea's national mobilization exercise "ULCHI."
- FOAL EAGLE - Joint/combined rear area battle and special operations field training exercise.

Navy

Due to the unique nature of Naval vessels, NBC defense training is conducted the same whether platforms are operating independently or in a group. Even in a battle group scenario, the task force would still continue with the mission while each unit would conduct NBC defense

against certain attacks. Therefore, formal training is conducted by Afloat Training Groups while platforms are operating independently. Required training exercises are conducted by each unit every three months in order to maintain their readiness rating. During scheduled NBC defense training periods, realism is stressed. NBC defense equipment is used extensively. Protective masks and suits are worn by required personnel.

Marine Corps

Exercises and operations at all levels include some degree of NBC defense training. The Marine Corps incorporates NBC defense training into combined arms exercises at the Marine Corps Air Ground Combat Training Center in Twenty Nine Palms, California. Battalion level unit exercises are also conducted during Korea and Thailand Incremental Training Programs where units deploy and exercise various tasks. Like the Air Force and Army, the Marine Corps also participates in major joint/combined exercises. The level is determined by mission, threat, and task organization. During FY95, the Marine Corps incorporated NBC defense training into such exercises as JTF Exercise UNIFIED ENDEAVOR, LAX 5/6-95, ULCHI FOCUS LENS 95, FOAL EAGLE, and IMEFEX 95. NBC evaluations are conducted annually for all Marine Corps units. Evaluations include operational, administrative, and logistical functional areas. These exercises incorporate realistic NBC defense training into the exercise scenario to enhance the value of the exercise.

5.7 INITIATIVES

5.7.1 Joint

Doctrine

Initiatives in Joint NBC defense doctrine are detailed in section 5.2.

Modeling

The Deputy Assistant Secretary of Defense for Chemical and Biological Matters, DATSD(CBM), and the Deputy Under Secretary of the Army for Operations Research (DUSA-OR) have initiated a CB Modeling Process Action Team whose purpose is to "provide OSD with a consolidated and integrated CB modeling program, where possible, harmonizing individual Service and Agency work into joint programs and eliminating duplication and overlapping projects." We initiated a system to establish configuration control and a model repository and data base through the CB Information Analysis Center. Our goal is to allow all aspects of CB defense to be performed in the Distributive Interactive Simulation (DIS) arena.

Training

5.7.2 Army

In an effort to refine doctrine and training, the Army is quantifying the impact of NBC

environments on combat operations. Two programs have been executed to achieve this goal: (1) Combined Arms in a Nuclear/Chemical Environment (CANE), and (2) Physiological and Psychological Effects of the NBC Environment and Sustained Operations on Systems in Combat (P^2NBC^2). These Force Development Testing and Experimentation (FDTE) evaluations have improved our understanding of individual and unit operations and performance degradation while in Mission Oriented Protective Posture (MOPP), and for the first time quantified field data that commanders can use for planning, training and decision making to respond to the threat.

The Army, as proponent for CANE tests, has completed five field evaluations (mechanized infantry squad/platoon in 1983, tank company team in 1985, armor heavy battalion task force in 1988, light infantry forces in 1992, and air defense artillery in 1993). The Army has established the CANE Implementation Plan (CIP), a systematic review process to ensure identified deficiencies are addressed and corrected. The Commander of the Army's Training and Doctrine Command (TRADOC), reviews the CIP annually. Army field manuals are then revised to address deficiencies identified in CANE tests.

Before CANE FDTEs were conducted, commanders' training in a simulated NBC environment had an indication of the degradation that MOPP places on their operations. They were aware that training could maximize proficiency, but they lacked the feedback to direct that training. Consequently, training was often sporadic and incomplete.

The Army is now implementing several training guidance improvements by:

- Providing heightened command emphasis to unit commanders on NBC threat with attention to the Third World countries;
- Simulating the NBC environment in training;
- Continuing emphasis and effort to integrate safe, realistic NBC defense in all training;
- Extending wear of MOPP gear in basic and annual training.

5.7.3 Air Force

The Air Force currently has three training and readiness initiatives underway.

The Disaster Preparedness (Civil Engineer Readiness) Technical School moved to Fort McClellan, Alabama during the summer of 1994. The school became operational in October 1994. This move consolidated chemical warfare training for all the Services at one location. Air Force instructors are working closely with the other Services to explore interoperability issues, with an eye towards maximizing the joint aspects of training. The Air Force continues to work toward qualifying its instructors to conduct joint classes at the CDTF. Efforts also include acquisition of more varied equipment (*i.e.*, aircraft) and development of lesson plans for that equipment.

The school is in the validation process for the basic Air Force Specialty (AFS) awarding course. During this validation period, the school is revising all blocks of instruction to ensure they are providing the most current, credible and realistic training possible. The school has an

on-going program wherein the scientific reports from each NBC testing facility are analyzed and lesson plans are updated as new information becomes available.

The Air Force is developing a computer-based training program for certification testing of NBC specialists. Training will be conducted through audio-visual products and instructional text. The program will test the student, provide the student feedback on areas that require further study, record test results, and serve as a record for the supervisor. This system will also allow individuals to continue their training under field conditions using laptop computers.

5.7.4 Navy

The Navy's main initiative for NBC defense training is the Integrated Damage Control Training Technology Program. This effort focuses on developing integrated organic shipboard training capabilities that will enhance the Navy's capability in NBC defense. Crew members using a self paced interactive software package will be instructed in a variety of areas at various levels. Senior leadership will be able to monitor individual progress through computer printouts. The ultimate goal is to train respective crews in a quick yet effective manner while increasing the basic level of knowledge.

With relocation of CBR-D training for officer Damage Control Assistants to Ft. McClellan, the Navy has consolidated its CBR-D training efforts.

Additionally, the Navy's basic NBC defense course has been incorporated in both officer and enlisted accession training curriculums. In conjunction with this initiative, the same course taught at the fleet training centers has been restructured to improve throughput.

5.7.5 Marine Corps

During FY95, the Marine Corps' training initiatives centered on two areas: casualty decontamination operations and staff planning. Many exercises included both. Joint operations received much attention in FY95 and will be of continued interest in FY96 and beyond.

Marine Corps initiatives for FY95 included:

- Conduct of a Biological/Chemical Response Force Workshops to identify requirements necessary to meet the Commandant of the Marine Corps guidance on the establishment of a strategic organization—manned, trained, and equipped—to counter the growing biological-chemical terrorist threat.
- Establishment of a Marine Corps Basic NBC Officer Course. This course provides the requisite NBC skills to newly selected Marine Corps NBC Defense Officers. The first iteration will begin in June 1996.
- Establishment of an NBC Staff Planning follow-on course, a training course to prepare NBC defense officers and NCOs to assist in the staff planning process.
- Establishment of combat training package for ISMs for reserve forces and follow-on forces in the event of hostilities involving an NBC threat.

- Integration of NBC defense procedures in Mission Oriented Tasks (Garrison and Field).
- Conduct of Joint Marine Corps and Navy shipboard decontamination exercises with 7th Fleet.
- Development of bilateral exchange program with the Republic of Korea (ROK) Chemical Corps.

During FY96 the Marine Corps plan to activate the Bio/Chem Response Force to be globally sourced to Marine Force Commanders and National Command Authority for duties as the President may direct. This force will consist of 300 skilled and trained personnel, possibly to include civilian experts. The organization will consist of five elements: Command (include virtual staff), Security, Service Support, Bio/Chem Detection and Decontamination, and Medical. The Bio/Chem Response Force will be equipped with state-of-the-art detection, monitoring, and decontamination equipment and will be prepared for operations in a wide range of military-civilian contingencies. The Commanding General, Marine Corps Combat Development Command will continue to develop the concept, doctrine, organization, and tactics, techniques and procedures for this Bio/Chem Response Force to be activated by 1 April 1996.

5.8 READINESS REPORTING SYSTEM

CJCS MOP 11, the policy document for the Status of Resources and Training System (SORTS) requires units from all Services to independently assess their equipment on hand and training status for operations in a chemical and biological environment. This is a change to previous SORTS reporting requirements, and provides more visibility to NBC defense related issues. It was included in a revision to MOP 11 in December 1992, and is one of many changes to SORTS which will be implemented by the Services.

The Services individually monitor their SORTS data to determine the type of equipment and training needing attention. Units routinely report their equipment on hand and training status for operations for operations in a chemical or biological environment. Commanders combine this information with other factors, including wartime mission, to provide an overall assessment of a unit's readiness to go to war.

Additionally, the Commanders-in-Chief (CINCs) of the Unified Commands submit readiness assessments at each Joint Monthly Readiness Review (JMRR). In the JMRR, CINCs assess the readiness and capabilities of their command to integrate and synchronize forces to execute assigned missions. As needed, CINCs address NBC defense readiness and deficiencies as part of the JMRR.

5.9 NBC DEFENSE TRAINING AND READINESS ASSESSMENT

*** DoD lacks adequate feedback on the status of training, equipment, and readiness. It needs information adequate for assessing operational force capabilities from the Department perspective and the warfighting CINCs' perspectives.**

SOLUTION: Assign consistent and higher priority to NBC defense, especially by the Joint Chiefs of Staff and the warfighting CINCs, in order to maintain an adequate state of readiness and to ensure NBC defense reporting information is accomplished in a timely and adequate manner. Existing reporting systems may provide an adequate mechanism for assessing readiness.

*** Joint NBC defense doctrine needs to continue to develop and include joint tactics, techniques, and procedures.**

SOLUTION: Initiatives began in 1987 to develop joint NBC defense doctrine which resulted in Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense*. In FY95 efforts were initiated to update this document. The Joint Service Integration Group, assisted by the U.S. Army Chemical School Joint Doctrine Cell, is responsible for assisting the U.S. Army in the development of this doctrine under sponsorship of the Joint Staff. Continued Service interaction and cooperation facilitated by these organizations will produce the next generation of Joint NBC Defense Doctrine.

*** There are limited chemical and biological features in wargaming and planning models.**

SOLUTION: Funding to add chemical and biological warfare to exercise scenarios has been received for FY96. Efforts are underway in the current DoD programming cycle to establish long term support. The CB Modeling Process Action Team is also addressing this issue.

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CHAPTER 6

PREPARATIONS FOR THE CHEMICAL WEAPONS CONVENTION

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6.1 DEPARTMENT OF DEFENSE PREPARATION

The Department of Defense conducts an Implementation Working Group (IWG) to plan for implementation of the Chemical Weapons Convention (CWC) and related bilateral chemical weapons agreements. Through regularly recurring meetings, representatives of the Office of the Secretary of Defense (OSD), the Joint Staff, the Military Services, and DoD agencies and activities coordinate planning efforts to ensure successful implementation of the CWC and related CW agreements. Formal meetings of the CWCIWG are scheduled approximately monthly and *ad hoc* meetings are held as needed to address short-notice requirements. Upon implementation of the CWC a counterpart Compliance Review Group (CRG) will be established within DoD. The CWCCRG will meet as needed to address ongoing compliance concerns.

The Military Services and the On-Site Inspection Agency (OSIA) have developed individual implementation plans to provide guidance for their commands and activities under the CWC and the related agreements. As outlined in their plans, the Services and OSIA have conducted assistance visits and formal exercises to ensure that all elements are prepared to comply with the agreements.

The Military Services have individually established implementation support offices which participate actively at the DoD CWCIWG, 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 and related CW agreements.

In accordance with the DoD Program Plan for Research, Development, Test and Evaluation (RDT&E) for Arms Control, the Defense Nuclear Agency (DNA) directs the DoD RDT&E effort to ensure that arms control verification proceeds using the most effective technology available.

OSD, the Joint Staff, the Military Services, OSIA and DNA frequently provide technical experts to support activity at the CWC Preparatory Commission (PrepCom) in The Hague, The Netherlands. The PrepCom is charged with developing procedures and implementing the international forum, the Organization for the Prohibition of CW (OPCW), which will oversee worldwide compliance with the CWC.

OSD and the Joint Staff have provided representation and OSIA has provided operational advice to US negotiating delegations in Moscow, Russia for completion of CW bilateral implementation protocols. Discussions continue concerning follow-on aspects of the historic Wyoming MOU, for which inspections were completed in December 1994. Negotiation of protocols to enable implementation of the Bilateral Destruction Agreement (BDA), which was signed in 1990, continues.

6.2 TRAINING FOR INSPECTORS

OSIA has prepared a number of US inspectors and escorts to conduct activities in support of the CWC and related CW agreements. The OSIA training program for both OSIA

cadre and augmentees from Defense agencies and throughout the US Government includes one week of classroom instruction in the Washington area (Module I), one week of field safety training (including operation in a toxic-agent training facility) at Fort McClellan, Alabama (Module II), and specialized training (including specialized equipment and technical training, team and collective training, and CW specific language training) at various locations. To date, 801 people have been trained through Module I (six courses) and 416 persons qualified through Module II (13 courses). The major emphasis of the OSIA effort in support of the CWC has been directed at bilateral CW agreements between the US and the Russian Federation. These bilateral agreements are intended to support and facilitate the CWC.

Building upon the OSIA training model, DNA and the Army Chemical School (supported by OSIA) have developed training courses that may be available for international experts who will conduct inspections under the CWC. To date, two pilot courses have been conducted to refine the curriculum for a basic (core level) course and two pilots have been held to confirm the technical content of advanced courses. Development continues on advanced technical specialty courses which could prepare inspectors for inspections at highly specialized facilities.

6.3 PREPARATION OF DEFENSE INSTALLATIONS

OSIA has coordinated actively with the Military Services in preparing DoD installations for inspections under the CWC and related bilateral CW agreements. All Defense installations which will be subject to declaration under the requirements of the CWC, and many which will be subject to challenge even though not declared, have been visited by OSIA technical experts and Military Service representatives. A series of staff assistance visits, joint training exercises, and mock inspections have been carried out at installations identified by the Military Services as being potentially vulnerable. Furthermore, the Military Services have initiated efforts to ensure that affected commands take timely and appropriate measures to reduce vulnerability.

OSIA has expended nearly 6,300 man days conducting site visits, field training exercises, bilateral CW agreement inspections, and other on-site activities (over 158 separate events) in preparation for the CWC and related CW agreements. OSIA has visited, on a recurring basis, every DoD CW-related facility in the US that will be declared under the CWC. In addition to assistance visits and routine training exercises, a total of 64 mock inspections and five inspections under a bilateral CW agreement have been conducted at US facilities over the past three years. Activity is continuing to ensure that all US DoD facilities are in full compliance with the applicable CW mandates.

6.4 PREPARATION OF DoD-CONTRACT INSTALLATIONS

In the event of CWC inspection of DoD-contract activities, the Defense Treaty Inspection Readiness Program (DTIRP), for which OSIA is the DoD Executive Agent, has a trained cadre of technical experts from the security countermeasures and counterintelligence community to assist defense contractors in preparing for a CWC challenge inspection. The DTIRP personnel have conducted CW vulnerability assessments and site assistance visits, and

have participated in numerous mock inspections and table top exercises. In order to assist program and facility managers, OSIA has developed a sophisticated arms control risk assessment model designed to address risks to national security and proprietary information. The DTIRP system enables the assessment of susceptibility, as well as vulnerability, and the level of preparation needed to protect critical technologies, sensitive programs, and capabilities.

OSIA has implemented an extensive outreach program to provide information about the CWC, security countermeasures, facility preparation, and DTIRP to both government and DoD industry. OSIA provides training and awareness services through such fora as industry seminars, mobile training teams, mock inspections, tabletop exercises, industry associations, national conventions and symposia. DTIRP speakers participated in more than 50 outreach events during the last fiscal year. OSIA also publishes various educational products (printed and video) and administers electronic bulletin boards to provide information concerning the CWC to government and industry.

Through DTIRP, OSIA maintains an operational capability to deploy counterintelligence personnel and specialized equipment to support assistance teams at challenged facilities on short notice. DTIRP is an integral support element to the Military Services, Department of Energy, and others for CW challenge inspections at their undeclared, as well as their declared, facilities. This capability will be available to support DoD and government contractors during implementation of the CWC.

6.5 COOPERATIVE THREAT REDUCTION (CTR)

The CW Destruction Assistance Project was established as a part of the CTR Program under a July 1992 agreement between the US DoD and the Russian Federation President's Committee on Conventional Problems of Chemical and Biological Weapons. This project is the primary vehicle for DoD to provide assistance to the Russian Federation's efforts to destroy their CW stockpile. This effort is consistent with both the US-Russian BDA and the CWC. DNA, under the staff supervision of the Assistant to the Secretary of Defense for Atomic Energy, is the DoD lead agency for implementing this and all other CTR projects.

Russia has declared a CW stockpile of 40,000 metric tons located at seven sites, the bulk of which (32,500 metric tons of nerve agent) is located at five of these sites. The declaration states that all nerve agents are weaponized in bombs, spray tanks, missile warheads, artillery projectiles, and rocket warheads.

The CW Project is focused on facilitating and expediting the safe disposal of the Russian CW stocks in a time frame which generally parallels the US CW demilitarization schedule and meets Russian obligations under the CWC and the BDA. It should be noted that, although this program is guided by provisions and requirements of both the CWC and the BDA, it is a stand alone effort and is not dependent on the ratification of either of these agreements by US and Russian legislators. Components of the project are listed as follow:

- Development of a comprehensive concept plan, to include systems analysis and design, for the Russian CW destruction program.

- Provision of detection devices and analytical and alarm systems to support the destruction concept.

- Establishment of a familiarization/intern program designed to acquaint Russian CW experts with the US demilitarization program.

- Visits by Russian technical representatives to CW destruction facilities in the US.

- Demonstration of US protective equipment and conduct of any training or tutorials required.

- Establishment of a Central CW Destruction Analytical Laboratory to support the Russian CW destruction program.

There are several issues currently under discussion which will govern the next steps in this project. In addition, the US has offered to design and construct a pilot-scale CW destruction facility to test the candidate technologies for the Russian CW destruction program. Agreement on these two initiatives will govern the pace and direction of the evolution of this important project under the CTR Program.

ANNEX A

CONTAMINATION AVOIDANCE PROGRAMS

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Chemical Agent Monitor (CAM)/Improved CAM - Production

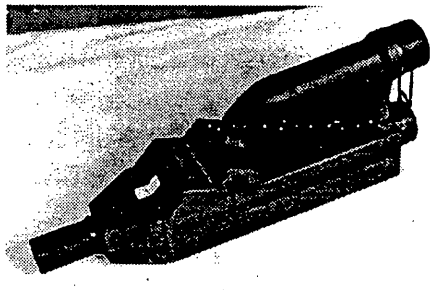
Rationale:

Army, Air Force, Marine Corps (Requirement)
Navy (Interest)

Key Requirements:

- Monitor low levels of nerve and blister agents
- Be lightweight and operate as a hand-held monitor
- Differentiate between nerve and blister agents
- Be unaffected by common battlefield interferences

Description:



The CAM is a hand-held device for monitoring chemical agent contamination on personnel and equipment. It monitors vapors of chemical agents by sensing molecular ions of specific mobility (time of flight) and uses timing and micro-processor techniques to reject interferences. The monitor discriminates between the vapors of nerve and mustard agents. The CAM consists of a drift tube, signal processor, molecular sieve, membrane, and expendables such as batteries, confidence tester, and dust filters. The improved CAM (ICAM) significantly reduces the level and frequency of maintenance without effecting the CAM's performance. The ICAM sieve pack has double the capacity of the two CAM sieve packs, which results in twice the operational life of the ICAM over the CAM.

XM22 Automatic Chemical Agent Alarm (ACADA/AVAD) - RDTE (FUE FY 97)

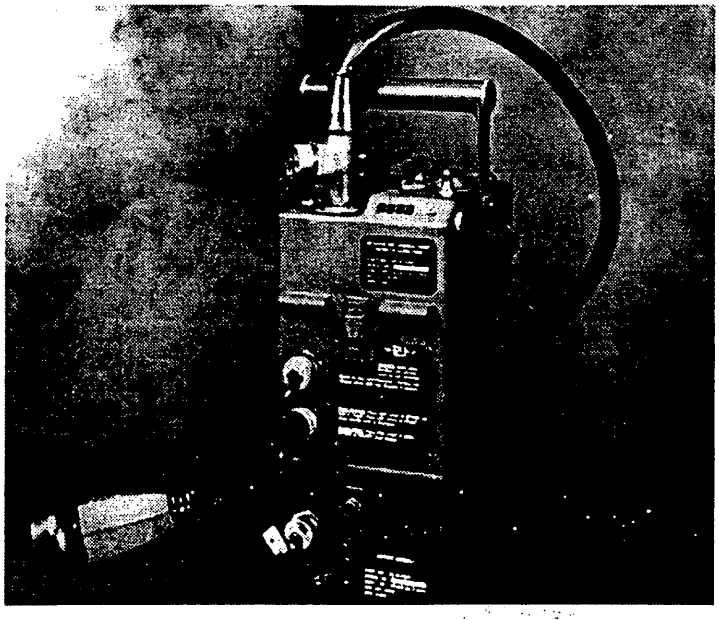
Rationale:

Army, Marine Corps, Air Force (Requirement)
Navy (Interest)

Key Requirements:

- Detect and identify nerve and blister agents
- Operate in area warning or survey/monitoring roles
- Be man-portable and programmable for new agents

Description:



ACADA is a man-portable, point sampling alarm system that provides significant improvement over current capabilities; it detects, identifies and quantifies all nerve agents, mustard and lewisite. ACADA provides concurrent nerve and blister agent detection, improved sensitivity and response time, agent identification capability, improved interference 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 M1 CAM as a survey instrument. The ACADA development effort is focused on selecting an off-the-shelf Non-Developmental Item (NDI) which best satisfies the user requirements.

Agent Water Monitors- RDTE

The Agent Water has been ***tentatively*** *planned as a cooperative RDTE effort, chartered to develop a family of monitors which will detect chemical agents in water. The monitors will feature multi-agent detection, and operate automatically, improving both ease and response time of existing system. The project will accommodate the four services' requirements for the following:*

In-line CB Detector (IL CBDWS)
Chemical Agent Water Monitor (CAWM)
CB Agent Water Monitor (CBAWM)

Rationale:

Army, Air Force, Marine Corps (Requirement)
Navy (Interest)

Key Requirements:

- Detect and identify nerve and blister agents in water
- Perform continuous and automatic monitoring
- 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 automatically detect CB agents at or below harmful levels in water and not false alarm to common interferents. The system will be compact, lightweight and easy to use, and be decontaminated to a negligible risk level.

Joint Service Chemical Miniature Agent Detector (JSCMAD) - RDTE

The JSCMAD is a fully cooperative RDTE effort, chartered to develop a family of miniature chemical agent detectors. The family of detectors will provide individual 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 for the following:

Individual Soldier Detector (ISD)
Special Operation Force Chemical Agent Detector (SOFCAS)
Individual Vapor Detector (IVD)
Aircraft Interior Detector (AIDET)
Shipboard Chemical Agent Monitor Portable (SCAMP)
CW Interior Compartment System (CWICS)
Improved Chemical Detection System (ICDS)

Rationale:

Army, Navy, Air Force, Marine Corps (Requirement)

Key Requirements:

- Small, lightweight detector capable of detecting presence of chemical agent vapors
- Capable of de-warning, allowing for rapid reduction of protective postures (IVD)
- Detect, identify, quantify and warn of presence of even low levels of nerve or blister agents in vapor form in aircraft interiors (AIDET)
- Operated/maintained by ship's force; operate in a shipboard environment (SCAMP)

Description:

The JSCMAD will first consist of a small lightweight device to be worn by individual personnel to warn them of a chemical agent attack. Secondly, it will consist of a system that will detect, identify, quantify and warn of the presence of nerve agents and blister agents in vapor form in aircraft interiors. Thirdly, it will consist of a shipboard monitor, capable of detecting nerve agents and blister agents on personnel and in compartments, free of false alarms which are caused by shipboard interferents.

Biological Point Detection - RDTE

Biological Point Detection is a fully cooperative RDTE effort chartered to develop new biological point detectors and detection systems for quad-services. The program is managed by JPO-BD and will yield three detector variants:

A. Interim Biological Agent Detector (IBAD)
B. Joint Biological Point Detection System (JBPDS)
C. Biological Integrated Detection system (BIDS)

IBAD is a stand-alone system. JBPDS will be a system that can stand alone, or be used in a suite of systems. The BIDS effort will encompass development of an integrated system as well as several stand-alone biological detectors:

Biological Detector - RDTE (BD)
Chemical and Biological Mass Spectrometer (CBMS)

Interim Biological Agent Detector (IBAD) - RDTE, Rapid Prototype

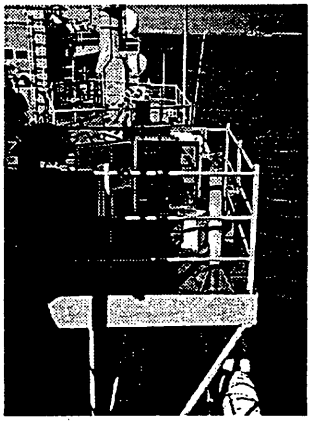
Rationale:

Navy (Requirement)

Key Requirements:

- Automatic point collection and identification of limited biological agents (IBAD)
- Automatic point detection and identification of all validated biological warfare agents (JPBDS)
- Automatic collection and identification of biological warfare agents while ship is underway (IBAD)
- Operate in a shipboard environment; operated and maintained by ship's force.

Description:



IBAD will provide a near term solution to a deficiency in shipboard detection of biological warfare agents. IBAD consists of a particle sizer/counter, particle wet cyclone sampler and a detection unit which uses improved membrane calorimetric tickets (flow-through assay). It is a rapid prototype system scheduled for imminent fielding, tailored to shipboard applications. IBAD also has been chosen as the detection piece of the Airbase/Port Biological Detection (ACTD).

JBPDS will detect in real time biological warfare agents at concentrations below incapacitating doses. It will consist of complementary technologies to detect, sample and identify biological warfare agents. Block I and Block II phases will allow for component upgrades. The JBPDS will be integrated on designated Service platforms.

Biological Integrated Detection System (BIDS) - (Non-Developmental Item (NDI) FUE FY 96)

Rationale:

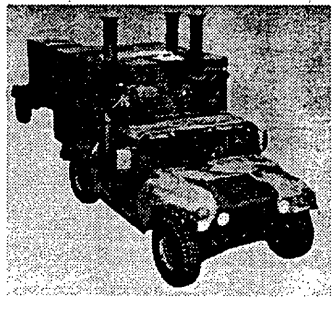
Army (Requirement)
Navy, Air Force, Marine Corps (Interest in BIDS' sub-components)

Key Requirements:

- Detect and identify 5 to 25 agent-containing particles/liter of air (ACPLA) in the 2–10 micron range in 15–30 minutes
- Provide agent detection and identification
- Provide collective protection with environmental controls (BIDS)
- Knowledge-based system to process detector information (BIDS)
- FM/HF radios to communicate (BIDS)
- Automatically detect and warn of biological pathogens and toxins (BD)
- Detect aerosol samples of specified materials (CAT A of ITF-6 Report) (BD)
- Reject common battlefield interferents and re-programmable to detect new agents (BD)
- Be data-linked with a centralized hazard information data collection center (BD)
- Characterize new agents; detect, identify, and semi-quantitative CB agents (CBMS)
- Respond to agent vapors, aerosols or liquid droplets (CBMS)
- Have detection thresholds at or below human response levels (CBMS)
- Possess modules to accommodate future advances in technology and CB threat (CBMS)

Description:

BIDS uses a multiple technology approach, both developmental and off-the-shelf materiel, to detect biological agents with maximum accuracy. The interim BIDS is a vehicle-mounted, fully integrated biological detection system. The system, which is collectively protected and housed in a HMMWV shelter, is modular to allow component replacement and exploitation of "leap ahead" technologies. The BIDS program will



include a P^3I system which will integrate the CB Mass Spectrometer (CBMS) with the Biological Detector as sub-components.

The BD is an antibody based, automatic aerosol sampling device capable of detecting specific biological agents on demand. It consists of electronics processing equipment, fluid processing modules, reservoirs for antibody reagents, and a light addressable potentiometric sensor to provide biological detection and identification. The total processing time, from insertion of sample, will be approximately 15 minutes at threshold concentrations. The BD includes an operator display which will provide identification and relative concentration of the biological agent detected. Built-in tests will also be provided to identify system malfunctions.

The CBMS detects and characterizes all known chemical and biological threat agents. It continuously and automatically detects threat agents via a mass analyzer chassis, a biological aerosol sampling probe, a surface sampling probe and sample identification device. The mass analyzer chassis houses the mass analyzer, pumps, control electronics, and computers. With the aerosol probe attached, the CBMS detects biological agent aerosols and chemical agents as aerosols and/or vapors in the air. With the ground probe attached, the CBMS detects chemical agents whether they exist as airborne vapors or aerosols, or as liquid droplets on surfaces. The CBMS will replace the MM1 and be mounted within the NBC Recon System to search for areas of CB agent contamination.

Shipboard Automatic Liquid Agent Detector (SALAD) - RDTE

Rationale:

Navy (Service-Unique Requirement)

Key Requirements:

- Automatic detection of liquid chemical agents
- Operated/maintained by ship's force
- Operate in a shipboard environment and detect while the ship is underway

Description:

SALAD is an exterior, liquid agent point detection and monitoring system that will detect and alarm in the presence of liquid nerve and blister agents. SALAD will consist of a detector unit that uses chemically treated paper, optical scanners, a central processing unit and alarms (visual and audible) on the bridge and Damage Control Central. Milestone II was achieved on 4 May 1993. Developmental Test/Operational Test (DT/OT) will commence in FY96 with procurement scheduled for FY97.

Improved (Chemical Agent) Point Detection System (IPDS) - RDTE

Rationale:

Navy (Service-Unique Requirement)

Key Requirements:

- Discriminate between nerve and blister agents along with standard shipboard interferent (AFFF, POLs, *etc.*)
- Provide automatic nerve and blister vapor agent detection
- Operated/maintained by ship's force
- Operate in a shipboard environment
- Detect while ship is underway

Description:

Using dual-cell ionization mobility spectroscopy technology, IPDS is being developed to replace CAPDS. IPDS is a fully automatic fixed point air sampling and detection instrument designed to detect nerve and blister agent vapor contamination in the exterior atmosphere around a ship. The software includes a library of signatures representative of both agents and commonly used chemical compounds found on ships called interferents. By comparing the ion-generated signatures of various compounds observed by IPDS with those in the library, the system is able to avoid false alarms. Milestone III was achieved in 3QFY95, and a product contract is to be awarded in 3QFY96.

Stand-Off Detection

M21 Remote Sensing Chemical Agent Alarm (RSCAAL) - Production

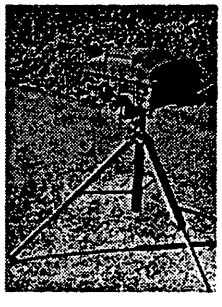
Rationale:

Army, Marine Corps (Requirement)

Key Requirements:

- Stand-off detection of nerve and blister agent clouds at line-of-sight distances (5 km)
- Stand alone surveillance
- On-the-move operations in reconnaissance (on an NBC reconnaissance vehicle)

Description:



The M21 RSCAAL is an automatic scanning, passive infrared (IR) sensor which detects nerve and blister agent vapor clouds based on changes in the infrared spectrum caused by the agent cloud. It is effective at line-of-sight distances of up to 5 kilometers. The alarm is used for surveillance and reconnaissance missions in both vehicle-mounted and trip-mounted modes. The detector can scan horizontally 60 degrees. It will be used in the stationary mode for reconnaissance and surveillance missions; to monitor avenues of approach and egress, bridges, road

junctions, and other point targets; to search areas between friendly and enemy forces for chemical agent vapors; and to provide advanced detection and warning of chemical hazards. The M21 RSCAAL is a two-man portable, stand-alone tripod-mounted chemical agent overwatch system or it can be vehicle mounted.

Joint Service Lightweight Stand-off Chemical Agent Detector (JSLSCAD) - RDTE

The JSLSCAD is a fully coordinated joint service RDTE program, chartered to develop a lightweight stand-off chemical detector for the quad-services. The JSLSCAD will utilize a passive infrared sensor with 360° scanning to satisfy requirements for:

Lightweight Stand-off Chemical Agent Detector (LSCAD)
M21 Moving Background
Chemical Agent Remote Detection System (CARDS)
Stand-off Detector for Armored System Modernization (SD/ASM)

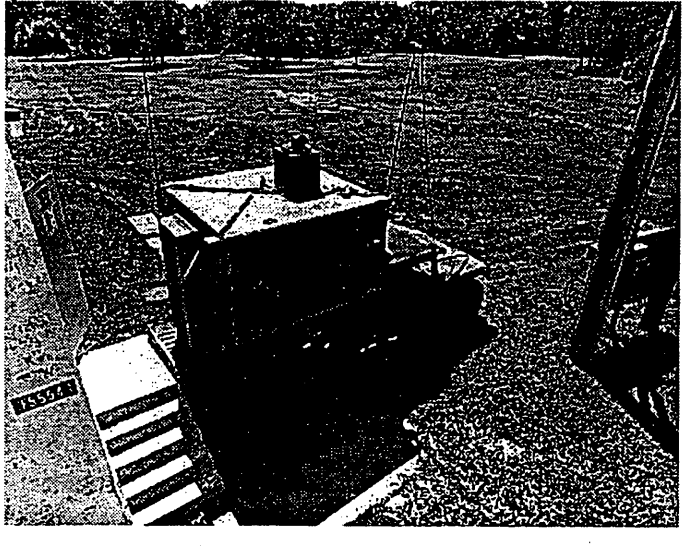
Rationale:

Army, Navy, Air Force, Marine Corps (Requirement)

Key Requirements:

- Automatically detect nerve or blister agents at a distance up to 5 km
- Be lightweight and employed from manned and unmanned systems
- Be capable of being data-linked with centralized hazard information data collection center
- Be capable of remote operations; aerial and on-the-move operation

Description:



The JSLSCAD will be capable of scanning 360° x 60°, and automatically detecting nerve or blister agents at a distance up to 5 km. 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.

Joint Service Chemical Warning and Identification LIDAR (JSCWILD) - RDTE

The JSCWILD is a fully coordinated joint service program, chartered to develop a chemical warning and identification system for the quad-services. The JSCWILD will utilize an active LIDAR sensor to perform rapid agent identification and ranging to satisfy requirement for:

Laser Stand-Off Chemical Detector (LSCD)
Area Detection System (ADS)
Stand-off Detector (SD)
CB Stand-off Detector (CBSD)

Rationale:

Army, Air Force (Requirement)

Key Requirements:

- Automatically detect, range, and map CW agents at distances of up to 3 km
- Scan atmosphere and terrain to detect chemical vapors, airborne liquids and particles, and ground contamination
- Provide stand-off capability for both fixed site and reconnaissance
- Provide rapid agent concentration mapping

Description:

The JSCWILD will be a lightweight, vehicle-mountable, contamination monitoring system which detects and quantifies, from a distance of 3 kilometers, all types of chemical agent contamination (including agent rain, vapors, aerosols, and ground contamination), in a stand-off mode. The JSCWILD will operate from fixed sites and ground vehicles. The system has distance-ranging and contamination-mapping capabilities and transmits this information to a battlefield information network.

Biological Stand-off RDTE

The Biological Stand-off program seeks to develop a biological early warning system. The Biological Stand-off will utilize infrared LIDAR technologies to satisfy requirements for:

Long Range Stand-off Bio-Detection System (LRBSDS)

Rationale:

Army (Requirement)
Air Force, Navy (Interest)

Key Requirements:

- Stand-off detection of aerosol clouds to a range of 50 km
- Provides relative concentration, range, location, and tracking of suspect aerosol clouds
- UH-60 helicopter-mounted

Description:

The Biological Stand-off program will yield a long-range stand-off aerosol detection capability. LRBSDS is an aircraft-mounted long-range aerosol cloud detector. LRBSDS utilizes infrared LIDAR technology to detect, range and track biological areosol clouds. The system, which is expected to be approximately 800 pounds and three cubic meters, has three major components: a pulsed IR laser transmitter operating at between 260 and 300 nanometer wavelength; a receiver and telescope; and an information processor and display.

NBC Reconnaissance

M93 NBC Reconnaissance System (NBCRS) Interim System - Production (FUE FY 92)

Rationale:

Army, Marine Corps (Requirement)

Key Requirements:

- Armored vehicle with collective protection
- Chemical agent point detectors and monitors
- Radiation detector and monitor
- Integrate navigation and secure communications systems

Description:

The M93 is a dedicated system for NBC detection, warning, and sampling equipment integrated into a high speed, high mobility armored carrier capable of performing NBC reconnaissance or primary, secondary, or cross-country routes through-out the battlefield. The M93 can find and mark chemical and nuclear contamination. Through a secure communications system, it provides warnings to follow-on forces. The crew is protected by an on-board overpressure system.

Joint Service NBC Reconnaissance (JSNBCRS) - RDTE

The Joint Service NBC Reconnaissance program is a coordinated Army and Marine Corps effort and will yield improved reconnaissance capabilities for both heavy and lightweight vehicle platforms. It will satisfy requirements for:

M93A1 NBC Reconnaissance System (NBCRS)
System Improvement Phase (SIP) - RDTE
Light NBC Reconnaissance System (LNBCRS)
Lightweight Reconnaissance System (LWRS)

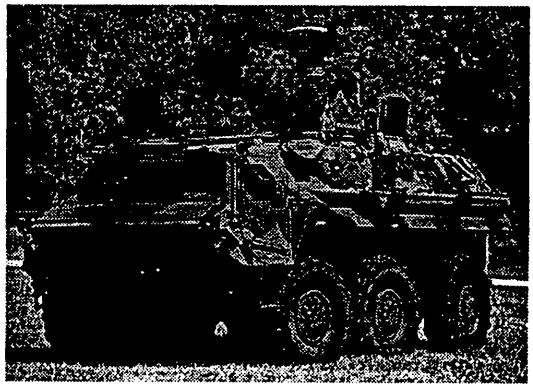
Rationale:

Army, Marine Corps (Requirement)

Key Requirements:

- Armored vehicle with over-pressure collective protection and macro cooling
- Chemical agent stand-off and point detectors and monitors
- Radiation detector and monitor
- Integrate central data processor with all detectors and monitors; navigation and communications system; jam resistant communications system; meteorological sensing system
- Integration of advance NBC detection and analysis equipment suited for Marine Air-Ground Task Force (MAGTF) operations (LNBCRS)
  Standard Marine Corps host vehicle, transportable by C-130, CH-53E, and LCAV-30 (LNBCRS)

Description:



The M93E1 is a system improvement phase (SIP) to upgrade the M93 to detect chemical contamination in its immediate environment using the M21 RSCAAL stand-off detector. It will automatically integrate contamination information from sensors with input from on-board navigation and meteorological systems. It rapidly transmits hazard warning via a central data processor, a commander's display, a keyboard, and integrated digital jam-resistant communications. The SIP will also replace the MM1 with a CBMS. The M93E1 permits reducing the crew from four to three individuals. For the first time this program also develops fields organic maintenance for the FOX NBCRS.

The LNBCRS will provide a premiere vehicle for accurate, rapid NBC combat hazard information by verifying the absence of, finding, mapping, and marking radiological,

biological, and chemical hazards. The LNBCRS will be an integration of advance NBC detection and analysis equipment suited for Marine Air-Ground Team Force expeditionary operations and Army rapid deployment/light operations.

Warning and Reporting

Joint Service Warning and Reporting Network (JWARN) RDTE (FUE FY 99)

Rationale:

Army, Air Force, and Marine Corps (Requirement)
Navy (Interest)

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 operation

Description:

Consolidation of HAZWARN (warning and reporting) with MICAD to form a comprehensive upgradable NBC component to the emerging C^4I systems in the services. System does not duplicate C^4I fractures but integrates into the global command and control system to provide automated NBC warning and NBC mission planning function.

Radiacs

AN/VDR-2 Radiac Meter - Production

Rationale:

Army, Marine Corps (Requirement)

Key Requirements:

- Lightweight, and man-portable
- Measures gamma radiation from 0.01 microGrays/hour to 9,999 centiGrays/hour
- Measures beta radiation from 0.001 centiGrays/hour to 5 centiGrays/hour

Description:

The AN/VDR-2 is a digital, auto-ranging dose-rate meter and dosimeter providing detection and measurement of gamma and beta radiation. The major components of the AN/VDR-2 are the radiac meter, probe (which contains gamma sensing Geiger-Mueller tubes), pouch with strap, and the converter cable receptacle. The dose rate is displayed on the three-digit liquid crystal display. The radiac meter has the capability of time-integrating

the dose-rate counts displaying the cumulative dose on command. The AN/VDR-2 detects beta radiation and measures gamma contamination at tactical levels as well as low-dose rates in equipment, supplies, personnel, food and water. Other features available are alarm setting and check, audio-visual alarms, instrument and battery test attenuation factor set, push-to-read external dose-rate, auto-ranging and illumination of display. The instrument is powered by three BA-3090 batteries when hand-carried, or 24V batteries when vehicular mounted or continuous monitoring. The AN/VDR-2 radiac meter is currently being fielded. The AN/VDR-2 is replacing the AN/PDR-27, AN/PDR-63, and the IM-174/PD. The AN/VDR-2, by replacing the above systems, will provide the Marine Corps with a more accurate and reliable radiac meter capable of detecting and measuring both gamma and beta radiation.

Multi-Function Radiation (MFR) Detector - RDTE (FUE FY 96)

Rationale:

Navy, Air Force (Requirement)

Key Requirements:

- Capable of detecting and measuring nuclear radiation (alpha, beta, gamma, neutron and x-ray), including low peacetime rates, and dosimeter measurements
- Lightweight, portable system
- Must issue an audible alarm when radiation is detected
- Must be accurate within ±15 percent, and have a response time ranging from 2–5 seconds
- Must be able to operate under field conditions, including during blackout, while in motion, and be ruggedized to prevent damage due to shock or vibration
- Probes must be capable of independent calibration with standard Navy desktop computer

Description:

This joint program will target an off-the-shelf buy of improved radiation detection equipment to replace the current suite of logistically unsupportable assets. Present detectors (PAC-1S, AN/PDR-43 and AN/PDR-56F) have exceeded maintainability standards. Original manufacturers have either discontinued production or are no longer in business. An improved capability is required to support both wartime and peacetime nuclear accident response operations. A production contract was awarded in March 1995. First deliveries are expected in March 1997.

AN/PDR-75 Radiac Set - Production

Rationale:

Army (Service-Unique Requirement)

Key Requirements:

- Lightweight, and man-portable
- Detects and measures individual exposure of accumulated neutron induced and gamma radiation

Description:

The AN/PDR-75 consists of the Detector, Radiac DT-236/PDR-75, and the Computer Indicator (CP-696-PDT-75). The Radiac Computer Indicator is designed to measure accumulated neutron and gamma radiation doses. The Radiac Detector is worn by personnel who may be exposed to radiation from tactical nuclear weapons. The DT-236/PDR-75 is the individual wrist-watch dosimeter, and the AN/PDR-75 is the device used to read the DT-236. The readings provided by these instruments will be recorded on a radiological chart and used to confirm or alter the radiation status of the unit, and to serve as a guide to the commander in planning to control exposures so that units or individuals with the lowest exposure can be used where operations must be carried out in radiologically contaminated areas.

AN/UDR-13 Pocket RADIAC (Platoon Radiac) - RDTE (FUE FY98)

Rationale:

Army (Service-Unique Requirement)
Air Force (Interest)

Key Requirements:

- Dosimeter capability of 0-999 cGy (neutrons/gamma-prompt initial and fallout)
- Rate meter capability of 0.1-999 cGy/hr (gamma fallout)
- Alarm setting capability for dose and dose-rate
- Mission dose capability
- Digital readout and night visibility (secure lighting)

Description:

The AN/UDR-13 Pocket RADIAC is a compact, hand-held, tactical device capable of measuring the gamma dose-rate and gamma/neutron cumulative dose in a battlefield environment. Its pocket size permits convenient use by troops on foot. Alarms 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.

Stand-off RADIAC System - RDTE

Rationale:

Army (Service-Unique Requirement)

Key Requirements:

- Automatically detect and measure from 10 km gamma radiation (1-1000 cGy/hr)
- Data processing and storage
- Compact and lightweight

Description:

The Stand-off RADIAC accurately and automatically measures radiation in the air and on the ground from distances of 10 kilometers. The compact, lightweight system will be tripod or vehicle mounted. It will determine range and position of gamma radiation and store the data on a removable-media memory module. It will transmit data via secure radio to field commanders to plan operations and unit movements.

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ANNEX B

NON-MEDICAL FORCE PROTECTION PROGRAMS

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Integrated

21st Century Land Warrior - RDTE

Rationale:

Army (Requirement)
Navy, Air Force, Marine Corps (Interest)

Key Requirements:

- Protection from all threats for the individual
- Integrated vision, communication, and locator systems and enhanced equipment interface

Description:

The 21St Century Land Warrior (21CLW) is an integrated soldier defense system which will improve the warfighter's combat system interface and ability to detect, recognize, and destroy enemy soldiers and equipment. Monitor and protection systems are integrated into a full body ensemble along with advanced locations, communications, microcomputer, and vision systems to maximize the warfighter's battlefield awareness, survivability, and lethality.

Respiratory

M40/M40A1 Protective Mask- Production
M42/M42A1 Combat Vehicle Mask-Production

Rationale:

Army, Marine Corps (Requirement)

Key Requirements:

- Respiratory protection from all CB warfare agents
- Enhanced comfort and external filter/canister
- Improved communication system and canister interoperability (M42A1)
- Quick Doff/Second skin hood, improved vision correction, and laser ballistic eye protection.

Description:

The M40 (shown left) and M42 (shown below) protective masks provide respiratory-eye-face protection from tactical concentrations of CB warfare agents, toxins and radioactive fallout particles. The mask consists of a silicone rubber face-piece with an in-turned peripheral face seal and binocular rigid lens system. It accommodates canisters which meets all NATO standards for inter-operability. The filter is face-mounted and can be worn on either cheek. Microphones and air adapters are provided for combat vehicle applications. The M40 is designed for the individual warfighter while the M42 is designed for combat vehicle crewmen. The M40A1/ M42A1 communication system and canister interoperability enables conversion of the M40 mask to a combat vehicle compatible M42 mask. The communication system includes speech amplification and microphone interchange ability. The second skin hood improves the mask's NBC survive-ability, while new eye-lens outserts provide laser ballistic eye protection.

M43 Protective Mask - Inventory
M43A2 Aircraft Mask - RDTE

Rationale:

Army (Service-Unique Requirement)
Marine Corps (Interest M43 only - No imminent requirement)

Key Requirements:

- CB protection compatible with all Army rotary wing aircraft; and weapon system interface
- Auxiliary motor blower using standard batteries
- Replaceable prescription lenses
- Improved NBC survivability
- Compact and lightweight blower (M43A2 only)

Description:

The M43 and M43A2 Aircraft Mask consist of a form-fitting facepiece with lenses mounted close to the eyes; an integral CB hood and skull-type suspension system; an inhalation air distribution assembly for air flow regulation; lenses and hood; a pressure compensated exhalation valve assembly for maintaining over pressure in the mask/hood; an electronic microphone; and a portable motor/blower filter assembly which operates on either battery or aircraft power. The M43 was developed for the AH-64 aviator and is compatible with the AH-64 Integrated Helmet and Display Sighting System and the Optical Relay Tube. The M43A2 is intended for the general aviator and will replace the M24. Both masks provide the required CB protection.

MCU-2/P, MCU-2A/P Protective Mask - Production

Rationale:

Navy, Air Force, Marine Corps (2/P only) (Requirement)

Key Requirements:

- Respiratory protection from all chemical and biological agents
- Enhanced comfort and field of view

Description:

The MCU-2/P and MCU-2A/P masks provide respiratory-eye-face protection from tactical concentrations of CB warfare agents, toxins and radioactive fallout particles. It accommodates a canister which meets all NATO standards for interoperability. The filter is face-mounted (gas and aerosol filter) and can be worn on either cheek. The mask consists of a uni-molded, silicone rubber face piece, a single polyurethane visor, a polycarbonate covering for the visor which provides additional abrasion protection. It can be worn over spectacles and the flexible lens permit the use of binoculars, a gun sight or other optical equipment. The mask has a drink tube and two voice emitters: one for face-to-face speech and one for use with communication equipment. The MCU-2A/P has an intercom and microphone adapter for enhanced communication.

A/P22P-9(V) - Production

Rationale:

Navy, Marine Corps (Requirement)

Key Requirements:

- CB protection compatible with a large variety of aircraft systems; integral hood and mask

Description:

The A/P22P-9(V) provides head-eye-respiratory protection via the MCK-3/P respirator and CQK-8/P tactical ventilator for "helo" crews. The ensemble, which utilizes a blower to provide positive pressure, has anti-drown features and provides system compatibility with a large variety of aircraft. In FY96, the ensemble will be upgraded with a rip away face plate, and improved tactical ventilator with a smaller man-mounted pusher fan.

MBU-19/P Aircrew Eye/Respiratory Protection (AERP) - Production

Rationale:

Air Force (Requirement)
Navy, Army, Marine Corps (Interest)

Key Requirements:

- Improved visibility, fit, chemical protection and comfort
- Weapon system interface and ejector seat compatibility

Description:

This system is a second generation chemical defense system that is designed to improve visibility, fit, protection, and comfort. The system includes a mask and hood, blower unit, intercom unit and passive anti-drown device. The bromo-butyl rubber hood incorporates a standard oxygen mask, clear plastic lens, neck dam, drink facility, and communication connection. The integrated mask and hood is compatible with the standard flight helmet.

A/P23P-14(V)N - RDTE

Rationale:

Navy, Marine Corps (Requirement)

Key Requirements:

- CB protection compatible with all aircraft system; integral respirator and protective ensemble

Description:

The A/P23P-14(V)N is a self contained protective ensemble designed for all forward deployed fixed wing (USN/USMC) and rotary wing (USN) aircrew. The design will incorporate 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 will provide enhanced protection and offer anti-drown features.

XM45 Aircrew Protective Mask (ACPM) - RDTE (FUE FY98)

Rationale:

Army (Requirement)

Navy, Air Force, Marine Corps (Interest)

Key Requirements:

- Unpowered protection compatibility with optical sighting systems
- Reduced weight, cost and logistic burden
- Improved RAM and M43A2

Description:

The ACPM will have close fitting eyelenses mounted in a silicone rubber facepiece with an in-turned peripheral seal, a detachable hood system, and a detachable motor blower assembly to reduce the inhalation burden. The mask will provide the required CB protection with or without forced ventilated air, and is compatible with aircraft sighting and night vision devices.

Respiratory Protection System 21 (RESPO 21) - RDTE (FUE FY02)

Rationale:

Army (Requirement)

Navy, Air Force, Marine Corps (Interest)

Key Requirements:

- Protection against future threats
- Improved system integration over M40 series protective masks
- Reduce breathing resistance by 50% over the M40; reduced mission degradation

Description:

RESPO 21 will provide improved respiratory, eye, and face protection against all known and future CB threats agent. It will feature a compact respirator which will minimize physiological burden and associated soldier degradation, and maximize compatibility with future weapon systems. Concepts include multi-layer and lightweight facepiece designs with modular facepiece component substitution according to mission needs.

Ancillary Mask Equipment

Protection Assessment Test System (PATS) - Production

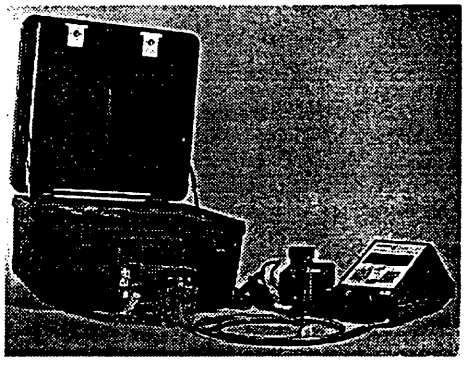
Rationale:

Army, Marine Corps (Requirement)
Navy, Air Force (Interest)

Key Requirements:

- Small, lightweight, portable device for determining mask fit

Description:



PATS provides the warfighter a simple, rapid, and accurate means of validating the facepiece fit of their protective mask. The system, approximately 200 cubic inches, 4 pounds, aids in sizing and fitting of protective masks by quantitatively assessing the degree of protection provided by the mask once it has been donned.

Voice Communication Adapter (VCA) - Production

Rationale:

Navy, Air Force, Marine Corps (Requirement)

Key Requirements:

- Small and lightweight voice amplifier

Description:

The VCA is a small clip-on device used to amplify speech while wearing a protective mask. It is compatible with all existing DoD protective mask systems.

Battlefield Protective Suits

CB Protective Overgarment Saratoga - Production

Rationale:

Marine Corps (Requirement)
Army, Navy (Interest)

Key Requirements:

- Provide 24 hour protection against 10 mg/m^2 liquid, 5000 mg/m^3 vapor, 1000 mg/m^3 aerosol (NATO standard) CB agents threats
- Provide protection after 30 days of wear
- Launderable, flame retardant, and lightweight (less than 4.5 kilograms)
- Compatible with current protective masks

Description:

The Saratoga is a two-piece lightweight CB protective ensemble. It provides 24 hours of protection against all CB agents at NATO standards, and retains full protection qualities for extended periods before use against contamination. The ensemble, made with Von Blucher carbon spheres, consists of a jacket with hood and trouser, and is less bulky than the BDO and CPOG.

Joint Service Lightweight Integrated Suit Technology I (JSLIST I)

The JSLIST 1 program is a fully cooperative RDTE effort chartered to develop new CB protective suits and garments 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 1 will provide enhanced CB protective ensembles with reduced physiological heat burden and will be generally lightweight and launderable. These garments will also integrate other types of protection. JSLIST 1 is the first of a 3 phase program and supports a variety of suits including:

Enhanced Aircrew Uniform Integrated Battlefield (EAUIB)
Lightweight CB Protective Garment (LWCBG)
Vapor Protective Flame Resistant Undergarment (VPFRU)
Advanced Chemical Protective Garment (ACPG)
Groundcrew Ensemble (GCE)

Enhanced Aircrew Uniform Integrated Battlefield (EAUIB) - RDTE (FUE FY97)

Rationale:

Army (Requirement)
Navy (Interest)

Key Requirements:

- Provide 12 hours protection (24 desired) against 10 g/m^2 liquid; 10,000 CT vapor/aerosols
- Provide 30 days field wear (minimum) in all geographical areas
- Retain CB protection after 4 launderings
- Provide flash fire protection (10 watts/cm^2 for 6 seconds)
- Provide lower physiological heat burden and 25% less than the AUIB
- Be compatible with micro climate cooling vest

Description:

The EAUIB provides protection against all CB agents after laundering and extended periods of non-CB wear. It will be worn by aircrew and aviation ground personnel. It will combine CB and flame protection in a single garment. The EAUIB is a two-piece suit design with an integrated hood compatible with M43 and XM45 series masks and second skins. It may be worn as an overgarment for the duty uniform or as a primary garment over underwear.

Lightweight Chemical/Biological Protective Garment (LCBPG) - RDTE (FUE FY97)

Rationale:

Army (Requirement)
Navy, Air Force (Interest)

Key Requirements:

- Provide 6 hours protection against 10 g/m^2 liquid; 5000 CT vapor/aerosols
- Provide 7 days field wear (minimum) in all geographical areas (launderability not required)
- Weigh no more than 4 pounds (3 desired)
- Have package volume for size medium no more than 500 in^3 (300 desired)
- Reduce the physiological heat burden of the BDO by at least 20% (30% desired)

Description:

In test conditions, the LCBPG provided 6 hours of protection against all CB agents after laundering and moderate periods of non-CB wear. The requirement has a trade-off of wear-time and protection-time in order to achieve a lightweight, low-bulk garment for short term, risk-taking missions. The LCBPG will be a two-piece suit design with an integrated hood compatible with the M40 mask with second skin. It will be worn as an overgarment for the duty uniform or as primary garment over underwear depending upon the environment or mission.

Vapor Protective Flame Resistant Undergarment (VPFRU) - RDTE (FUE FY97)

Rationale:

Army (Requirement)

Key Requirements: (When worn under the Nomex coveralls)

- Provide 12 hours protection (24 desired) against 10 g/m^2 liquid; 10,000 CT vapor/ aerosols
- Provide 30 days field wear (minimum) in all geographical areas
- Retain chemical protection after 4 launderings (10 desired)
- Provide flash fire protection (10 watts/cm^2 for 6 seconds)
- Weigh less than 3 pounds (without coveralls)
- Reduce by 20% the physiological heat burden imposed by the CPU worn with coveralls

Description:

The VPFRU will provide 12 hour protection after extended wear and laundering. It will also offer a reduction for the heat stress burden when compared to the CPU. The VPFRU will be a one or two-piece undergarment with an integral hood compatible with the M42 series mask.

Advanced Battle Dress Overgarment (ABDO) - RDTE (FUE FY97)

Rationale:

Army (Requirement)
Navy, Marine Corps (Interest)

Key Requirements:

- Provide 24 hours protection against 10 g/m^2 liquid agent; 5000 CT vapor/aerosols
- Provide 30 days field wear (minimum) in all geographical areas
- Retain chemical protection after 4 launderings
- Weigh less than 4 lbs for a size medium-regular, packed garment
- Reduce physiological heat burden currently imposed by BDO

Description:

The ABDO will provide 24 hour protection after extended wear and laundering. Liners currently are based upon activated carbon technology (carbon beads, thin carbon foam and others). The ABDO will be a two-piece design with an integrated hood compatible with the M40 mask with second skin. It will be worn as an overgarment for the duty uniform or as a primary garment over underwear depending upon the environment and mission.

Advanced Chemical Protective Garment (ACPG) - RDTE (FUE FY97)

Rationale:

Navy (Requirement)

Key Requirements:

- Provide 24 hours protection against 10 g/m^2 liquid agent; 5000 CT vapor/aerosols
- Provide 30 days field wear (minimum) in all geographical areas
- Retain chemical protection after 4 launderings
- Weigh less than 4 lbs for a size medium-regular, packed garment
- Reduce physiological heat burden currently imposed by BDO

Description:

The ACPG will provide 24 hour protection after 30 days wear time and 4 launderings. Liners currently are based upon various activated carbon technologies (carbon beads, thin carbon foam and others). It will be two-piece suit with an integrated hood compatible with the MCU-2/P mask with second skin. The ACPG will be worn as an overgarment for the duty uniform or as a primary garment over underwear depending upon the environment and mission.

Groundcrew Ensemble (GCE) - RDTE

Rationale:

Air Force (Requirement)

Key Requirements.

- Enhance existing capability with lighter, less thermal burdening ensemble

Description:

The GCE provides chemical protection, from the neck down, to personnel while in an Air Base environment. It provides protection from liquid and vapor hazards while greatly reducing the level of physiological stress encountered with the current battle dress overgarment (BDO). The material, which will be lighter and will provide a reduction in heat stress, will be capable of being laundered and decontaminated.

CWU-66/P Aircrew Ensemble - Production (FUE FY96)

Rationale:

Air Force (Service-Unique Requirement)

Key Requirements:

- Enhanced existing chemical protection
- Reduced ensemble weight and thermal burden

Description:

The CWU-66/P, a one-piece flightsuit configuration, provides 24-hour protection against standard NATO threats. It is made with Von Blucher carbon spheres, and is less bulky than prior ensembles. It offers a reduced thermal load burden and is compatible with aircrew life support equipment.

Chemical Protective Undergarment (CPU) - Production

Rationale:

Army (Service-Unique Requirement)
Marine Corps (Interest -no imminent requirement)

Key Requirements:

- Provides 12 hours protection against 10 g/m^2 agent contamination after 15 days of non-NBC field wear
- Lightweight (2 lbs, 11 ozs) and launderable CB protective undergarment

Description:

The CPU is a two-piece lightweight undergarment made of a non-woven fabric with activated charcoal. When worn under the combat vehicle crewmen (CVC) coverall, battle dress uniform (BDU), the CPU provides 12 hour protection at NATO standards after moderate non-NBC field wear and one laundering.

Aircrew Uniform, Integrated Battlefield (AUIB) - Production (FUE FY95)

Rationale:

Army (Service-Unique Requirement)
Marine Corps (Interest - no imminent requirement)

Key Requirements:

- Provides 24-hour protection against 10 g/m^2 agent after 15 days non-NBC field wear, and 6-hour protection after 30 days wear
- Lightweight, flame retardant and compatible with aircrew life support equipment

Description:

The AUIB is a two-piece duty uniform which provides aircrew with flame and CB protection in a single uniform. It provides 24 hour protection at NATO standards after moderate wear. The AUIB, which replaces the BDO for aircrew, is worn over the Nomex flight suit. The outer shell is a laminate of 95/5 Nomex/Kevlar and polytetrafluoroethylene film.

The inner layer is a laminate of carbon impregnated, flame resistant polyurethane foam and nylon knit. The AUIB is compatible with life support equipment used in rotor-winged aircraft and with developmental cooling vests.

Specialty Suits

Suit Contamination Avoidance Liquid Protection (SCALP) - Production

Rationale:

Army (Requirement)
Marine Corps (Interest)

Key Requirements:

- Liquid CB protection coverall
- Lightweight, quick and easy to doff

Description:

The SCALP is a lightweight overgarment which provides liquid splash protection to undergarments. The SCALP, which consists of a jacket with hood and trouser, is made from a blend a Gore-tex and butyl rubber-coated nylon.

Interim-Self Contained Toxic Environment Protective Outfit (STEPO-I) - Production

Rationale:

Army (Requirement)

Key Requirements:

- Full encapsulating protection ensemble
- Provides 2 hour CB protection in IDLH environments

Description:

Approved as an interim system for 2-hour depot operations in Immediate Danger to Life and Health (IDLH) environments. Consists of encapsulating suit made of butyl rubber-coated nylon with a polycarbonate visor. Respiratory protection is provided by one of two options--tethered clean air supply or a self-contained rebreather worn as a back-pack. Cooling is provided by an ice vest worn underneath the suit.

Improved Toxicological Agent Protective (I-TAP) -RDTE

Rationale:

Army, Air Force (*i.e.*, EOD Ensemble) (Requirement)
Navy, Marine Corps (Interest)

Key Requirements:

- Provide 4 hours liquid chemical agent protection at 10 g/m^2
- Provide wear durability equal to current TAP suit
- Be compatible with M40 Special Purpose Mask and Hood and TAP boots and gloves
- Provide a 1-hour supplied air bottle with capability for switching to filtered air respirator
- Be light in color to reduce solar load and offer a universal cooling system pass through

Description:

The I-TAP will enhance existing capabilities with a lighter, less thermal burdening ensemble. The fabric will be self-extinguishing and decontaminated after a minimum 5 reuses. The I-TAP will support short term entry and life saving operations requiring supplied air. The respiratory system will weigh under 25 lbs., and air bottles will be replaceable while the suit is worn. The I-TAP will have an improved design with seals at the neck and cuffs to eliminate bellows effect. The suit will have a voicemitter and a pass through for cooling systems.

CB Protective Firefighter Ensemble (FFEN) - RDTE
Fire Fighter Suit-Combat (FIS-C) - RDTE
Joint CB Protective Firefighter Suit (J-Fire) - RDTE

Rationale:

Army, Air Force (Requirement)

Key Requirements:

- Provide 12 hours of CB agent protection against 10 g/m^2 liquid agent
- Provide firefighters CB protection in both structural and crash fire fighting/rescue operations

- Allow firefighters to use mission essential tools and equipment
- Provide resistance to water and all standard fire fighting chemicals (foam, CO_2, aircraft POL)
- Capable of being donned in 3 minutes or less

Description:

Ensemble will consist of CB undergarment worn under the standard fire fighting outer garment and used with a switchable filtered/supplied air respiratory system (same as for the Improved TAP ensemble). Four types of CB undergarments are being evaluated, including the CPU. J-Fire is being developed by the Air Force under the JSLIST program and will meet FFEN requirements.

Protective Accessories

Multipurpose Overboot (MULO) - RDTE (FUE FY97)

Rationale:

Army, Air Force, Marine Corps (Requirement)
Navy (Interest)

Key Requirements:

- Provide 24 hours protection against 10 g/m^2 liquid agent as well as environmental protection from water, snow and mud
- Provide 60 days wear in all environments without degradation of protection
- Provide resistance to incidental slashing by POL and self-extinguishing flame resistance
- Capable of being decontaminated to an operationally safe level using standard decontaminants

Description:

The MULO is a joint service program under the auspices of the JSLIST program. It will be made of an elastomer blend and will be produced by injection molding. It will be designed for wear over the combat boot, jungle boot and intermediate cold/wet boot. The MULO will be more durable, lighter weight and will provide more protection than the GVO/BVO. The sole will be designed to provide traction on various surfaces including dirt and metal.

Improved CB Protective Glove - RDTE (FUE FY97)

Rationale:

Army (Requirement)
Navy, Air Force, Marine Corps (Interest)

Key Requirements:

- Provide 24 hours protection against 10 g/m^2 liquid agent
- Provide protection against POL and standard decontaminants
- Provide self-extinguishing flame resistance
- Provide 15 days wear durability in all environments without degradation of protection
- Provide dexterity equal to or better than the standard 14 and 25 mil butyl gloves

Description:

The Improved CB Protective Glove will be a joint service program under the auspices of the JSLIST program. Candidate materials include a flame retardant (FR) butyl rubber; polyepichlorohydrin/FR butyl rubber; and an experimental, permeable material.

Collective Protection Equipment

CB Protected Deployable Medical Systems (DEPMEDS) - Production

Rationale:

Army, Air Force (Requirement)
Navy, Marine Corps (Interest)

Key Requirements:

- Provides CB collective protection and CB hardening
- Corps level hospital use

Description:

The hardening of the Corps hospital will upgrade the existing Deployable Medical System (DEPMEDS) assets to provide CB collective protection to surgical functions of the hospital. These functions are housed in ISO shelters (2:1 & 3:1) and 64 TEMPERS. The TEMPERS are chemically protected by using the Simplified Collective Protection Equipment (SCPE) which includes liners, entry-way and filter/blower units. The DEPMEDS efforts also provide chemical hardening to the Environmental Control Unit (C-100) and the heater.

CB Protected Shelter (CBPS) - Production

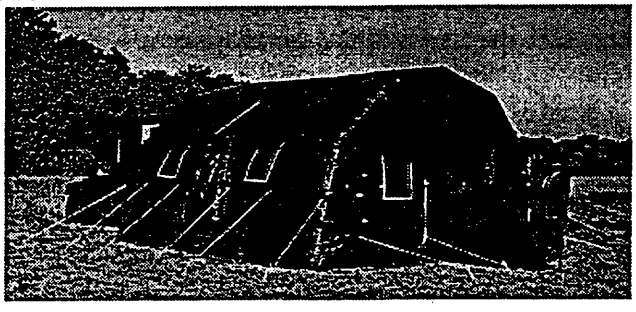
Rationale:

Army (Requirement)
Marine Corps (Interest)

Key Requirements:

- Highly mobile and easy to set up and take down

Description:



The CB protected shelter will provide collective protection (300 sq. ft.) for medical and selected combat, combat support, and combat service support personnel to perform missions in a CB environment. The CB protected shelter is highly mobile, and easy to set up and take down to accommodate the dynamic integrated battlefield.

Advanced Integrated Collective Protection system (AICPS) for Vehicles, Vans and Shelters (VVS) - RDTE

Rationale:

Army (Requirement)
Navy, Marine Corps (Interest)

Key Requirements:

- Integral NBC filtration power and environmental control for vehicles, vans and shelters
- Minimize filter changes and overall system logistics burden
- Protection to meet future threats and
- Reduced size, weight and energy requirements

Description:

The AICPS is an NBC filtration system integrated with an environmental control unit and auxiliary power unit for combat systems. The combined components provide overall size, weight and energy reduction, and eliminate the need for additional electrical power for the host system. Advanced filtration technology (regenerable filtration or catalytic-oxidation) significantly reduces filter change logistics burden, meets future threat and alleviates disposal of hazardous materials impregnated carbon filters.

Chemical/Biologically Hardened Air Transportable Hospital (CHATH) - RDTE

Rationale:

Air Force (Service-Unique Requirement)
Army, Navy (Interest - no imminent requirement)

Key Requirements:

- Integrated CB hardening
- Reduce weight and costs for Air Transportable Hospital

Description:

The CHATH enhances the existing 50-bed air transportable hospital by providing CB protection and hardening to the hospital. The CHATH will have an integrated environmental control system which will provide improved sterility within the treatment area. The system weighs less and has a lower life cycle cost than existing systems.

M20A1/M28 Simplified CPE (SCPE) - Production

Rationale:

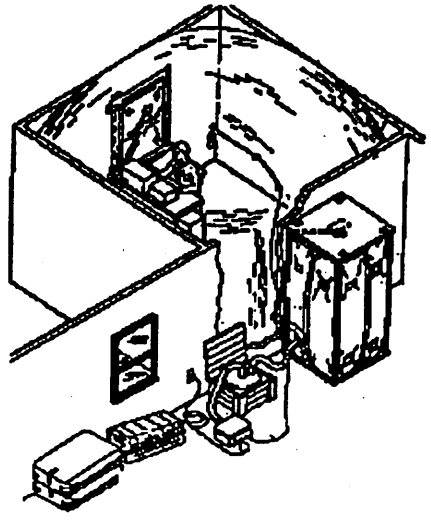
Army (Service-Unique Requirement)
Navy (Interest - no imminent requirement)

Key Requirements:

- Provide a medical airlock for litter patients (M28 only)
- Increase entry-exit rate
- Provide liquid agent resistance
- Expandable, modular, and interface with tent
- Interface with existing Army environmental control units
- Reduce generated electromagnetic interference

Description:

The SCPE is a low cost method of transforming a room of an existing structure into an NBC collective protection shelter for command, controal and communication (C^3) and soldier relief functions. Its 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



that provides filtered air to both the liner and the protective entrance; and a support kit that contains ducting, lighting, sealing and repair material and an electronically powered blower. A pre-planned product improvement (P^3I) program to the SCPE (M20A1/M28) provides liquid agent resistant liners, protective liners for tents, interconnectors, and an interface with environmental control units. The improved SCPE also allows more people to enter at one time, and protects hospitals under tents.

Standardized Integrated Command Post System and Tent (SICPS) and SICPS P^3I

Rationale:

Army (Service-Unique Requirement)

Key Requirements:

- Environmental protection, heating and cooling
- Integrated CB Protection

Description:

SICPS, the Army's next generation of command posts and tents, will integrate NBC protection into the air filtration and environmental control system. The combined components provide overall size, weight and energy reduction to current stand-alone systems. SICPS will use advanced filtration technology to significantly reduce the filter change logistics burden. It uses the standard modular command post system (MCPS) aluminum frame with and outer fabric of Kevlar based laminates. The tent is overpressured using the blower and filter from the M-20 CPS. The wall panels are removable to allow complexing of any number of MCPS together and to SICPS rigid wall shelter using a chemically hardened connector.

Shipboard Collective Protection System - Production

Rationale:

Navy (Service-Unique Requirement)

Key Requirements:

- Integrated CB hardening for new construction ships.

Description:

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 Hg. CPS is modular and is based on a Navy-improved version of the 200 cfm M56 filter. CPS includes filters, filter housings, high pressure fans, airlocks, pressure control valves, low pressure alarm system, and personnel decontamination stations.

Selected Area Collective Protection System - Production

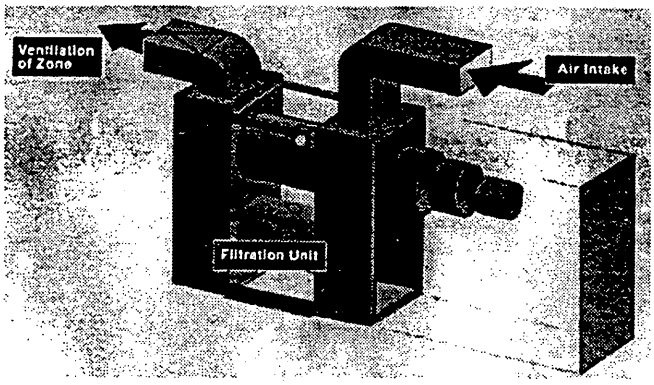
Rationale:

Navy (Service-Unique Requirement)

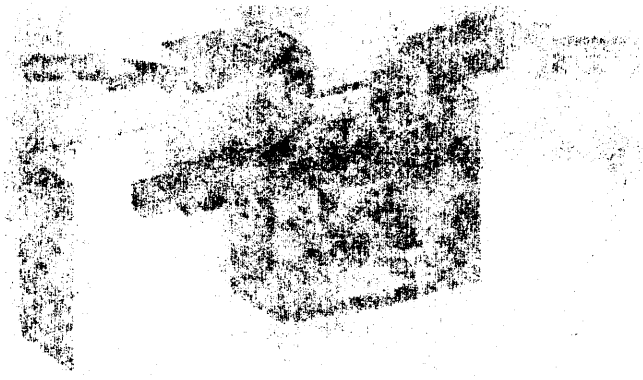
Key Requirements:

- Affordable backfit of Shipboard CPS onto critical spaces on existing ships.

Description:



Selected Area CPS (SACPS) is designed to be easily adaptable to current ships to provide selected spaces (*i.e.*, command and control, berthing areas, *etc.*) with an affordable CPS system. SACPS is modular and is based on a Navy-improved version of the 200 cfm M56 filter. SACPS is easily integrated into the ship's existing HVAC system, and includes filters, filter housings, a high pressure fan, an airlock, a pressure control valve, and a low pressure alarm system.



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ANNEX C

DECONTAMINATION PROGRAMS

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M291 Decontamination Kit - Production

Rationale:

Army, Navy, Air Force, Marine Corps (Requirement)

Key Requirements:

- Decontaminates skin to safe levels
- Lightweight, man portable
- Pose no hazard to individual user

Description:

The M291 will enable the warfighter to perform basic decontamination to remove, neutralize, or destroy CB warfare agents and toxins on contaminated skin. The kit consists of a wallet-like flexible carrying pouch containing six individually packaged, hermetically sealed foiled packets. Each packet contains a folded non-woven fiber applicator pad with an attached strap handle on one side. The applicator pad is impregnated with 2.8 grams of a reactive and sorptive resin polymer mixture, Ambergard XE-555 Decontaminant. The kit provides for 3 decontamination missions, each at 1,300 cm^2 against a 2.5 g/m^2 CB challenge for a single kit. The kit is small and rugged enough to be carried in a trouser pocket of the BDO.

M295 Individual Equipment Decontamination Kit - RDTE

Rationale:

Army (Requirement)
Navy, Air Force, Marine Corps (Interest)

Key Requirements:

- Decontaminates equipment to safe levels
- Lightweight, man portable
- Pose no hazard to individual user

Description:

The M295 will enable the warfighter to perform basic decontamination to remove, neutralize, or destroy CB warfare agents and toxins on contaminated personal and load bearing equipment. The squad container consists of 20 individually packaged, hermetically sealed foiled packets. The packet contains a folded non-woven fiber applicator mitt impregnated with 22 grams of a reactive and sorptive resin polymer mixture, Ambergard XE-555 Decontaminant. Each mitt enables the warfighter to decontaminate 1,700 cm^2 CB challenge. The kit is small and rugged enough to be carried in a trouser pocket of the BDO.

M17A2/A3 Lightweight Decontamination System (LDS) - Production

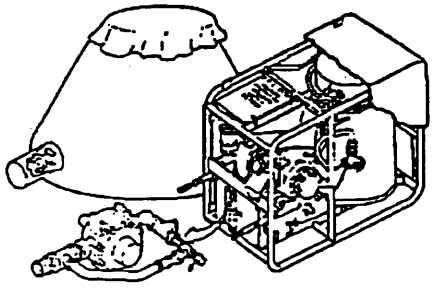
Rationale:

Army, Marine Corps (Requirement)
Navy, Air Force (Interest)

Key Requirements:

- Portable engine-driven pump and water heating unit
- Produce hot water at 80°C at 100 psi at 5 gpm flow rate
- Use on vehicle rinse and personnel showers

Description:



The M17A2/A3 LDS is an improved lightweight, compact, engine-driven pump and multifuel-fired water heating system. The system can be used for hasty and deliberate decontamination and is capable of drawing water from any source and delivering it at moderate pressure (up to 100 psi) and controlled temperatures (120°C). The major improvements in the M17A2/A3 include a new gasoline powered engine; and the choice of a 1,500 and 3,000 gallon larger water storage tank.

Sensitive Equipment Decontamination System - RDTE

Rationale:

Army (Requirement)
Navy, Air Force, Marine Corps (Interest)

Key Requirements:

- Non-aqueous based decontamination systems for sensitive equipment
- Capable of being used in both mobile and fixed-sites

Description:

Provide a first ever capability to decontaminate chemical and biological warfare agents and toxins from sensitive electronic, avionics, and electro-optic, equipment. It's use must be compatible with and not degrade sensitive materials or equipment. It must be operator safe and offer protection from off-gassing and direct liquid exposure during decontamination.

Sorbent Decontamination System - RDTE

Rationale:

Army, Marine Corps (Requirement)
Navy, Air Force (Interest)

Key Requirements:

- Effectively decontaminants all CB warfare agents from contaminated surfaces
- Easy-to use and possess no hazard to users
- Non-damaging and non-corrosive to military equipment
- Environmentally safe to store

Description:

The catalytic sorbent decontamination system provides a simple, rapid, and efficient system to decontaminate small and individual issue items of equipment. It is effective in all environments, is less corrosive, and presents a lowered logistics burden through improved shelf life and reduced special handling and storage needs. The system uses a catalytic component that reacts with the chemical agents being sorbed; this eliminates the potential hazard created by the off-gassing of agents from used sorbents.

Joint Chem-Bio Decon

Rationale:

Army (Requirement)
Navy, Air Force, Marine Corps (Interest)

Key Requirements:

- Self releasing coating
- Decontaminates without reliance upon specialized labor or decontamination equipment

Description:

The catalytic self-decontaminating coating is a follow-on semi-permanent coating applied to military equipment in advance of chemical attacks. The coating contains active sites which will neutralize/destroy CB agents upon contact, thereby reducing the need for extensive decontamination operations.

XM21/XM22 Modular Decontamination System (MDS) - RDTE

Rationale:

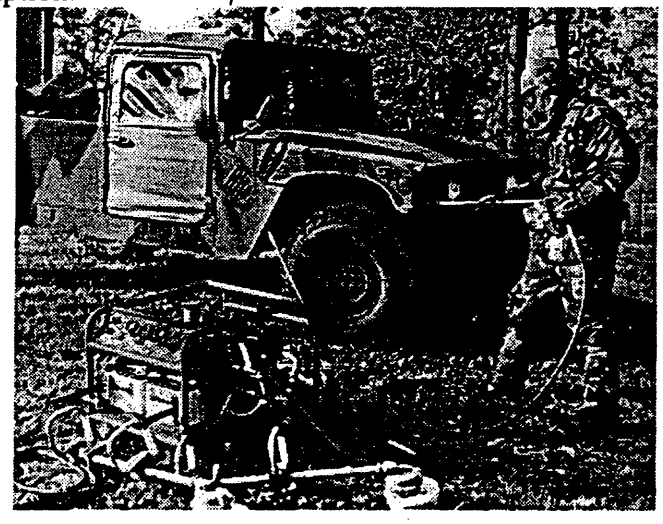
Army (Service-Unique Requirement)
Navy, Air Force Marine Corps (Interest - No Imminent Requirement)

Key Requirements:

- Provide high pressure water for the primary wash process
- Mechanically dispense and scrub decontaminant

- Fit within the payload limits of a 3/4 ton trailer and a 1-1/2 ton trailer
- Use existing equipment to supplement the deliberate decontamination process
- Provide adapters to draw water from fire hydrants

Description:



The MDS will provide the soldier an improved capability to perform detailed equipment decontamination on the battle field. The system will replace current methods of decontamination application (*i.e.*, mops and brooms or with the portable M13 Decontamination Apparatus) which are both time consuming and labor intensive. The MDS reduces water usage, equipment processing time, labor intensiveness and improves effectiveness. The MDS consists of a XM21 decontaminant Pumper/Scrubber module, and XM22 High Pressure/Hot Water module. The XM22 delivers DS2 or liquid field expedient decontaminants and is capable of drawing the decontaminant directly from a container on the ground while mounted on a trailer. The XM22 provides hot water up to 3000 psi at a rate of 5 gpm with the capability of high volume cold water and detergent injector. It will also be capable of drawing water from natural and urban water sources and delivering it at variable adjustable pressures, temperatures and flow rates. Each module (M21 or XM22) may be transported or operated from a 3/4-ton trailer towed by a M1037 High Mobility Multipurpose Wheeled Vehicle.

M17 Diesel Lightweight Decontamination System (LDS) - RDTE

Rationale:

Marine Corps (Service-Unique Requirement)
Air Force, Navy (Interest - No Imminent Requirement)

Key Requirements:

- Be capable of operation using Military Standard (MIL STD) fuels
- Have no component which cannot be moved by a four man crew
- Be capable of decontaminating both sides of a vehicle or aircraft simultaneously
- Generate no new manpower requirements

Description:

The Diesel LDS is a portable, lightweight, compact, engine-driven pump and multifuel-fired water heating system. The system will be capable of performing the same hasty and deliberate decontamination procedures as required of the M17 series LDS.

ANNEX D

JOINT MEDICAL CHEMICAL AND BIOLOGICAL DEFENSE RESEARCH PROGRAMS

MEDICAL CHEMICAL AND BIOLOGICAL DEFENSE RESEARCH PROGRAMS

The Gulf War and recent events such as the Tokyo subway nerve gas attack have shown that many countries and terrorist groups have acquired the means for producing chemical and biological weapons. This increases the threat to deployed U.S. forces. In response, our medical chemical and biological defense research programs' (MCBDRP) mission is to preserve combat effectiveness by timely provision of medical countermeasures in response to Joint Service Chemical Warfare (CW) Defense Requirements and threats due to validated biological warfare (BW) agents. The MCBDRP has three goals: (1) provide individual level protection and prevention to preserve fighting strength; (2) maintain technological capabilities to meet present requirements and counter future threats; and (3) provide medical management of CW and BW casualties to enhance survivability and expedite and maximize return to duty.

Chemical warfare agents include vesicants, nerve and blood agents; biological agents include bacteria, viruses, rickettsia, toxins, and physiologically active compounds.

Technology Barriers: Current research models are not entirely adequate for evaluating new countermeasures and for chemical and biological candidates and human trials are not possible. Future threats may involve genetically engineered biological weapons that are easily produced, highly lethal, difficult to detect, and resistant to conventional therapies.

Program Organization

The U.S. Army is the Department of Defense's (DoD) Executive Agent for the Medical Chemical and Biological Defense Research Program as prescribed in DoD Directive 5160.5 and, as such, is the lead requirements coordinator. The Joint Technology Coordinating Group (JTCG) 3 (Medical CW Agent Defense) and JTCG 4 (Medical BW Agent Defense) of the Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee are responsible for the program's consolidation, coordination, and integration. The ASBREM Committee maximizes efficiency by coordinated planning, and minimizes unnecessary program overlaps and costly materiel retrofits. The Army Technology Base Master Plan and the Medical Science and Technology Master Plan are the program drivers for the MCBDRP. The science and technology base is managed through the development and execution of Science and Technology Objectives (STO). The advanced development program (6.4 - 6.5) is directed by the U.S. Army Medical Materiel Development Activity. The program is an integrated DoD in-house and extramural effort.

D.1 MEDICAL CHEMICAL DEFENSE RESEARCH PROGRAM

Mission, Goals, and Objectives

The mission of the MCDRP is to preserve combat effectiveness by timely provision of medical countermeasures in response to Joint Service CW defense requirements. The MCDRP has three broad goals: (1) research efforts to be technologically and scientifically capable to develop timely countermeasures; (2) protecting the individual soldier; and (3) ensuring adequate treatment of chemical casualties. The following are objectives to meet the goals of the MCDRP:

Goal 1: Maintain technological capability to meet present requirements and counter future threats.

- Determine sites, mechanisms of action, and effects of exposure to chemical warfare agents with emphasis on exploitation of neuroscience technology and dermal pathophysiology.
- Identify sites and biochemical mechanisms of action of medical countermeasures.
- Exploit molecular biological and biotechnological approaches to develop new approaches for medical countermeasures.
- Exploit molecular modeling and quantitative structure-activity relationships supporting drug discovery and design.

Goal 2: Provide individual-level prevention and protection to preserve fighting strength

- Develop new concepts for prophylaxes, pretreatment, antidotes, and therapeutic countermeasures.
- Develop skin protectants and decontaminants.
- Identify factors that influence safety and efficacy properties of candidate countermeasures.
- Develop and Maintain preformulation, formulation, and radiolabeling capabilities.

Goal 3: Provide enhanced medical management of chemical casualties.

- Develop concepts and recommend therapeutic regimens and procedures for the management of chemical casualties.
- Develop diagnostic and prognostic indicators for chemical casualties.
- Develop life-support equipment for definitive care.

The objectives of the program differ with the varying threats. For vesicant agents the objective is to develop a pathophysiological data base on vesicant chemical agents and develop a working hypothesis on how damage occurs at the cellular level. Used with associated technologies, this approach will formulate definitive pretreatment strategies and is expected to produce a safe and effective reactive topical skin protectant. For nerve agents the objective is to field a safe and more effective anticonvulsant nerve agent antidote and develop and field a more effective enzyme reactivator for use with the Mark I kit. For blood agents the objective is to develop and field an effective cyanide pretreatment due to the rapidity and lethality of the threat.

For respiratory agents the objective is to develop approaches to pretreatment and treatment by understanding pathophysiological changes after agent exposure.

Threats, Countermeasures, Technical Barriers Status and Accomplishments

The classical threat categories include: vesicants or blister agents (*e.g.*, sulfur mustard [HD] and lewisite), nerve agents (*e.g.*, soman [GD], VX), blood agents (*e.g.*, cyanide, and respiratory agents (*e.g.*, phosgene). The threats, however, are not restricted to commonly accepted classical agents. Novel agents may be developed by potential adversaries. The ability to provide timely and effective medical countermeasures to new threats depends upon maintaining a high level of technological capability.

Countermeasures include pharmaceutical, medical equipment, specialized materiel or medical procedures, and concepts for training, doctrine, and organization. Medical countermeasures are designed not only to prevent lethality but to preserve and sustain combat effectiveness in the face of combined threats from chemical and conventional munitions on the integrated battlefield by:

- Prevention of the effects of chemical agents (e.g., pretreatment or prophylaxes),
- Far-forward treatment upon exposure to chemical warfare threats (*e.g.*, antidotes), and,
- Chemical casualty care (*e.g.*, therapy and management).

THREAT CATEGORY: VESICANT AGENTS

Countermeasures:

- Topical protectants to protect skin against blister (and thickened nerve) agents
- Biological/pharmaceutical products to prevent cell death caused by vesicant agents

Technical Barrier:

- Appropriate experimental model systems to predict drug or treatment efficacy and safety in humans
- Pretreatments/antidotes with special characteristics, such as quick action, long-lasting, easy to carry and use
- Reactive/catalytic decontaminant activity versus safety of decontaminant and protectant compounds

Status:

- Results of studies used to formulate hypotheses of sulfur mustard pathophysiological mechanisms
- Candidate countermeasures synthesized based on proposed mechanisms of mustard action
- Candidate reactive decontaminants prepared for incorporation into candidate topical skin protectants

Accomplishments:

- Characterized the alterations of basement membrane zone proteins following sulfur mustard exposure of hairless guinea pig skin
- Describe the time course of pathology following the cutaneous exposure of hairless guinea pig
- Advanced to concept of pretreatment with compounds that modulate intracellular scavenger molecules
- Utilized *in vitro* human cellular models to characterize the cell cycle and metabolic disruptions caused by vesicating agents
- Developed multiparametric spectrophotometic assays to define a broad array of cellular structural and biochemical changes following sulfur mustard exposure
- Developed analytical methods for the detection of sulfur mustard and lewisite in biological samples
- Identified five (5) thiodiglycol dependent bacterial strains from soil
- Confirmed that these bacteria can metabolize the agent VX and have potential to metabolize HD
- isolated fractions from most active bacteria for incorporation of enzyme into reverse micelles, liposomes, or microcapsules.
- Confirmed feasibility of increasing protection against mustard gas vapor by incorporation of reactive elements into the topical skin protectant

THREAT CATEGORY: NERVE AGENTS

Countermeasures:

- Pretreatment regimen that protects against incapacitating effects
- Improved antidote to treat incapacitating effects
- Anticonvulsant antidote to prevent or minimize convulsions and brain injury

Technical Barriers:

- Appropriate experimental model systems to predict drug or treatment efficacy and safety in humans
- Pretreatment/antidotes with special characteristics, such as quick action, long-lasting, easy to carry and use
- CNS-active drugs with acceptable side-effects
- Generation of immune response to small molecules

Status:

- Identified monoclonal antibody with catalytic activity
- Demonstrated pretreatment efficacy of exogenous enzyme administration
- Four Human-Cholinesterase mutants expressed and being tested for nerve agent catalytic activity
- Development of next generation anticonvulsant based on fact that neurotransmitter control of convulsions is time dependent; drugs with both anticholinergic and NMDA properties are most promising.

Accomplishments:

- Investigated mechanisms and treatment of nerve agent-induced seizures and neuropathology
- Characterized the effectiveness of motor neuron active drugs on seizure activity induced by GD
- Performed decision tree network evaluations of candidate pretreatment/treatment compounds
- Demonstrated protection against GD with carboxylesterase, exogenous cholinesterase, and somanase
- Used 3-dimensional crystal structure to model cholinesterase
- Expressed candidate catalytic enzymes
- Tested three expression vectors for increased enzyme production
- Identified the utility of pretreatment with neuroprotectants, such as ganglioside GM, in protecting against nerve agent induced brain injury

THREAT CATEGORY: BLOOD AGENTS

Countermeasures:

- Pretreatment compounds to protect against rapid action of these chemical agents

Technical Barriers:

- Appropriate experimental model systems to predict drug or treatment efficacy and safety in humans
- Pretreatments/antidotes with special characteristics, such as quick action, long-lasting, easy to carry and use
- CNS-active drugs with acceptable side-effects

Status:

- Protection through hemoglobin formers

Accomplishments:

- Toxicity and safety assessment of two identified methemoglobin formers
  - Confirm and quantify methemoglobin protection
  - Determine dose parameters
  - Performance assessment
  - Successful transition of lead compounds to advanced development

THREAT CATEGORY: RESPIRATORY AGENTS

Countermeasures:

- Short-term: Health risk criteria for emerging threat doctrine, care and treatment strategies

- Intermediate-term: Specific casualty management techniques to improve survival and minimize lost duty time
- Long-term: Pharmaceutical/biological pretreatments, antidotes, or decontaminants/protectants

Technical Barriers:

- Appropriate experimental model systems to predict drug or treatment efficacy and safety in humans
- Pretreatment/antidotes with special characteristics, such as quick action, long-lasting, easy to carry

Status:

- In vitro model suggests the pulmonary cellular cytoskeleton is one target of phosgene toxicity
- One candidate compound appears to prevent phosgene-induced edema
- Multiple drugs are being evaluated for treatment efficacy

Advanced Development Products

In Advanced Development the goal is proof of principle. Efforts in this category are directed toward the solution of identified deficiencies.

The medical R&D process links the Materiel Developer (USAMRDC) with the Combat and Training Developer (AMEDDC&S) and the Logistician [U.S. Army Medical Materiel Agent (USAMMA)] in addressing the threat and DoD requirements. Medical chemical defense products now in the advanced development phase are:

TOPICAL SKIN PROTECTANT

- Concept:
  - Use perfluorinated formulations
  - Form non-toxic, non-irritating barrier film layer on skin
  - Augments MOPP
  - Protection against vesicant and nerve agents
- Status:
  - Two candidates transitioned to demonstration-validation phase
  - Candidates demonstrated efficacy against broad spectrum of threat agents
  - IND submitted to FDA

MULTICHAMBERED AUTOINJECTOR

- Concept:
  - Speed administration of life-saving antidotes against nerve agents
  - Replace 2 Injector MARK I Kit with single autoinjector
- Status:
  - Engineering contract awarded in September 1993
  - Fielding will require full FDA approval

NERVE AGENT ANTIDOTE SYSTEM (NAAS)

- Concept:
  - Replaces 2-PAM C1 with more effective and more potent antidote
  - Provides greater survival
  - Broader spectrum of coverage
  - Retains capabilities of multichambered autoinjector concept
- Status:
  - HI-6 transitioned to development 2QFY91
  - Leveraging Canadian developmental effort through US-UK-Canada MOU
  - Technical testing failed to support continued development of this concept; terminated at Milestone I

CYANIDE PRETREATMENT

- Concept:
  - Provide protection against incapacitation and lethality without performance degradation
  - Enhance soldier protection and sustainment
- Status:
  - Lead component transitioned to advanced development
  - Completed preclinical toxicology and drug distribution studies
  - Developed dose parameters and performance assessments

Fielded Products

Advances in Army medical R&D significantly impact the warfighting mission by sustaining unit effectiveness through conserving the fighting strength of our soldiers and supporting the nation's global military strategy which requires the ability to effectively deploy and operate. Army medical R&D products (materiel and non-materiel solution) 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 has provided a significant increase in military effectiveness in the past and presents the potential for future enhancement on military operational effectiveness. Some of the fielded materiel and non-materiel solutions by Medical R&D are:

- Pharmaceuticals:
  - Nerve Agent Antidote Kit (Mark I), 1983
  - Skin Decontamination Kit (M291), 1990
  - Nerve Agent Pretreatment (Pyridostigmine), 1991
  - Convulsant Antidote for Nerve Agent (CANA), 1991
  - Aerosolized Atropine (MANAA), 1993
- Materiel:
  - Resuscitation Device, Individual, Chemical, 1990
  - Decontaminable Patient Litter, 1991, 1993

- CW Protective Patient Wrap, 1991
- Computer-Based Performance Assessment Battery, 1993

- Information and Doctrine:
  - Toxonomic Work Station, 1985
  - USAMRICD Technical Memoranda on Chemical Casualty Care, 1990
  - FM 8-285 "Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries," 1990
  - Handbook "Medical Management of Chemical Casualties", 1995 (updated annually)

D.2 MEDICAL BIOLOGICAL DEFENSE RESEARCH PROGRAM

Mission, Goals, and Objectives

The mission of the Medical Biological Defense Research Program (MBDRP) is to develop medical countermeasures to deter, constrain, and defeat the use of biological agents against U.S. Forces (DoD Directive 5160.5, May 1985). The program is directed against agents of biological origin that are validated military threats. A primary concern is the development of vaccines, antitoxins, and toxoids against agents of biological origin (see Table D-1). Goals of the program include protecting the U.S. forces' warfighting capability during a biological attack, providing medical management of biological warfare casualties, and preventing a threat surprise by maintaining a strong technology base. In addition to requirements derived from Army sources (for example, Science and Technology Objectives, Battlefield Development Plans, *etc.*), the MBDRP responds to requirements of all Services as specified in the Joint Service Agreements.

Table D-1. Medical Biological Defense Countermeasures

VACCINES
- *Broad spectrum* – single antigen that protects against many related agents
- *Polyvalent* – mixture of antigens that protects against a number of different agents
- *Vectored* – single carrier organism genetically engineered to confer immunity against more than one agent

ANTIBODY
- *Homologous* – collected from an individual who has protective immunity against the disease
- *Monoclonal* – a cell culture technique for producing antibodies against a specific disease
- *Broad-spectrum antitoxin*

DIAGNOSTIC TECHNOLOGIES
- *Field* – early diagnosis and identification
- *Laboratory* – confirm agent used, justify strategic response

The objective of the research is to: develop countermeasures such as vaccines, antitoxins, toxoids, and drugs; treat casualties to prevent lethality and minimize lost duty time; develop rapid diagnostic assays; generate data bases pertinent to doctrine, training, organizations, leader development, and force structure; and, maintain state-of-art technology.

The current MBDRP includes the following areas of research:

- Bacterial studies – Development of potential vaccines, and determination of the role of these vaccines in the cellular and humoral immune response
- Toxin research – Basic and developmental research leading to methods of defense against broad classes of toxins

- Viral and Rickettsial studies – Identification and characterization of organisms, molecular antigenic analysis, development of diagnostic assays and investigations of pathogenesis, immunology, and epidemiology that will allow decisions regarding the optimal approach to disease prevention and control
- Diagnosis – Investigation and evaluation of sensitive and specific methods for detection of infectious organisms, antigens and antibodies in biological materials to include the application of nucleic acid probes or synthetic antigens; development of rapid identification and diagnostic methods for the assay of toxins, metabolites, and analogs in clinical specimens and collector samples
- Computer science and artificial intelligence (AI) - Use of computer science and AI techniques to enhance fundamental medical systems for biological defense (vaccines, diagnostic capabilities, management of biologically exposed casualties).

Threats, Countermeasures, and Technical Barriers

Countermeasures and technical barriers to their implementation that are associated with the threats addressed by the MBDRP are identified below.

Threat Category: Bacterial Agents

- Countermeasures
  - Vaccines for immunity against threat agents
  - Antibiotics for treatment of bacterial disease
  - Forward deployed diagnostic systems

- Technical Barriers:
  - Incomplete genetic information for all the threat agents
  - Appropriate model systems for investigation of bacterial threats and countermeasures
  - Capability to produce GMP pilot lots of vaccine candidates
  - Inability to perform human clinical trials to prove efficacy of vaccines
  - Expression vectors for recombinant products
  - Immunogenicity of vaccine
  - Difficulty in field testing rapid identification kits under natural conditions

- Status:
  - Developed aerosol models for pneumonic plague
  - Determined that the current whole-cell plague vaccine does not protect rodents and non-human primates against a lethal aerosol plague challenge
  - Demonstrated efficacy of a recombinant plague vaccine candidate against exposure to bubonic and pneumonic plague
  - Isolated Brucella melitensis DNA that contributes to the organism's pathogenicity in susceptible human cell culture
  - Characterized recombinant protective antigen products under consideration for use in improved anthrax vaccines

- Demonstrated that the licensed human anthrax vaccine conferred protection to non-human primates from an aerosol challenge of 500 LD_{50} of virulent anthrax spores two years after immunization

- Demonstrated that 2 doses of the new recombinant anthrax protective antigen vaccine protects non-human primates against lethal aerosol challenge

- Determined that Q fever CMR vaccine is less likely than the currently used whole-cell vaccine to produce severe local reactions in sensitized animals

- Developed a hand-held, flow-through assay that can detect several threat agents (ng/ml) in less than 15 minutes.

- Demonstrated rapid confirmatory electrochemoluminescent technology, that is 1000-times more sensitive (0.009 to 100 ng/ml) than conventional assays for the identification of plague-specific antigen.

Threat Category: Protein Toxins

- Countermeasures:
  - Antibodies (antitoxins) directed against common antigens of protein toxin molecules
  - Vaccines for immunity against protein toxin threat agents
  - Confirmatory assays to identify protein toxins specifically or as members of their class
  - Drugs for supportive therapy of agent intoxication

- Technical Barriers:
  - Capability to produce GMP pilot lots of vaccine candidates
  - Inability to perform human clinical trials to prove efficacy of vaccines and antitoxins
  - Optimizing expression vectors for recombinant products
  - Immunogenicity of vaccine and vaccine delivery technology
  - Difficulty in field testing diagnostic kits under natural conditions
  - Difficult to produce polyvalent vaccines against toxin classes
  - Lack of rapid confirmatory assays with "gold standard" sensitivity and specificity

- Status
  - Demonstrated that immunization with proteosome-SEB vaccines protects against a lethal aerosol challenge with Staphylococcal Enterotoxin B
  - Produced recombinant SE vaccine candidates that will be safer and cheaper to produce; vaccine protected rodents and non-human primates against lethal challenges of Staphylococcal Enterotoxin B
  - Demonstrated that an abbreviated immunization schedule with the pentavalent botulinum toxoid protected non-human primates against lethal aerosol challenge
  - Produced recombinant botulinum vaccine candidate (serotypes A,B, and E) and demonstrated immunogenicity and protective efficacy in rodent models. Recombinant vaccine will be much cheaper and safer to produce.
  - Demonstrated rapid confirmatory electrochemoluminescent technology that is 1000 times more sensitive (0.03 to 100 ng/ml) than conventional assays for the identification of Staphylococcal enterotoxin B toxin.

Threat Category: Neuroactive Compounds

- Countermeasures:
  - Antidotes to counteract common neurotoxin and physiologically active compound (PAC) effects
  - Antibodies (antitoxins) directed against common antigens of neurotoxin molecules or PACs
  - Vaccines
  - Reagents to rapidly identify neurotoxins and PACs

- Technical Barriers:
  - Lack of appropriate model systems for the investigation of neurotoxins and PACs
  - Inability to test for efficacy
  - Pharmacological characteristics of pretreatment and antidotes need to be established
  - CNS-active drugs induce CNS side effects
  - Difficulty in expressing immune response to small molecules
  - Development of a polyvalent vaccine against toxin classes
  - Appropriate expression vectors for recombinant products (vaccine and antitoxins)

- Status:
  - Evaluated passive immunity against saxitoxin lethality
  - Cloned saxitoxin- and tetrodotoxin-binding scavenger genes
  - Developed *in vitro* production of human cardiac and brain sodium channels using gene cloning
  - Determined the primary mechanism for the neurotoxic effects of the PAC dynorphin
  - Established methods to assess nitric oxide synthetase enzyme inhibition and cellular damage due to the PAC phospholipase A2 toxicity
  - Measured mental and physical performance decrements due to the PAC serotonin in animal models

Threat Category: Viral Agents

- Countermeasures:
  - Vaccines for immunity against viral threat agents
  - Antibodies and antivirals for treatment of viral disease
  - Devices and technologies for diagnosis of viral disease

- Technical Barriers:
  - Appropriate model systems for investigation of viral threats and countermeasures
  - Capability to produce GMP pilot logs of vaccine candidates
  - Inability to perform human clinical trials to prove efficacy of vaccines
  - Production of multivalent vaccines against heterologous viral agents
  - Expression vectors for recombinant products (vaccines and antibodies)
  - Immune enhancement of disease
  - Rapid virus identification technology

- Status:
  - Selected a Venezuelan equine encephalitis (VEE) vaccine candidate for advanced development
  - Determined that the VEE vaccine candidate is not neurovirulent in animal model systems
  - Determined that the VEE vaccine candidate induces acceptable duration of immunity in animal model systems
  - Field tested VEE diagnostic assays
  - Determined the extent of antigenic and genetic heterogeneity of multiple VEE subtypes
  - Produced molecularly-defined, infectious clone of western equine encephalitis (WEE) virus
  - Produced a cleavage deletion mutant WEE virus based on the VEE vaccine candidate design
  - Produced a molecularly defined, infectious clone of enzootic (serotype IE) VEE virus
  - Demonstrated that microencapsulation significantly enhances the efficacy of inactivated alphavirus vaccines
  - Produced cDNA clones of eastern equine encephalitis virus
  - Developed a rapid screening method for nucleic acid-based diagnostics for VEE virus
  - Demonstrated efficacy of vaccinia vaccine (Wyeth) against a lethal aerosol surrogate challenge model for smallpox (monkeypox)
  - Demonstrated efficacy of several antiviral drugs against orthopoxes *in vitro*
  - Demonstrated nucleic acid based technology for the rapid confirmatory identification of encephalitis viruses, orthopox virus and filoviruses
  - Observed protection by inactivated Marburg virus against homologous challenge in an animal model system
  - Cloned and expressed Ebola protective epitope genes in vaccinia vaccine vectors *in vitro* for evaluation as a vaccine candidate

Predevelopment Products - Technical Demonstrations (TD)

In this TD phase (6.3) of the medical materiel life cycle, candidates are fully evaluated for preclinical (prior to human use) safety and efficacy and the best candidates are selected for transition into advanced development as candidate products. Medical biological defense candidate products that are now in the predevelopment stage are:

Ricin Toxoid

- Status: MS I in 2QFY95

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ANNEX E

FY 1995 ANNUAL REPORT TO CONGRESS ON RESEARCH, DEVELOPMENT, TEST AND EVALUATION CONDUCTED BY THE DEPARTMENT OF THE ARMY FOR THE PURPOSE OF BIOLOGICAL DEFENSE

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INTRODUCTION

This report is submitted for the purpose of complying with Public Law 103-160, dated 30 November 1994 and Section 2370 U.S.Code 10, Biological Defense Research Program (BDRP). This report provides the following information on the BDRP:

(1) A description of each biological or infectious agent or toxin that was used in, or that was the subject of, research, development, test, and evaluation conducted for the purposes of biological defense the fiscal year covered by the report (FY95) and not previously listed in publications of the Centers for Disease Control (CDC) and the location of this research. (**Enclosure 1.**)

(2) A description of the biological properties of each agent. (**Enclosure 1.**)

(3) A statement of the location of each biological defense research facility and the amount spent by the Department of Defense during the fiscal year covered by the report (FY95) at each such facility for research, development, test, and evaluation for biological defense research. (**Enclosure 2.**)

(4) A statement of the biosafety level used at each such facility in conducting that research, development, test and evaluation. (**Enclosure 2.**)

(5) A statement that documentation of annual coordination with local health, fire, and police officials for the provision of emergency support services has been included in the facility safety plan for each biological defense research facility. (**Enclosure 3.**)

All of the infectious organisms used or studied in the Department of Army (DA) BDRP are listed in the CDC-NIH Guidelines, *Biosafety in Microbiological and Biomedical Laboratories*, 3rd Edition, May 1993. With the exception of botulinum toxin, biological agents that are not infectious organisms are not listed in the CDC-NIH Guidelines and there is no national consensus document on such agents. In the context of the BDRP, the non-infectious biological agents used or studied are toxins of biological origin or physiologically active compounds (PACs).

The toxins or PACs listed are studied under conditions that approximate CDC-NIH biosafety levels 1 and 2 facilities. The biosafety levels defined in the CDC-NIH guidelines consider three elements: laboratory practices and techniques, safety equipment, and facility design. These biosafety levels were formulated specifically for work with infectious microorganisms and were not intended to apply to toxins or PACs. Accordingly, biosafety level used in conducting RDT&E with toxins and PACs are approximated based upon the CDC determining elements.

ENCLOSURE 1

LISTING OF BIOLOGICAL OR INFECTIOUS AGENTS OR TOXINS USED IN THE BIOLOGICAL DEFENSE RESEARCH PROGRAM DURING FY95

TOXIN NAME: Staphylococcal Enterotoxins

MOLECULAR WEIGHT: 27,000 to 30,000 daltons.

COMPOSITION: Single peptide chain with single disulfide loop.

NATURAL SOURCE: Bacteria *Staphylococcus aureus.*

TOXIC DOSE: Minimum dose of toxin needed to produce illness is less than 1 g/kg in human by the oral route.

MECHANISM OF ACTION: A group of exotoxins produced by *Staphylococcus aureus* known to cause disease in humans. Many of the pathogenic effects of the toxins are mediated through their potent activation of specific components of the immune system. Potentiation of the immune response leads to overproduction of a number of naturally occurring mediators. Incapacitating illness can occur in 1 to 6 hours with recovery in 1 to 3 days; common signs include, respiratory distress, diarrhea, nausea, and vomiting. Although rarely fatal, severe cases may result in life threatening shock.

SUPPLIER: Sigma Chemical Co.
St. Louis, MO

Toxin Technology
Sarasota, Florida

LOCATION OF RESEARCH:

U.S. Army Medical Research Institute of Infectious Diseases
Ft. Detrick, Frederick, Maryland

U.S. Army Edgewood Research,Development,and Engineering Center,
Aberdeen Proving Ground, MD

Walter Reed Army Institute of Research
Washington, D.C.

CDS, Inc.
Kettering, OH

Hebrew University
Jerusalem, Israel

LynnTech, Inc.
College Station, TX

Ophidian Pharmaceutical, Inc.
Madison, WI

Organon Teknika/Biotechnology Research Institute
Rockville, MD

Southern Research Institute
Birmingham, AL

Therapeutic Systems Research
Ann Arbor, MI

Veterans Administration Medical Center
Pittsburgh, PA

TOXIN NAME: Ricin

MOLECULAR WEIGHT: 66,000 daltons.

COMPOSITION: A globular protein composed of two subunits. The amino acid sequence (primary structure) and secondary structure are known and published in the scientific literature.

NATURAL SOURCE: Seed of the castor bean plant, *Ricinis communis*.

TOXIC DOSE: The median lethal dose (LD_{50}) in the mouse ranges from 3 to 20 µg/kg.

MECHANISM OF ACTION: Protein synthesis inhibitor; exact cause of death unknown.

SUPPLIER:
Sigma Chemical Co.
St. Louis, MO.

Vector Laboratories, Inc.
Burlingame, CA.

Inland Laboratories
Austin, TX

Chemical and Biological Defense Establishment
Porton Down, UK

LOCATION OF RESEARCH:

U.S. Army Edgewood Research, Development, and Engineering Center,
Aberdeen Proving Ground, MD

U.S. Army Medical Research Institute of Infectious Diseases
Ft. Detrick, Frederick, Maryland

Walter Reed Army Institute of Research
Washington, D.C.

U.S. Navy Medical Research and Development Command Laboratories
Bethesda and Silver Spring, MD

Albert Einstein School of Medicine
Bronx, NY

Oklahoma, University of
Oklahoma City, OK

Ophidian Pharmaceutical
Madison, WI

Organon Teknika/Biotechnology Research Institute
Rockville, MD

Salk Institute
San Diego, CA

University of Texas at San Antonio
San Antonio, TX

TOXIN NAME: Sodium channel toxins: saxitoxin and tetrodotoxin

MOLECULAR WEIGHTS: Approximately 300 to 1,000 daltons.

COMPOSITION: Complex organic chemicals, derivatives of tetrahydropurine. The structures are published.

NATURAL SOURCE: Saxitoxin and derivatives: dinoflagellates of the genus Protogonyaulax; tetrodotoxin: puffer fish (fugu), certain species of newts. Toxins enter the food chain through shellfish and fish.

TOXIC DOSE: The median lethal dose (LD50)in the mouse ranges from 6 to 10 μg/kg.

MECHANISM OF ACTION: These toxins act on one of the five sites on the voltage-dependent sodium channels in nerve and muscle tissue, and interfere with normal transmission of nerve impulses.

SUPPLIER: Sigma Chemical Co.
St Louis, MO

Sherwood Hall, Ph.D.
Food and Drug Administration, Washington, D.C

EAL Biochem Corporation
San Diego, CA

LOCATION OF RESEARCH:

U.S. Army Medical Research Institute of Infectious Diseases
Ft. Detrick, Frederick, Maryland

U.S. Army Medical Research Institute of Chemical Defense
Aberdeen Proving Ground, MD

Baylor College of Medicine
Houston, TX

Hahnemann Medical College
Philadelphia, PA

Wyoming, University of
Laramie, WY

Yale University
New Haven, CT

NAME: Venoms: Phospholipase A2 neurotoxins; textilotoxin, taipoxin, notexin, ß-bungarotoxin, pseudexin, crotoxin, concolor toxin, Mojave toxin, vegrandis toxin, ammodytoxin and caudoxin.

MOLECULAR WEIGHTS: 14,000 to 60,000 daltons.

COMPOSITION: These toxins are proteins; the sequences of most are published.

NATURAL SOURCE: Snakes from around the world.

TOXIC DOSE: The median lethal dose (LD50) in the mouse ranges from 1 to 1250 µg/kg.

MECHANISM OF ACTION: These toxins inhibit the release of neurotransmitters at the presynaptic nerve terminal. Death occurs from respiratory arrest.

SUPPLIER: Sigma Chemical Co.
St Louis, MO

Miami Serpentarium Laboratories
Miami, FL

LOCATION OF RESEARCH:

U.S. Army Medical Research Institute of Infectious Diseases
Ft. Detrick, Frederick, Maryland

Hahnemann University
Philadelphia, PA

Wyoming, University of
Laramie, WY

NAME: Venoms: Postsynaptic alpha-like toxins; alpha bungarotoxin, cobrotoxin, cobratoxin

MOLECULAR WEIGHTS: 1,500 to 7,000 daltons.

COMPOSITION: Proteins and peptides, sequences of most are published.

NATURAL SOURCE: Snakes and sea snails from around the world.

TOXIC DOSE: The median lethal dose (LD50)in the mouse ranges from 20 to 200 μg/kg.

MECHANISM OF ACTION: These toxins all bind to the acetylcholine receptor and inhibit neuromuscular function. Death occurs from respiratory arrest.

SUPPLIER: Sigma Chemical Co.
St Louis, MO

Miami Serpentarium Laboratories
Miami, FL

LOCATION OF RESEARCH:

U.S. Army Medical Research Institute of Infectious Diseases
Ft. Detrick, Frederick, Maryland

NAME: Venoms: Cardiotoxins.

MOLECULAR WEIGHTS: Approximately 7,000 daltons.

COMPOSITION: Proteins, sequences of most are published.

NATURAL SOURCE: Snakes, primarily cobras.

TOXIC DOSE: The median lethal dose (LD50) in the mouse ranges from 2000 to 3000 µg/kg.

MECHANISM OF ACTION: Acts on cardiac tissue to cause membrane damage. Death due to cardiac arrest.

SUPPLIER: Sigma Chemical Co.
St Louis, MO

Miami Serpentarium Laboratories
Miami, FL

LOCATION OF RESEARCH:

U.S. Army Medical Research Institute of Infectious Diseases
Ft. Detrick, Frederick, Maryland

Hahnemann University
Philadelphia, PA

NAME: Venoms: Scorpion toxins.

MOLECULAR WEIGHTS: Approximately 6,000 to 7,000 daltons.

COMPOSITION: Proteins, sequences of most are published.

NATURAL SOURCE: Scorpions.

TOXIC DOSE: (LD50) (mouse): Toxicity of individual scorpion toxins ranges from 20 µg/kg to non-lethal.

MECHANISM OF ACTION: The scorpion toxins act on one of the five sites on the voltage-dependent sodium channels in nerve and muscle tissue, and interfere with normal transmission of nerve impulses.

SUPPLIER: Sigma Chemical Co.
St Louis, MO

Miami Serpentarium Laboratories
Miami, FL

LOCATION OF RESEARCH:

U.S. Army Medical Research Institute of Infectious Diseases
Ft. Detrick, Frederick, Maryland

TOXIN NAME: Physiologically Active Compounds (PACs)

including: Adenosine triphosphate, corticotropin releasing factor, dynorphin, enkephalin, glutamate, morphine modulatory peptide, N-acetyl-aspartyl-glutamate, nitric oxide, norepinephrine, serotonin, substance P, tumor necrosis factor, vasoactive intestinal peptide.

MOLECULAR WEIGHT: 100 to 5000 daltons.

COMPOSITION: Primarily amino acids linked to make peptides, as well as other small low molecular weight compounds.

NATURAL SOURCE: Endogenous mammalian compounds such as hormones, neurotransmitters, and neuropeptides.

TOXIC DOSE: The median lethal dose (LD50) in the mouse has not been determined for most PACs. Low microgram per kg range to nonlethal in most cases tested.

MECHANISM OF ACTION: Exposure to these compounds results in stimulation or over stimulation of the natural physiological state of the organism resulting in incapacitation or disruption of homeostasis. This action usually occurs by direct action on an endogenous receptor for the PAC.

SUPPLIERS:

Aldridge Chemical Co., Milwaukee, WI
Amersham, Arlington Heights, IL
Bachem, Torrance, CA
Boehringer Mannheim, Germany
Calbiochem, La Jolla, CA
Cambridge Research Biochem, Wilmington, DE
Genzyme, Boston, MA
Peninsula Labs, Belmont, CA
Peptide Int, Louisville, KY
Research Biochemicals Inc., Natick, MA
Sigma Chemical Co., St Louis, MO
Tocris Neuramin, Bristol, UK

LOCATION OF RESEARCH:

Walter Reed Army Institute of Research
Washington, D.C.

TOXIN NAME: Cholera

MOLECULAR WEIGHT: Whole toxin 87,000 Daltons
Subunit A 29,000 Daltons
Subunit B 55,000 Daltons

COMPOSITION: Single A subunit containing two polypeptide chains connected by a disulfide linkage and a B subunit containing 5 polypeptide chains. Subunits are noncovalently associated and arranged in a pentameric form. The toxin is largely proteinaceous.

NATURAL SOURCE: Vibrio cholerae bacteria

TOXIC DOSE: LDSO (mouse): 250 ug/kg

MECHANISM OF ACTION: The toxin binds irreversibly to receptors on the brush border in intestinal epithelia cells. This binding causes an increased concentration of intracellular CAMP production which leads to rapid water loss. Death occurs when profuse diarrhea leads to dehydration and hypovolemic shock.

SUPPLIER: ICN Biochemicals
Costa Mesa, CA

Sigma Chemical Company
St. Louis, MO

LOCATION OF RESEARCH:

Edgewood Research, Development, and Engineering Center
Aberdeen Proving Ground, MD

TOXIN NAME: Cytotoxin I, II, III, & IV

MOLECULAR WEIGHT: 6500-6700 Daltons

COMPOSITION: Linear peptides with 4 disulfide linkages and 8 cysteines.

NATURAL SOURCE: Elapidae snakes

TOXIC DOSE: LD50 (mouse): 200 ug/kg

MECHANISM OF ACTION: Cardiotoxin (cytotoxin)

SUPPLIER: No commercial source. Research Sample provided by Gifu Pharmaceutical University, Gifu, Japan.

LOCATION OF RESEARCH:

Edgewood Research, Development & Engineering Center
Aberdeen Proving Ground, MD

TOXIN NAME: Basic Peptide

MOLECULAR WEIGHT: 6450 Daltons

COMPOSITION: Linear Peptide

NATURAL SOURCE: Naja naja atra (Chinese cobra)

TOXIC DOSE: LD5O: None (non-toxic peptide)

MECHANISM OF ACTION: Unknown; no known toxicity

SUPPLIER: Research sample provided by Gifu Pharmaceutical University, Japan

LOCATION OF RESEARCH:

Edgewood Research, Development & Engineering Center
Aberdeen Proving Ground, MD

TOXIN NAME: Botulinum toxoid A

MOLECULAR WEIGHT: Approx. 500,000 daltons

COMPOSITION: Non-toxic formalin inactivated toxoid containing four sulfhydryl groups and at least one disulfide bond.

NATURAL SOURCE: Clostridium botulinum bacteria

TOXIC DOSE: LD50 (rat): 800 mg/kg

MECHANISM OF ACTION: Toxin is a neurotoxin which inhibits release of acetylcholine at neuromuscular junction. Toxoid is essentially non-toxic.

SUPPLIER: Wako Chemicals USA
Richmond, VA

Sigma Chemical
St. Louis, MO

LOCATION OF RESEARCH:

Edgewood Research, Development & Engineering Center
Aberdeen Proving Ground, MD

University of Texas at San Antonio
San Antonio, TX

TOXIN NAME: Conus Peptides

MOLECULAR WEIGHT: 1200-3200 Daltons
COMPOSITION: Linear peptides with 4-6 cysteines and some with gamma-carboxyglutamic acid.

NATURAL SOURCE: Conus snails

MECHANISM OF ACTION: Post and presynaptic neurotoxic and sodium channel blockers.

TOXIC DOSE: LD50 (mouse): 50-200 ug/kg

SUPPLIER: Sigma Chemical Company
St. Louis, MO

LOCATION OF RESEARCH:

Edgewood Research, Development & Engineering Center
Aberdeen Proving Ground, MD

University of Texas at San Antonio
San Antonio, TX

ENCLOSURE 2

FISCAL YEAR 1995 DISBURSEMENTS BY LOCATION AND BIOSAFETY LEVEL (BL)

DEPARTMENT OF ARMY (DA)

LOCATION	DOLLARS ($K)	BL
U.S. Army Medical Research Institute of Chemical Defense Aberdeen Proving Ground, MD	2,410	1-2
U.S. Army Medical Research Institute of Infectious Diseases Fort Detrick, Frederick, MD	23,810	1-4
Walter Reed Army Institute of Research Washington, D.C. and Rockville, MD	4,913	1-3
U.S. Army Edgewood Research Development and Engineering Center Aberdeen Proving Ground, MD	100	1-2

OTHER DOD AGENCIES FUNDED BY DA

LOCATION	DOLLARS ($K)	BL
U.S. Navy Medical Research and Development Command Laboratories Bethesda and Silver Spring, MD	2,257	1-2
U.S. Air Force Detachment Edgewood Research,Development and Engineering Center, Aberdeen Proving Ground, MD	300	1-2

FISCAL YEAR 1995 DISBURSEMENTS BY LOCATION AND BIOSAFETY LEVEL (BL) [1]

CONTRACTS

LOCATION	DOLLARS ($K)[2]	BL
Alabama, University of at Birmingham [3] Birmingham, AL	70	1-2
Albert Einstein College Bronx, NY	296	1-2
Baylor College of Medicine Houston, TX	308	1-2
Biotech Transfer[3] Columbia, MD	70	1-2
Brigham Young University [3] Salt Lake City, UT	31	1-2
California University of, the Regents [3] Berkeley, CA	187	1-2
California, University of, San Diego [3] La Jolla, CA	43	1-2
California, University of, San Francisco [3] San Francisco, CA	264	1-2
Cambridge Scientific Belmont, MA	70	1-2
CDS,Inc. Kettering, OH	70	1-2

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[1] Facilities listed are those where RDT&E of subject agents was conducted during FY 95. Contract obligations not related to use of subject toxins are not listed.

[2] Obligated dollars as of 31 Oct 95.

[3] The contracted effort pertains to work with agents listed in CDC publications.

CONTRACTS

LOCATION	DOLLARS ($K)	BL
Chemotherapeutical Research Institute Frankfurt, Germany	24	1-2
CropTech,Inc.[3] Blacksburg, VA	89	1-2
Dana-Farber Cancer Institute [3] Boston, MA	137	1-2
Hahnemann University School of Medicine Philadelphia, PA	62	1-2
Hebrew University of Jerusalem Jerusalem Israel	104	1-2
Illinois, University at Urbana Champaign [3] Urbana, IL	66	1-2
Kentucky, University of [3] Lexington, KY	70	1-2
Louisiana State University [3] Shreveport, LA	41	1-2
LynnTech, Inc. Colege Station, TX	70	1-2
Massachusetts, University of, Medical Center [3] Worcester, MA	173	1-2
Nebraska, University of [3] Lincoln, NE	37	1-2
North Carolina, University of [3] Chapel Hill, NC	128	1-3
Oklahoma, University of Oklahoma City, OK	30	1-2

CONTRACTS

LOCATION	DOLLARS ($K)	BL
Ophidian Pharmaceutical, Inc. Madison, WI	80	1-2
Organon Teknika/Biotechnology Research Inst.[3] Rockville, MD	545	1-2
Porton Products Ltd.[3] (c/o Porton International) Washington, DC	2685	1-2
Salk Institute Swiftwater, PA	1,250	1-3
Southern Research Institute Birmingham, AL	72	1-2
Texas, University of Austin, TX	72	1-1
Therapeutic Systems Rsch. Ann Arbor, MI	70	1-2
University of Texas at San Antonio San Antonio, TX	187	1-2
Veterans Administration Medical Center Pittsburgh, PA	82	1-2
Virginia Tech. [3] Blacksburg, VA	46	1-3
Washington, University of [3] St. Louis, MO	232	1-2
Whalen Biomedical[3] Cambridge, MA	70	1-2
Wisconsin, University of [3] Madison, WS	113	1-3
Wyoming, University of Laramie, WY	290	1-2
Yale University New Haven, CT	102	1-2

ENCLOSURE 3

STATUS OF THE BIOLOGICAL DEFENSE RESEARCH SAFETY PROGRAM REQUIREMENTS FOR FISCAL YEAR 95

Documentation of annual coordination with local health, fire, and police officials for the provision of emergency support services has been included in the facility safety plan for each biological defense research facility in the DA MBDRP. Information on individual contractors has been verified by the Medical Research and Materiel Command Safety and Occupational Health Office (Memorandum dated 29 November 1995).

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ANNEX F

DEPARTMENT OF DEFENSE ANNUAL REPORT TO CONGRESS ON THE RESEARCH, DEVELOPMENT, TEST AND EVALUATION OF THE CHEMICAL/BIOLOGICAL DEFENSE PROGRAM 1 OCTOBER 1994 THROUGH 30 SEPTEMBER 1995

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ANNEX F
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APPENDIX A

DEPARTMENT OF THE ARMY ANNUAL REPORT TO CONGRESS ON THE RESEARCH, DEVELOPMENT, TEST AND EVALUATION OF THE CHEMICAL/BIOLOGICAL DEFENSE PROGRAM 1 OCTOBER 1994 THROUGH 30 SEPTEMBER 1995 RCS:DD-USADRE(A) 1065

SECTION I: OBLIGATION REPORT ON THE CHEMICAL DEFENSE RDTE PROGRAM

During the fiscal year 1995, the Department of the Army obligated $70,784,195 for general research investigations, and the development and testing of chemical defensive equipment.

FUNDS OBLIGATED:			
Current Fiscal Year (CFY)	$64,166,075		
Prior Year (PY)	6,618,120	In-house	$44,110,933
TOTAL	**$70,784,195**	Contract	$26,673,262

BREAKDOWN OF PROGRAM AREAS

1. BASIC RESEARCH

In-house Laboratory Independent Research (ILIR)	CFY	$581,000		
	PY	16,000	In-house	$470,000
		$597,000	Contract	$127,000
Research in Chemical Warfare Defense	CFY	$1,181,000		
	PY	7,000	In-house	$870,000
		$1,188,000	Contract	$318,000
TOTAL BASIC RESEARCH	CFY	$1,762,000		
	PY	23,000	In-house	$1,340,000
		$1,785,000	**Contract**	**$445,000**

2. CONCEPT EXPLORATION/DEFINITION (CE/D)

Warning and Detection Investigations	CFY	$9,842,000		
	PY	90,000	In-house	$6,442,000
		$9,932,000	Contract	$3,490,000
Physical Protection Investigations	CFY	$946,000		
	PY	- 0 -	In-house	$713,000
		$946,000	Contract	$232,000

Individual Protection	CFY	$2,039,000		
	PY	- 0 -	In-house	$1,749,000
		$2,039,000	Contract	$290,000
Collective Protection	CFY	$5,002,000		
	PY	130,000	In-house	$2,960,000
		$5,132,000	Contract	$2,172,000
Decontamination	CFY	$502,000		
	PY	- 0 -	In-house	$393,000
		$502,000	Contract	$109,000
Supporting Technologies	CFY	$2,012,000		
	PY	- 0 -	In-house	$2,012,000
		$2,012,000	Contract	- 0 -
TOTAL - CE/D	CFY	$20,343,000		
	PY	220,000	In-house	$20,695,000
		$20,563,000	Contract	$6,293,100
3. DEMONSTRATION/VALIDATION (DEM/VAL)				
Collective Protection	CFY	$5,408,000		
	PY	5,000	In-house	$1,714,000
		$5,413,000	Contract	$3,699,000
Decontamination	CFY	$2,975,000		
	PY	- 0 -	In-house	$1,949,000
		$2,975,000	Contract	$1,026,000
Contamination Avoidance	CFY	$316,000		
	PY	- 0 -	In-house	$316,000
		$316,000	Contract	-0-
Manufacturing Science and Technology	CFY	$35,000		
	PY	- 0 -	In-house	$35,000
		$35,000	Contract	- 0 -
Individual Protection	CFY	$1,479,000		
	PY	323,000	In-house	$463,000
		$1,802,000	Contract	$1,338,000
TOTAL - DEM/VAL	CFY	$10,213,000		
	PY	328,000	In-house	$4,477,700
		$10,541,000	Contract	$6,063,300

4. ENGINEERING AND MANUFACTURING DEVELOPMENT (EMD)

Warning and Detection	CFY	$10,220,000		
	PY	98,000	In-house	$5,935,000
		$10,318,000	Contract	$4,383,000
Individual Protection	CFY	$7,931,075		
	PY	2,347,473	In-house	$6,175,333
		$10,278,548	Contract	$4,655,862
Collective Protection	CFY	$1,715,000		
	PY	- 0 -	In-house	$473,000
		$1,715,000	Contract	$1,242,000
TOTAL - EMD	CFY	$19,866,075		
	PY	2,445,473	In-house	$12,583,333
		$22,311,548	Contract	$10,280,862

5. MANAGEMENT AND SUPPORT (M/S)

Joint Chemical/Biological	CFY	$1,719,000		
Contact Point and Test	PY	- 0 -	In-house	$1,719,000
		$1,719,000	Contract	- 0 -
Management and Admin Support	CFY	$10,263,000		
	PY	3,049,000	In-house	$7,699,000
		$13,312,000	Contract	$2,580,000
TOTAL - M/S	CFY	$11,982,000		
	PY	3,049,000	In-house	$11,440,000
		$15,031,000	Contract	$3,591,000

SECTION I:
EXPLANATION OF OBLIGATION

1. BASIC RESEARCH

a. In-house Laboratory Independent Research (ILIR): Program Element (PE) 61101, Project A91A - Supports in-house, innovative and entrepreneurial research projects. Provides a pathway to the development of novel and high quality research projects.

FY 95 Accomplishments:

- Investigated synthetic routes to Epibatidine, a new analgesic.

b. Research in Chemical Warfare Defense: PE 61102, Project A71A - Basic research in support of improved defensive systems for chemical and biological threat agents and toxins; new concepts in decontamination, aerosol and obscuration studies; and determinations of the environmental fate and impact of militarily unique chemicals.

FY 95 Accomplishments:

- Determined and validated mustard degradation using hydroxide reactions.

2. CONCEPT EXPLORATION AND DEFINITION

Chemical/Biological (CB) Defense and General Investigations: PE 62622, Project A553 - Addresses urgent need to provide all Services with defensive materiel to protect individuals and groups from CB threat agents.

a. Contamination Avoidance: Supports development of multi-agent sensors and detectors providing real-time detection and identification of CB threat agents.

FY 95 Accomplishments:

- Demonstrated theoretical feasibility of using passive infrared technology for high altitude stand-off detection.
- Expanded CB modeling efforts using a Distributed Interactive Simulation (DIS) module for the FOX Nuclear, Biological, and Chemical (NBC) Reconnaissance Vehicle to include CB defense in war gaming efforts.
- Conducted a successful test of the Joint United States (U.S.)/France Laser Stand-off Chemical Agent Detector.

b. Individual Protection: Supports increased protection against current and future threat agents, while minimizing the physiological burden imposed by CB protective gear.

FY 95 Accomplishments:

- Conducted studies to optimize integration of respiratory designs into the Generation II Soldier System concepts.

- Developed the methodology to measure CB protection factors for respirators using CB simulant test results.

c. Collection Protection: Supports continuous air filtration for unit sustainment in a CB environment while eliminating the burden of changing filters.

FY 95 Accomplishments:

- Conducted studies on limits of performance of regenerable filtration concepts and optimized integration on the Crusader, Comanche, and Advanced Assault Amphibian platforms.

d. Decontamination: Supports development of multipurpose decontaminants and requisite dispensing systems with emphasis on noncorrosive, all-agent decontaminants for personal equipment and sensitive electronics.

FY 95 Accomplishments:

- Conducted studies using solid state nuclear magnetic resonance technology to determine decontamination reactions in solids such as contaminated soil.
- Demonstrated the feasibility of using enzymatic foam in the Joint U.S./United Kingdom (UK) CB Antiterrorist Containment Device.
- Published a North Atlantic Treaty Organization (NATO) standard test methodology for CB Survivability.

e. Physical Protection Investigations: PE 62786, Project AH98 - Supported evolution of concepts for individual protection against potential threat agents for Joint Service application; development of a technical base to study the mechanism of chemical/biological (CB) protective material.

FY95 Accomplishments:

- Completed physical and barrier properties evaluation of candidate selectively permeable membrane material.
- Fabricated prototype garments from candidate selectively permeable membrane material, and carried out limited field test of garments.
- Initiated development of two alternative membrane technologies.
- Developed a flame retardant stretchable material which contains adsorptive carbon for use in form-fitting chemical protective undergarments, gloves, and socks.
- Developed a novel passive sampler for use in vapor systems tests.
- Developed a new abrasion resistance test for textiles and determined the relationship between fabric abrasion and chemical protection.
- Evaluated copolymers of isobutylene and B-methyl styrene for chemical protective clothing applications.

3. DEMONSTRATION AND VALIDATION

a. Collection Protection Concepts:

Advanced Integrated Collective Protection System (AICPS):
PE 63806, Project D604 - This project provides for development of the AICPS. The AICPS will integrate NBC filtration environmental controls and power source components for tactical and combat systems and exploit new filtration technology (regenerable filtration, catalytic oxidation or deep bed chromium-free carbon). The effort extends vehicular collective protection applications providing for reductions in system size, weight, energy and in filter change logistics burden. The AICPS can be integrated into multiple configurations to provide protection to different tactical systems. Additionally, the effort provides a system solution for countering future threat agents and alleviating the disposal problems associated with hazardous material chromium impregnated carbon filters.

FY 95 Accomplishments:
- Initiated prototype fabrication of the AICPS.
- Completed preliminary/critical design reviews.
- Developed prototype filter.
- Conducted successful prototype filter testing.
- Initiated engineering design filter test.
- Continued providing support to the development of the AICPS.

b. Decontamination Concepts:

Modular Decontamination System (MDS): PE 63806, Project DE81 - Funding supports the MDS, a more transportable, less labor intensive, and more effective system for applying decontaminating solutions to vehicle and equipment surfaces. Lessons learned from Desert Storm validated the need for a deployable and efficient decontamination system. The MDS reduces water usage and equipment processing time with increased water pressure and variable water temperature. The MDS consists of the XM21 Decontaminant Pumper Module and the XM22 High Pressure Washer Module.

FY 95 Accomplishments:
- Completed engineering tests for the XM21 portion of the MDS.
- Fabricated XM21 engineering test hardware.
- Completed a Critical Design Review of the XM21.
- Resolicited the XM22 development contract using performance specifications instead of military specifications.

c. Contamination Avoidance:

NBC Contamination Avoidance Systems: PE 63806 - This project supports development of reconnaissance, detection, and identification equipment.

CB Mass Spectrometer (CBMS): PE 63806, Project D601 -
The CBMS is a developmental component of the Biological Integrated Detection System (BIDS) and the NBC Reconnaissance System (NBCRS) which is designed to detect and presumptively identify threat biological and chemical agents. The CBMS includes a mass analyzer capable of tandem mass spectrometry and a transfer line/pyrolyzer which pyrolyzes aerosol materials prior to mass spectral analysis. In the BIDS, the CBMS will be linked to a central computer and will interface to a BIDS aerosol sampling device. For chemical reconnaissance applications, the CBMS will interface with the NBCRS's chemical ground probe.

FY 95 Accomplishments:
- Developed improved hardware requirements and rescheduled chemical profiling tests to coincide with new contract award.

d. Manufacturing Science and Technology: PE 63771, Project DE20- This project supports programs in the development of advanced technologies for the production of Army weapons systems and CB defense materials.

FY 95 Accomplishments:
- Initiated efforts to identify a replacement for Freon 12 for filter leak testing.

e. Individual Protection: PE 63747, Project D669 - Supported development of the Self-Contained Toxic Environment Protective Outfit (STEPO)

FY95 Accomplishments:
- Modified Test Prototypes and initiated Phase II developmental and operational (DT/OT) testing.
- Conducted metobolic work rate study on individuals wearing the STEPO ensemble.
- Finalized draft training and technical manuals for STEPO.
- Finalized STEPO Integrated Logistics Support Plan.
- Drafted STEPO Material Fielding Plan.
- Finalized STEPO Acquisition Strategy Report.

4. ENGINEERING AND MANUFACTURING DEVELOPMENT

a. Warning and Detection Systems

NBC Contamination Avoidance System: PE 64806, Project D020 This provides for the development of new nuclear and chemical defensive equipment to enhance U.S. capability to detect and identify threat agents on the battlefield. The project supports: (1) Automatic Chemical Agent Detector Alarm (ACADA), (2) Multipurpose Integrated Chemical Agent Alarm (MICAD), and (3) the XM93E1 FOX NBC Reconnaissance System (NBCRS).

FY95 Accomplishments:
- ACADA - Closed out program and Engineering and Manufacturing Development contract.
- ACADA - Conducted initial non-developmental items engineering efforts.

- ACADA - Prepared production contract and the In-Process Review program documentation.
- NBCRS - Completed the Engineering and Manufacturing Development phase and initiated production planning for the FOX NBCRS Block I Modification upgrade program.
- NBCRS - Completed all required documentation for a Milestone III program review and held the review which approved the FOX NBCRS for Type Classification Standard.
- NBCRS - Conducted an Operational Manpower and Personnel Integration Demonstration which successfully proved that modifications made following Initial Operational Tests permitted downsizing the FOX NBCRS crew from four to three persons.
- MICAD - Continued to provide engineering and test support to the MICAD program.

b. Individual Protection Equipment

Air Crew Protection Mask (ACPM): PE 64806, Project D017 - Provides Engineering and Manufacturing Development of equipment to protect soldiers on NBC contaminated battlefields. The project resources development of the XM45 ACPM which provides rotary-wing air crewmen with a less burdensome respiratory protection system. The ACPM eliminates the air crew dependence on forced air and is compatible with helicopter weapon sights and the night vision system.

FY 95 Accomplishments:

- Completed design and construction of all developmental masks required to conduct engineering design and preproduction qualification tests.
- Initiated a partial purchase only of the Technical Data Package tooling due to a funding shortfall. Continued to develop the logistics support to include the new equipment training and technical manuals.

Enhanced Water Supply Operations in a NBC Environment: PE 64804, Project DL39 - This project provides for the development of methods and equipment to improve the NBC survivability of military water purfication equipment and their ability to treat NBC contaminated water.

FY95 Accomplishments:

- Completed a Cost and Operational Effectiveness Analysis (COEA) on the use of Collective Protection and Contamination Avoidance Covers (CACs) with the 3000 gallons per hour (GPH) Reverse Osmosis Water Purification Unit (ROWPU).
- Conducted chemical and biological agent simulant testing on CAC protected 3000 GPH ROWPU.
- Prepared draft procedures for the operation of ROWPUs on NBC contaminated water sources.

Individual Protection Equipment: PE 64801, Project DC45 - Supports a follow-on lightweight blower for the M43A1E1 Chemical Protective Mask. Also supports an Aircrew Microclimate Conditioning System (AMCS) to provide cooling for aircrew encumbered in the NBC ensemble during desert or tropic operations to prevent incapacitating heat stress. These

two efforts are part of engineering development of life support items peculiar and necessary to Army aircrews for survival on the integrated battlefield.

FY95 Accomplishments:

- Completed acceptance test of five candidate lightweight blowers for the XM48/XM49 (formerly M43A1E1).
- Completed procurement contract package for pending award of production contract for the XM48/XM49 blowers.
- Completed developmental and operational flight testing of the AMCS on OH-58D, UH-60, and CH-47D aircraft types to verify system technical and operational objectives, and adequacy of training package.

JLIST: PE 64713, Project DL40, D668 - Supported development of Joint Service, Lightweight Integrated Suite Technology I (JSLIST-I), chemical protective garments; including Vapor Protective, Flame Resistant Undergarment/Enhanced Aircrew Uniform, Integrated Battlefield/Advanced Battledress Overgarment/Lightweight Chemical Protective Overgarment and JSLIST II Program.

FY95 Accomplishments:

- Finalized all documentation required for developmental and operational (DT/OT) testing.
- Established a Joint Service New Equipment Training (NET) Team.
- Completed JSLIST-I DT/OT test item contract.
- Completed hot weather DT evaluation at the Yuma Proving Grounds.
- Completed initial Navy shipboard DT evaluation.
- Initiated Cold Weather DT evaluation at the Cold Regions Test Center.
- Initiated Tropics DT evaluation in Panama.
- Initiated the Main OT evaluation at 29 Palms.
- Redefined JSLIST II Program Plans for FY97 start.

Combat Feeding, Clothing and Equipment: PE 64713, Project DL40- Supported engineering and manufacturing development for state-of-the-art individual clothing and equipment to improve the effectiveness, sustainability, and quality of life of the individual solider.

FY95 Accomplishments:

Improved Toxicological Agents Protective (ITAP) System

- Awarded contract to integrate suit, cooling system, and breathing apparatus.
- Tested initial design in a user evaluation involving all services.
- Modified design based on user input.

Fire Fighter's Suit - Combat (FIS-C)

- Transitioned to Joint Firefighter's Integrated Response Ensemble (JFIRE), a joint program with the USAF.

- Conducted compatibility testing, with both Army and Air Force Firefighters wearing a JSLIST Duty Uniform with firefighting gear.
- Incorporated JFIRE as a subcommittee under the JSLIST program, using the JSLIST BRATT Excursion for JFIRE DT/OT.
- Established schedules for JFIRE mask modification and glove liner development.
- Prepared JFIRE MOA and submitted it to Army and Air Force PM's for signature.

Multipurpose Rain, Snow, Chemical/Biological Overboot (MULO)
- Acquired MULO test items for JSLIST I DT/OT.
- Completed compatibility/acceptability evaluation.
- Completed Hot Weather DT evaluation at Yuma Proving Ground.
- Completed initial Navy Shipboard evaluation.
- Initiated Cold Weather DT evaluation at Cold Regions Test Center.
- Initiated Tropics DT evaluation in Panama.

Vapor Protective Flame Resistant Undergarment - Sock (VPFRU-Sock)
- Conducted physical and chemical agent testing.
- Completed Human-Factors "Upsize Test".
- Conducted "Mini-User" Evaluation.
- Completed "Final Down Selection".

Soldier Enhancement Program (SEP): PE 64713, Project D668 - Supports multiple projects to identify, test and evaluate equipment for the individual soldier (focusing on non-development items whenever possible) to improve soldier lethality, survivability, and combat effectiveness.

FY95 Accomplishments:
Improved Chemical/Biological Protective Glove
- Evaluated Type A and Type B Glove Concepts.
- Completed Hot Weather DT evaluations at Yuma Proving Grounds.
- Initiated Tropics DT Evaluation at Panama Tropical Test Center.
- Initiated Cold Weather DT evaluation at Cold Regions Test Center.
- Initiated Main OT Evaluation at 29 Palms.

c. Collective Protection: PE 64804, Project D429 - Supported development of the Chemically and Biologically Protected Shelter (CBPS). The CBPS will be a highly mobile system providing a contamination-free environmentally controlled working area for a Battalion Aid Station or Division Cleaning Station.

FY95 Accomplishments:
- Completed all Technical Testing and conducted Customer User Test.
- Obtained Type Classification - Limited Procurement approval for CBPS is 15 Dec 94.
- Prepared and solicited RFP, and evaluated proposals for procurement of CBPS to meet users' urgent requirement.
- Received best and final offers 26 Oct 95.

5. MANAGEMENT AND SUPPORT

a. Joint Chemical/Biological Contact Point and Test: PE 65710, Project D049 - The objective of this program is to plan, conduct, evaluate, and report on joint tests (for other than development hardware) and accomplish operational research assessments in response to requirements received from the Commanders-In-Chief and Services; to serve as the Department of Defense joint point of contact for CB defense tests and technical data; and to publish and maintain the CB Technical Data Source Book.

FY 95 Accomplishments:

- Published five field test reports, five laboratory reports, and six technical assessments.
- Published two source books: (1) Toxic Theater Database, (2) Ricin Source Book.
- Continued automation of the Joint Technical Information Center.
- Conducted the Joint CB Contact Point and Test Annual Planning Meeting.
- Completed technical assessments for all Services and the Office of the Surgeon General.

b. Management and Admin Support: PE 65502, Project MM40; PE 65709, Project D650; PE 65801, Projects MAC3 and MM55; and PE 65803, Project C16.

FY 95 Accomplishments:

- Awarded 13 Small Business Innovative Research type contracts.
- Purchased state-of-the-art laboratory equipment.
- Continued to purchase various computer network system upgrades.

c. NBC Survivability: PE 65710, Project DJ30 - This project provides for test and analytical methodology, generic material testing and database support for design and analysis of numerous weapon system programs to ensure that NBC survivability is readily and adequately addressed during the acquisition cycle.

FY95 Accomplishments:

- Assisted Program Executive Officer/Project Managers (PEOs/PMs) Research, Development and Engineering Centers (RDECs), defense decision makers and the Army Battle Labs to meet Chemical, Biological and Nuclear (CBN) survivability requirements and field sustainable equipment.
- Continued development and expansion of CBN databases and predictive techniques to enhance the survivability/lethality of Army Materiel.
- Hosted the semi-annual tri-service Chemical-Biological Modeling symposium and workshop.
- Supported Small Business Innovative Research (SBIR) programs related to CBN survivability.

SECTION II:
OBLIGATION REPORT ON THE BIOLOGICAL DEFENSE RDTE PROGRAM

During the fiscal year 1995, the Department of the Army obligated $21,394,000 for general research investigations, and the development and testing of biological defensive equipment.

FUNDS OBLIGATED:			
Current Fiscal Year (CFY)	$21,219,000		
Prior Year (PY)	175,000		
		In-house	$10,193,000
TOTAL	$21,394,000	Contract	$11,201,000

BREAKDOWN OF FUNDS

1. BASIC RESEARCH				
	CFY	$2,640,000		
	PY	8,000	In-house	$2,009,000
		$2,648,000	Contract	$639,000
2. CONCEPT EXPLORATION/DEFINITION (CE/D)				
Warning and Detection	CFY	$9,098,000		
	PY	137,000	In-house	$4,142,000
		$9,235,000	Contract	$5,093,000
3. DEMONSTRATION/VALIDATION (DEM/VAL)				
Contamination Avoidance	CFY	$7,216,000		
	PY	- 0 -	In-house	$3,485,000
		$7,216,000	Contract	$3,731,000
NATO Research and	CFY	$1,700,000		
Development (Nunn Funds)	PY	- 0 -	In-house	- 0 -
		$1,700,000	Contract	$1,700,000
Industrial Preparedness -				
Manufacturing Science	CFY	$565,000		
and Technology	PY	30,000	In-house	$557,000
		$595,000	Contract	$38,000
TOTAL DEM/VAL	CFY	$9,481,000		
	PY	30,000	In-house	$4,042,000
		$9,511,000	Contract	$5,469,000

SECTION II:
EXPLANATION OF OBLIGATION

1. BASIC RESEARCH

a. In-house Laboratory Independent Research (ILIR): PE 61101, Project A91A - Supports in-house, innovative and entrepreneurial research projects. Provides a pathway to the development of novel and high quality research projects.

FY95 Accomplishments:

- Determined the extent to which aerosol antibodies retain their biological activity when dispersed into air.

b. Research in Chemical Warfare Defense: PE 61102, Project A71A - Basic research in support of new and improved defensive systems for chemical and biological threat agents and toxins; new concepts in decontamination, aerosol and obscuration studies; and determinations of the environmental fate and impact of militarily unique chemicals.

FY 95 Accomplishments:

- Transitioned Clostridial probe development to the Concept Exploration and Definition phase and initiated deoxyribonucleic acid (DNA) primer and probe development for additional organisms.
- Demonstrated inverse scattering for use in optical detection of micro-encapsulated particles.
- Completed construction of a single bioparticle trap coupled to a fluorometer and demonstrated matrix assisted laser desorption/time of flight mass spectrometry of bioparticles.
- Synthesized new Starburst dendrimers as candidate substrates for detection reactions.

2. CONCEPT EXPLORATION AND DEFINITION

Chemical/Biological (CB) Defense and General Investigations: PE 62622, Project A553 - Addresses urgent need to provide all Services with defensive material to protect individuals and groups from CB threat agents.

FY 95 Accomplishments:

- Conducted biological simulant field trials of biological agent point detection prototypes utilizing technologies such as DNA probes, flow cytometry, light addressable potentiometric, electrochemiluminescence, and coulometric feedback redox threshold. Preliminary results indicate high detection efficiencies in the aforementioned technologies.
- Evaluated a stand-off biological detector prototype using light scattering passive infrared technology and successfully detected the presence of a biological cloud.
- Cloned the first recombinant antibody against botulinum toxin and used bacterial fermentation to produce large economical quantities.

3. DEMONSTRATION AND VALIDATION

a. Contamination Avoidance:

NBC Contamination Avoidance Systems: PE 63806 - This project supports development of reconnaissance, detection, and identification equipment.

CB Mass Spectrometer (CBMS): PE 63806, Project D601 -
The CBMS is a developmental component of the Biological Integrated Detection System (BIDS) and the NBC Reconnaissance System (NBCRS) which is designed to detect and presumptively identify threat biological and chemical agents. The CBMS includes a mass analyzer capable of tandem mass spectrometry and a transfer line/pyrolyzer which pyrolyzes aerosol materials prior to mass spectral analysis. In the BIDS, the CBMS will be linked to a central computer and will interface to a BIDS aerosol sampling device. For chemical reconnaissance applications, the CBMS will interface with the NBCRS's chemical ground probe.

FY 95 Accomplishments:
- Completed development of biological detection algorithms for all Phase II BIDS threat agents.
- Completed design modifications to improve the flow controller, personal computer, adapter for connection to the BIDS, and mounting system.
- Initiated reliability testing and rescheduled engineering testing to coincide with budget approval.
- Fabricated test hardware for feasibility testing and completed plans for purchase of user test hardware.

North Atlantic Treaty Organization (NATO) Research and Development (Nunn Funding), PE 63790 - This program supports the advanced development of new, innovative defense projects with international interest and cooperation.

FY 95 Accomplishments:
- Improved detection sensitivity and reliability of the Biological Detector and advanced the development to a prototype stage. Improvements were successfully tested during joint field trials.
- Developed antibodies for use in the BIDS biological detection suite.

b. Industrial Preparedness

Manufacturing Science and Technology: PE 63771, Project DE20 - Supports manufacturing process studies for antibodies and enzymes used for biological detection systems.

FY 95 Accomplishments:
- Optimized the fermentation process on the 5-liter scale fermenter to obtain a thermostable urease enzyme to be used in biological detection devices.
- Initiated process scale-up to the 30-liter scale fermenter and obtained good results and favorable oxygen transfer early in the scale-up operations.

SECTION III:
OBLIGATION REPORT ON COUNTERPROLIFERATION - OSD FUNDING (CB DEFENSE)

During the fiscal year 1995, CBDCOM obligated $4,788,000 in support of CB defense engineering and manufacturing development, and management and support for the Counterproliferation Support Program.

FUNDS OBLIGATED:			
Current Fiscal Year (CFY)	**$4,788,000**		
Prior Year (PY)	**- 0 -**	In-house	$1,833,000
TOTAL	**$4,788,000**	Contract	$2,955,000

BREAKDOWN OF PROGRAM AREAS

1. ENGINEERING AND MANUFACTURING DEVELOPMENT (EMD)				
Individual Protection	CFY	$1,338,000		
	PY	- 0 -	In-house	$1,009,000
		$1,338,000	Contract	$329,000
NBC Contamination Avoidance	CFY	$2,699,000		
	PY	- 0 -	In-house	$190,000
		$2,699,000	Contract	$2,509,000
TOTAL - EMD	CFY	$4,037,000		
	PY	- 0 -	In-house	$1,199,000
		$4,037,000	Contract	$2,838,000

2. MANAGEMENT AND SUPPORT				
Joint NBC Doctrine Development -	CFY	$751,000		
	PY	- 0 -	In-house	$634,000
		$751,000	Contract	$117,000

SECTION III:
EXPLANATION OF OBLIGATION

1. ENGINEERING MANUFACTURING AND DEVELOPMENT

Chemical and Biological (CB) Defense: Program Element (PE) 64384 - This program element supports the Engineering and Manufacturing Development of CB defensive equipment, both medical and non-medical, and addresses shortcomings identified in the Conduct of the Persian Gulf War report.

a. Individual Protection Equipment

Air Crew Protective Mask (ACPM): The ACPM provides rotary-wing air crewmen with a less burdensome respiratory protection system. The ACPM eliminates the air crew dependence on forced air and is compatible with helicopter weapon sights and the night vision system.

FY 95 Accomplishments:
- Conducted the engineering design test and prepared the test plans and procedures for the preproduction qualification test.
- Constructed mounting fixtures and face forms for use in the preproduction qualification test.

b. Nuclear, Biological and Chemical (NBC) Contamination Avoidance

Multipurpose Integrated Chemical Agent Alarm (MICAD):
The MICAD provides automatic NBC warning and reporting throughout the battlefield and links digital data into the Army's command, control and communications systems.

FY 95 Accomplishments:
- Completed construction of functional systems to permit software prototyping in an operational scenario.
- Initiated the development of operating software for the functional systems.
- Prepared draft versions of the Operator's Manual, Maintainer's Manual and Program of Instruction for use by new equipment training personnel when teaching the operation and servicing of the MICAD.

2. MANAGEMENT AND SUPPORT

Joint Nuclear, Biological and Chemical (NBC) Doctrine Development: PE 65384 - This program will provide development of joint NBC defense doctrine requirements and will define sound tactics, techniques, and procedures to facilitate joint operations in an NBC environment. This doctrine will be used to develop joint training requirements for the Services and drive the NBC defense joint professional training development.

FY 95 Accomplishments:
- Initiated effort to identify existing doctrine, tactics, techniques, and procedures used by the Services which will result in a road map for joint doctrine efforts.
- Initiated effort to develop the architecture that will serve as the strategy for the generation of new doctrine.
- Established a Joint Doctrine Cell co-located at the U.S. Army Chemical School.

SECTION IV:
OBLIGATION REPORT ON COUNTERPROLIFERATION - OSD FUNDING (BIOLOGICAL)

During the fiscal year 1995, CBDCOM obligated $5,692,000 in support of biological defense concept exploration and definition, and management and support for the Counterproliferation Support Program.

FUNDS OBLIGATED:			
Current Fiscal Year (CFY)	**$5,692,000**		
Prior Year (PY)	**- 0 -**	In-house	$1,850,000
TOTAL	**$5,692,000**	Contract	$3,842,000

BREAKDOWN OF PROGRAM AREAS

1. CONCEPT EXPLORATION AND DEFINITION (CE/D)

Warning and Detection	CFY	$4,915,000		
	PY	- 0 -		
		$4,915,000	In-house	$1,559,000
			Contract	$3,356,000
Decontamination	CFY	$591,000		
	PY	- 0 -		
		591,000	In-house	$291,000
			Contract	$300,000
TOTAL CE/D	CFY	$5,506,000		
	PY	- 0 -	In-house	$1,850,000
		$5,506,000	Contract	$3,656,000

2. MANAGEMENT AND SUPPORT

Warning and Detection	CFY	$186,000		
	PY	- 0 -		
		$186,000	In-house	- 0 -
			Contract	$186,000

SECTION IV:
EXPLANATION OF OBLIGATION

1. CONCEPT EXPLORATION AND DEFINITION

Chemical and Biological Defense: PE 62384 - This program funds technology development which will enhance U.S. Forces' ability to deter, defend, and survive chemical and biological warfare.

a. Warning and Detection Technology

FY 95 Accomplishments:

- Gathered and cataloged three dimensional ultra-violet spectral fluorescence data for ten biological agents, ambient backgrounds for twenty sites, and twenty biological interferents. This work supports technology development for a Short Range Ultra-violet Stand-off Laser Induced Detection and Ranging (LIDAR) Biological Agent Detector

b. Decontamination Technology

FY 95 Accomplishments:

- Held a Decontamination Workshop to identify novel decontamination methods.
- Initiated a study for methods to decontaminate biological materials.

2. MANAGEMENT AND SUPPORT

Chemical and Biological Defense: PE 65384 - This program supports Joint Chemical and Biological Contact Point and Test, Counterproliferation in the passive defense area, and financial/program management of the Joint Service Chemical and Biological Defense Program.

Warning and Detection

Joint Nuclear, Biological and Chemical Long Range Biological Stand-off Detection System:

FY 95 Accomplishments:

- Initiated a plan to pursue alternate technologies in counterproliferation for the Long Range Biological Stand-off Detection System.

APPENDIX B

DEPARTMENT OF THE AIR FORCE ANNUAL REPORT TO CONGRESS ON THE RESEARCH, DEVELOPMENT, TEST AND EVALUATION OF THE CHEMICAL/BIOLOGICAL DEFENSE PROGRAM 1 OCTOBER 1994 THROUGH 30 SEPTEMBER 1995 RCS:DD-USADRE(A) 1065

SECTION I: OBLIGATION REPORT ON THE CHEMICAL DEFENSE RDTE PROGRAM

During the FY95, the Department of the Air Force obligated $783,000 for development and testing of chemical defensive equipment.

FUNDS OBLIGATED:

Current Fiscal Year (CFY)	$783,000		
Prior Year (PY)	0	In-house	$146,000
TOTAL	**$783,000**	Contract	$637,000

BREAKDOWN OF PROGRAM AREAS

1. CONCEPT EXPLORATION/ DEFINITION (CE/D)				
Nuclear, Biological, and Chemical Operability	CFY	$461,000		
	PY	-0-		
		$461,000	In House	$66,000
			Contract	$395,000
2. DEMONSTRATION AND VALIDATION (DEM/VAL)				
Detection	CFY	$322,000		
	PY	-0-		
		$322,000	In House	$80,000
			Contract	$242,000
TOTAL - DEM/VAL	CFY	$322,000		
	PY	-0-		
		$322,000	In House	$80,000
			Contract	$242,000

SECTION I:
EXPLANATION OF OBLIGATION

1. CONCEPT EXPLORATION AND DEFINITION

Chemical and Biological (CB) Defense and General Investigations: PE 62622, Project A553 - Investigated new or enhanced technologies to protect individuals and groups from CB agents.

FY95 Accomplishments:

NBC Operability
- Revised infectivity data from field data and aerosol chamber
- Determined human infectivity

Detection
- Demonstrated solid state chemical detection and alarm technology
- Improved technology for identification of biological warfare agents

2. DEMONSTRATION AND VALIDATION

a. Crew Systems Technology (Detection): PE 63231F, Project 2830 - Supported development of an aircraft interior chemical agent detector and airbase biological detector.

FY95 Accomplishments:
- Improved and fabricated surface acoustic wave detector that required 50 percent less power and reduced size to about twice the size of a VCR tape.
- Published laboratory results of a biological point detector that is 80 times more sensitive than the anthrax infective dose.
- Developed a DNA identification system for a biological field detector.

APPENDIX C

DEPARTMENT OF THE NAVY ANNUAL REPORT TO CONGRESS ON THE RESEARCH, DEVELOPMENT, TEST AND EVALUATION OF THE CHEMICAL/BIOLOGICAL DEFENSE PROGRAM 1 OCTOBER 1994 THROUGH 30 SEPTEMBER 1995 RCS:DD-USADRE(A) 1065

SECTION I: OBLIGATION REPORT ON THE CHEMICAL DEFENSE RDTE PROGRAM

During the FY95, the Department of the Navy obligated $9,601,898 for development and testing of chemical defensive equipment.

FUNDS OBLIGATED:			
Current Fiscal Year (CFY)	$9,343,898		
Prior Year (PY)	$258,000	In-house	$5,908,000
TOTAL	**$9,601,898**	Contract	$3,693,898

BREAKDOWN OF PROGRAM AREAS

1. CONCEPT EXPLORATION AND DEFINITION (CE/D)				
Warning and Detection Investigations	CFY	$150,000		
	PY	$0	In-house	$150,000
		$150,000	Contract	$0
Physical Protection Investigations	CFY	$314,000		
	PY	$0	In-house	$222,000
		$314,000	Contract	$92,000
Decontamination	CFY	$75,000		
	PY	$0	In-house	$25,000
		$75,000	Contract	$50,000
Supporting Technologies	CFY	$618,000		
	PY	$32,000	In-house	$565,000
		$650,000	Contract	$85,000
TOTAL - CE/D	CFY	$1,157,000		
	PY	$32,000	In-house	$962,000
		$1,189,000	Contract	$227,000

2. DEMONSTRATION/VALIDATION (DEM/VAL)

Collective Protection	CFY	$590,000		
	PY	$10,000	In-house	$590,000
		$600,000	Contract	$10,000
Individual Protection	CFY	$582,000		
	PY	$48,000	In-house	$620,000
		$630,000	Contract	$10,000
Warning and Detection	CFY	$636,000		
	PY	$10,000	In-house	$357,000
		$646,000	Contract	$289,000
TOTAL - DEM/VAL	CFY	$1,808,000		
	PY	$68,000	In-house	$1,567,000
		$1,876,000	Contract	$309,000

3. ENGINEERING AND MANUFACTURING DEVELOPMENT (EMD)

Collective Protection	CFY	$374,000		
	PY	$0	In-house	$361,000
		$374,000	Contract	$13,000
Warning and Detection	CFY	$2,858,898		
	PY	$0	In-house	$1,793,000
		$2,858,898	Contract	$1,065,898
Individual Protection	CFY	$3,146,000		
	PY	$158,000	In-house	$1,225,000
		$3,304,000	Contract	$2,079,000
TOTAL - EMD	CFY	$6,378,898		
	PY	$158,000	In-house	$3,379,000
		$6,536,898	Contract	$3,157,898

SECTION I:
EXPLANATION OF OBLIGATION

1.. CONCEPT EXPLORATION AND DEFINITION

(a) Warning and Detection Investigations:

(1) PE 0602233N (Readiness, Training and Environmental Quality Tech): Development of the Battle Area Dense Gas Effects (BADGE) airborne hazards prediction model.
(2) PE 0602233N (Readiness, Training and Environmental Quality Tech): Continued development, upgrade, verification, validation and documentation of the Chemical Agent Vapor, Liquid and Solid Tracking (VLSTRACK) computer model.
(3) PE 0602233N (Readiness, Training and Environmental Quality Tech): Development of Ventilation Model computer graphics capability to enhance existing Chemical Warfare Naval Simulation Model.
(4) PE 0602233N (Readiness, Training and Environmental Quality Tech): Identify Naval activities which would benefit from the incorporation of chemical/biological warfare aspects into battle analysis.

FY 1995 Accomplishments:
(1) PE 0602233N: Completed development of the BADGE model.
(2) PE 0602233N: Continued VLSTRACK release 1.5/2.0 verification, validation and documentation efforts.
(3) and (4) PE 0602233N: Began efforts to upgrade activity analysis capability in the chemical/ biological warfare modeling/wargaming arena.

(b) Physical Protection Investigations:

(1) PE 0602233N (Readiness, Training and Environmental Quality Tech): Development of a scientific methodology to determine impact and quantify effectiveness of post-attack shipboard chemical hazards.
(2) PE 0602233N (Readiness, Training and Environmental Quality Tech): Assess effectiveness of existing chemical/biological warfare mask in Naval Special Warfare applications.
(3) PE 0602233N (Readiness, Training and Environmental Quality Tech): Develop forced air breathing system (lightweight hood blower system) to eliminate physiological stress caused by existing gas mask canisters.
(4) PE 0602233N (Readiness, Training and Environmental Quality Tech): Investigate On-Board Oxygen Generating System (OBOGS) performance in Naval aircraft operating in a chemical/ biological environment.

FY 1995 Accomplishments:
(1) PE 0602233N: Investigated effect of a penetrating chemical/biological weapon on naval fire fighting protective ensemble.
(2) PE 0602233N: Conducted testing and evaluations on masks suitable for naval special warfare applications, and transitioned results to the special warfare community.

(3) and (4) PE 0602233N: Developed 'local equilibrium model' to determine OBOGS principal features.

(c) Decontamination:

PE 0602233N (Readiness, Training and Environmental Quality Tech): Develop a methodology for determining the effects of chemical agents and decontaminates on shipboard materials.

FY 1995 Accomplishments:

- Established methodology using Raman spectroscopy to evaluate effect of chemical agents and decontaminates on ship structure materials and equipment.
- Established initial results database.

(d) Supporting Technologies:

(1) PE 0603640M (Marine Corps Advanced Technology Demonstration): Supported background research and technical representation at joint forums in support of Commandant's initiative for Special Forces Response Teams and other Marine Corps interests.
(2) PE 0602233N (Readiness, Training and Environmental Quality Tech): Serves as threat and technology interface between the intelligence community and Navy end users. The task includes acquiring threat information; reviewing it for relevance; identifying potential beneficiaries; and identifying technology which may solve Navy problems in the area. The project also funds a biennial Threat and Technology Interface Symposium.

FY 1995 Accomplishments:

(1) PE 0603640M: Provided technical counsel resource research, letter reports, establishing Marine Crops technical needs, and concept evaluation.
(2) PE 0602233N:

- Conducted Fourth Threat and Technology Symposium.
- Reported on Tri-Service effort to measure transport and diffusion of aerosols and vapor over long distances over water.

3. DEMONSTRATION AND VALIDATION

(a) Collection Protection:

PE 0603514N, Project S2053 (Chemical/Biological/Radiological (CBR) Defense): Work under this sub-project involves advanced development of shipboard collective protection system designs and component improvements to provide CBR contamination-free zones such that mission essential operations and life sustaining functions can be performed during or after a NBC weapons attack.

FY 1995 Accomplishments:

- Conducted modified Cost and Operational Effectiveness Analysis for Advanced CBR Filtration Systems.

- Completed Improved Collective Protection System shipboard evaluations; provided feasibility report and recommended technical data package modifications.
- Completed Advanced Filter Technology options evaluation.

(b) Individual Protection:

PE 0603514N, Project S2053 (CBR Defense): Work under this sub-project involves advanced development of improved individual chemical protective clothing and accessories for naval applications, emphasizing technological advances to increase protection capability while minimizing associated operational performance degradation.

FY 1995 Accomplishments:

- Initiated fabrication of prototype garments and achieve Milestone (MS) I/II approval.
- Completed acquisition documentation preparation including Request for Proposal (RFP) for Advanced Chemical Protective Garment (ACPG).
- Awarded contract.
- Achieved Joint Services Lightweight Integrated Suit Technology (JSLIST) MS I/II.
- Evaluated Collective Protection Overgarment shelf life.

(d) Warning and Detection:

PE 0603514N, Project S2053 (CBR Defense): Work under this sub-project involves advanced development of automated shipboard chemical and biological sensors and warning devices. Classification of development programs include liquid/vapor, point/standoff, fixed/mobile detection systems.

FY 1995 Accomplishments:

- Initiated Advanced Development Model design specifications, component testing and preparation of acquisition document for Chemical Agent Remote Detection System (CARDS).
- Completed chemical agent standoff requirements analysis.
- Initiated process to integrate CARDS into joint service program.

4. ENGINEERING AND MANUFACTURING DEVELOPMENT

(a) Collective Protection:

PE 0604516N, Project S0410 (CBR Defense (EMD)): Work under this sub-project involves engineering development of shipboard collective protection systems designs and component improvements to provide CBR contamination-free zones such that mission essential operations and life sustaining functions can be performed during or after a NBC weapons attack.

FY 1995 Accomplishments:

- Continued support for fleet introduction of CPS and additional CPS Fleet Operational Test & Evaluation on other ship classes.
- Conducted final evaluations of CPS high pressure fan.
- Completed revision to CPS alarm system.
- Installed/tested on LSD-44.
- Completed High Efficiency Particulate Air Filter testing - Army to modify specification.
- Completed acoustic, shock and vibration testing on pre-production prototype fan design to verify performance.
- Completed flat ship tests with original flat pre-filter design.

(b) Warning and Detection:

(1) PE 0603635M, Project C1598 (Marine Corps Ground Combat Support System/NBC Survivability): Provides Marine units with the ability to detect the presence of biological agents in a combat environment.
(2) PE 0604516N, Project S0410 (CBR Defense (EMD)): Work under this sub-project involves engineering development of automated shipboard chemical sensors and warning devices. Classification of development programs include liquid/vapor, point/standoff, fixed/mobile detection systems.
(3) PE 0604215N, Project S1857 (Calibration Standards): This project provides for the development of 25 different calibration standards. One of these tasks is to provide support for a Fiber Optic Biosensor being developed by NRL.

FY 1995 Accomplishments:

(1) PE 0603635M/C1598:

- Developed preliminary documentation to support MS1 for Light Nuclear Biological Chemical Reconnaissance System (LNBCRS).
- Provided salaries for US Army NBC expertise.
- Provided funds for integration of Light Standoff Chemical Agent Detector into LNBCRS.

(2) PE 0604516N/S0410:

- Procured Shipboard Chemical Agent Monitor, Portable (SCAMP) Non-Developmental Items (NDIs) based on outcome of downselect process.
- Continued data development, support Operational Evaluation (OPEVAL) and MS III decision for Improved Chemical Agent Point Detectors (IPDS).
- Conducted Shipboard Automatic Liquid Agent Detector (SALAD) component/system testing, including shipboard technical evaluation (TECHEVAL).
- Successfully completed IPDS developmental/environmental testing, OPEVAL, and independent Logistic Assessment.
- Achieved MS-III approval for Full Rate Production.
- Conducted SALAD Critical Design Review.
- Completed Assessment of available NDI detector technologies for SCAMP development.

(3) PE 0604215N/S1857:

- Developed a viable calibration methodology.
- Developed a theoretical model of biosensor.
- Completed Biosensor variability design study.

(c) Individual Protection:

(1) PE 0603635M, Project C1598 (Marine Corps Ground Combat Support System/NBC Survivability): Individual Protection includes all items necessary to protect the individual Marine.
(2) PE 0604264N, Project W0606 (Aircrew Systems Development): This program provide engineering and manufacturing development of Aviation Life Support Systems to protect aircrews from current known and future threats including: directed energy weapons, chemical/biological/radiological agents/fallout, ballistic projectiles, temperature extremes, heat/fire, low concentration oxygen environments, high dynamic forces during emergency egress, and high "G" forces.
(3) PE 0604516N, Project S0410 (CBR Defense (EMD)): Work under this sub-project involves engineering development of improved individual chemical protective clothing and accessories for naval applications, emphasizing technological advances to increases protection capability while minimizing associated operational performance degradation.

FY 1995 Accomplishments:
(1) PE 0603635M/C1598:

- Conducted live agent testing of the JSLIST suits.
- Conducted first article testing of JSLIST suits.
- Awarded contract to provide test planning and managing for JSLIST testing.

(2) PE 0604264N/W0606:

- NAVAIR continued development of an off-the-shelf Chemical/Biological filtering system to be used with protective hood/mask gear. This system will be used by the Navy and Marine Corps TACAIR, rotary wing and land-based fixed wing aircrews.
- In FY 1994, the Navy completed the draft RFP but because of DOD specifications and standards policy change, the Navy had to rewrite the RFP in FY 1995 and released it to industry in August 1995.

(3) PE 0604516N/S0410:

- Awarded JSLIST Engineering Development Model contract.
- Initiated Phase II Development Test/Operational Test using downselect materials.
- Conducted first article testing and initiate ACPG TECHEVAL.
- Continued acquisition document development.

SECTION II:
OBLIGATION REPORT ON THE BIOLOGICAL DEFENSE RDTE PROGRAM

During the FY95, the Department of the Navy obligated $1,703,000 for development and testing of biological defensive equipment.

FUNDS OBLIGATED:			
Current Fiscal Year (CFY)	$1,703,000		
Prior Year (PY)	$0	In-house	$1,413,000
TOTAL	**$1,703,000**	Contract	$290,000

BREAKDOWN OF PROGRAM AREAS

1. CONCEPT EXPLORATION AND DEFINITION (CE/D)				
Non-medical Bio Defense	CFY	$1,273,000		
	PY	$0	In-house	$983,000
		$1,273,000	Contract	$290,000
TOTAL - CE/D	CFY	$1,273,000		
	PY	$0	In-house	$983,000
		$1,273,000	Contract	$290,000

2. ENGINEERING AND MANUFACTURING DEVELOPMENT (EMD)				
Non-medical Bio Defense	CFY	$430,000		
	PY	$0	In-house	$0
		$430,000	Contract	$430,000
TOTAL - EMD	CFY	$430,000		
	PY	$0	In-house	$0
		$430,000	Contract	$430,000

SECTION II:
EXPLANATION OF OBLIGATION

1. CONCEPT EXPLORATION AND DEFINITION

(a) Non-medical Bio Defense:

(1) PE 0602233N, Readiness, Training and Environmental Quality Tech: Analysis of background respirable aerosol: develop algorithms which will discriminate between biological agent clouds and other aerosol clouds.
(2) PE 0602233N, Readiness, Training and Environmental Quality Tech: Biological particle detector/sizer: Efforts will lead to modification of the existing APS-3300 aerodynamic particle sizer and field testing to determine whether the enhanced system can distinguish biological particles from background aerosols.
(3) PE 0602233N, Readiness, Training and Environmental Quality Tech: Development of biodetectors: Through the use of either antibody based essays or DNA matching, develop technologies for a biological detector that will support OPNAV/NAVSEA operational requirements.

FY 1995 Accomplishments:
(1) PE 0602233N: Conducted literature review to determine APS-3310 aerodynamic particle sizer capabilities.
(2) PE 0602233N:
- Designed, fabricated, modified, conducted bend top calibration, performance evaluations and field trial comparisons with other detection instruments and techniques.
- Prepare for FY 1996 field trials.

(3) PE 0602233N:
- Constructed and performed laboratory tests on a biosensor that uses cantilever deflection measured by force microscopy for biological detection.
- Constructed and field tested a biosensor that uses antibodies to capture molecules on an optical filter.
- Conducted comparative evaluations with other emerging technologies.

2. ENGINEERING AND MANUFACTURING DEVELOPMENT

(a) Non-medical Bio Defense:

PE 0603635M, Project C1598 (Marine Corps Ground Combat Support System/NBC Survivability): Provide Marine units with the ability to detect the presence of biological agents in a combat environment.

FY 1995 Accomplishments:
- Awarded development contract.
- Demonstrated subsystem technology concept.
- Participated in 1995 joint field trials in Dugway Proving Ground.

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APPENDIX D

JOINT BIOLOGICAL DEFENSE PROGRAM ANNUAL REPORT TO CONGRESS ON THE RESEARCH, DEVELOPMENT, TEST AND EVALUATION OF THE CHEMICAL/BIOLOGICAL DEFENSE PROGRAM 1 OCTOBER 1994 THROUGH 30 SEPTEMBER 1995 RCS:DD-USADRE(A) 1065

SECTION I: OBLIGATION REPORT ON THE JOINT CHEMICAL DEFENSE PROGRAM

During the fiscal year 1995, the Department of the Army obligated $38,262,000 for general research investigations, and the development and testing of chemical defensive equipment.

FUNDS OBLIGATED:			
Current Fiscal Year (CFY)	$37,998,000		
Prior Year (PY)	$264,000	In-house	$19,052,000
TOTAL	**$38,262,000**	Contract	$19,221,000

BREAKDOWN OF PROGRAM AREAS

1. MEDICAL CHEMICAL DEFENSE RESEARCH PROGRAM				
a. Science Base/Medical Chemical Defense-	CFY	$7,297,000		
PE 61102/BS11	PY	10,000	In House	$3,145,000
		$7,307,000	Contract	$4,162,000
b. Medical Chemical Defense-Exploratory	CFY	$14,584,000		
Development-PE 62787/A875	PY	248,000	In House	$11,381,000
		$14,832,000	Contract	$3,451,000
c. Medical Chemical Defense Life Support	CFY	$11,170,000		
Materiels-Non-Systems Advanced	PY	3,000	In House	$2,420,000
Development-PE 63002/D995		$11,173,000	Contract	$8,753,000
2. CHEMICAL DEFENSIVE EQUIPMENT PROGRAM				
a. DEMONSTRATION/VALIDATION (DEM/VAL)				
Medical Chemical Defense Life Support	CFY	$4,090,000		
Materiel-PE 63807/D993	PY	4,000	In House	$1,985,000
		$4,094,000	Contract	$2,109,000
b. ENGINEERING MANUFACTURING DEVELOPMENT (EMD)				
Medical Chemical Defense Life Support	CFY	$857,000		
Materiels-PE 64807/D848	PY	- 1,000	In House	$121,000
		$856,000	Contract	$735,000

SECTION I:
EXPLANATION OF OBLIGATION

1.a. Science Base-Medical Chemical Defense: PE61102, Project BS11 - Basic studies are performed to delineate mechanisms and site of action of identified and emerging chemical threats to generate required information for initial design and synthesis of medical countermeasures.

FY 1995 Accomplishments:

- Characterized cellular mechanisms and markers of injury; exploring possible role of heat shock proteins, for example, as biomarkers of skin injury.
- Developed instrumented animal models to validate diagnostic, prognostic, and treatment procedures directly applicable to chemical casualty management.
- Characterized role of gangliosides and other potential neuroprotectants in nerve agent-induced seizures and pathology.
- Explored potential biological scavengers for chemical agents; applied biotechnological approaches to the development of scavengers.
- Developed new models of sulfur mustard injury; developed improved animal models to follow course of sulfur mustard-induced pathology and evaluate reactive topical skin protectants.
- Generated hypothesis and models to define mechanisms of action of CW threat agents.

1.b. Medical Chemical Defense-Exploratory Development: PE62787, Project A875 - This project supports exploratory development of prophylaxes, pretreatment, antidotes, decontaminants, and therapeutic compounds that will counteract the lethal, physical, and behavioral toxicity of chemical agents. It also supports development of medical chemical defense material that insures adequate patient care, field resuscitation, and patient procedures.

FY 1995 Accomplishments:

- Characterized and screened candidate countermeasures against sulfur mustard.
- Investigated reactive components for topical skin protectant; demonstrated proof of concept for reactive topical skin protectant in animal model against mustard agent vapor.
- Characterized and validated countermeasures to nerve agent-induced seizures and pathology; refined methods to detect agents in biological fluids.
- Characterized and validated the catalytic approach to scavengers for nerve agents; demonstrated stoichiometric activity of mutated human cholinesterase (HuChE) that acts as a scavenger for nerve agent.

1.c. Medical Chemical Defense-Life Support Materiel-Non-Systems Specific Advanced Development: PE63002, Project D995 - Analytical stability studies, and safety and efficacy screening in addition to pre-clinical toxicology studies are performed prior to full scale development on promising pretreatment or treatment compounds. Capabilities are maintained for reformulation, formulation, and scale-up of candidate compounds using current good laboratory practices (CGLP).

FY 1995 Accomplishments:

- Evaluated candidate medical countermeasures to sulfur mustard.
- Validated tests for blister agents in biological fluids; produced technical bulletins on standardized assays for CW agents.
- Produced reactive components for topical skin protectant.
- Transitioned to advanced development a methemoglobin forming pharmaceutical for protection against cyanide.
- Developed pseudo-catalytic model of catalytic nerve agent scavengers; validated methods to detect agents in biological fluids.
- Demonstrated, using primary cell cultures and animal models, that antiparkinsonian drugs protect against nerve agent seizures.
- Investigated advanced biotechnological approaches to development of catalytic scavengers for nerve agents.

2.a. **Medical Chemical Defense-Life Support Materiel : PE63807, Project D993 -** This project funds advanced development of countermeasures for chemical agents including life support equipment, pretreatment and therapeutic drugs, and individual/casualty decontamination compounds.

FY 1995 Accomplishments:

- Completed studies of the nerve agent antidote system, HI-6.
- Conducted technical testing of the multi-chambered autoinjector.
- Demonstrated efficacy of the topical skin protectant against CW agent.
- Initiated development program for cyanide pretreatment.
- Evaluated commercial products for use with the chemical protective patient wrap to improve air circulation.

2.b. **Medical Chemical Defense-Life Support Materiel: PE 64807, Project D848 -** This project funds advanced engineering development of medical materiel necessary to field an effective capability for medical defense against chemical agent threats facing U.S. forces in the field.

FY 1995 Accomplishments:

- Completed extended stability testing of the medical aerosolized nerve agent antidote.
- Determined comparative safety and pharmacokinetics of pyridostigmine in males and females.

SECTION II:
OBLIGATION REPORT ON THE JOINT BIOLOGICAL DEFENSE RDT&E PROGRAM

During the fiscal year 1995, the Department of the Army obligated $42,214,000 for biological research investigations, and the development and testing of physical and medical defense systems.

FUNDS OBLIGATED:

Current Fiscal Year (CFY)	$42,265,000		
Prior Year (PY)	- $51,000	In-house	$28,483,000
TOTAL	**$42,214,000**	Contract	$13,731,000

BREAKDOWN OF PROGRAM AREAS

1. MEDICAL BIOLOGICAL DEFENSE RESEARCH PROGRAM				
a. Science Base/Medical Biological Defense-PE 61102/BS12	CFY	$14,233,000		
	PY	-57,000		
		$14,176,000	In House	$9,065,000
			Contract	$5,111,000
b. Medical Biological Defense-Exploratory Development-PE 62787/A871	CFY	$13,792,000		
	PY	23,000		
		$13,815,000	In House	$11,902,000
			Contract	$1,913,000
c. Industrial Base/Medical Biological Defense Vaccines and Drugs-PE 63002/D807	CFY	$14,240,000		
	PY	-17,000		
		$14,223,000	In House	$7,516,000
			Contract	$6,707,000
2. DEFENSIVE SYSTEMS				
a. DEMONSTRATION/VALIDATION (DEM/VAL)				
Medical Biological Defense Drug and Vaccine-Advanced Development-PE 64807/D809*	CFY	$0		
	PY	0		
		$0	In House	$0
			Contract	$0
b. ENGINEERING MANUFACTURING DEVELOPMENT (EMD)				
Medical Biological Defense-Engineering Development-PE 64807/D847*	CFY	$0		
	PY	0		
		$0	In House	$0
			Contract	$0
Non Medical Biological Defense				

*DEMVAL and EMD are now managed by the Joint Program Office-Biological Defense.

SECTION II:
EXPLANATION OF OBLIGATION

1.a. Science Base-Medical Biological Defense: PE61102, Project BS12 - Basic research is conducted to develop medical countermeasures to provide an effective medical defense against validated biological threat agents including bacteria, toxins, viruses and other agents of biological origin.

FY 1995 Accomplishments:

- Investigated the genetics and physiology of designated bacterial threat agents to understand how they cause disease.
- Developed expression vector for recombinant plague vaccine.
- Conducted basic research on the genetic composition of designated viral threat agents.
- Sequenced and expressed filovirus proteins and developed an infectious clone of the Western equine encephalitis virus for vaccine preparation.
- Conducted basic research on the physiological sites of action for biological toxins.
- Formulated intervention strategies for identified biological threat agents.

1.b. Medical Biological Defense-Exploratory Development: PE62787, Project A871 - Exploratory research on the development of vaccines and drugs to provide an effective medical defense against validated biological threat agents including bacteria, toxins, viruses and other agents of biological origin.

FY 1995 Accomplishments:

- Characterized the role of specific genes that code for virulence in bacterial threat agents: identified those for anthrax bacillus.
- Evaluated pharmacologic agents for prophylaxis and therapy of biological toxin intoxication; screened numerous drugs and compounds for inhibition of toxicity of threat toxins such as ricin using an in vitro system.
- Evaluated sensitive, specific biosensors for confirmatory diagnosis based on the presence of BW agents present in clinical specimens.
- Formulated specific intervention strategies for biological threat agents based on acquired paradigms; tested two promising peptides as second generation vaccine candidates for Staphylococcus Enterotoxin B.
- Prepared viral bio-engineered candidate vaccines to Venezuelan equine encephalitis, and formulated strategies for bio-engineering vaccines to other viral threat agents.

1.c. Industrial Base-Medical Biological Defense Vaccines and Drugs: PE63002, Project D807 - This project funds research on pre-clinical development of safe and effective prophylaxis and therapy (vaccines and drugs) for exposure to biological threat agents. This project also supports the advanced technology development of kits to rapidly diagnose exposure to biological agents in clinical samples.

FY 1995 Accomplishments:

- Screened candidate vaccines for preliminary safety and efficacy; successfully transitioned a ricin toxoid to advanced development.
- Completed advanced screening for safety, efficacy, and toxicity of candidate Venezuelan equine encephalitis vaccines.
- Produced chromatographic hand-held assay providing simple, rapid and specific capability to diagnose base on the presence of selected BW agents in clinical samples.
- Demonstrated that two immunizations with anthrax vaccine were protective in aerosol challenge in an advanced animal model.
- Conducted advanced pre-clinical prophylaxis studies on medical countermeasures to biological threat agents; demonstrated protective efficacy of Botulinum A heavy chain recombinant vaccine in rodent model.

2.a. Medical Biological Defense-Drug and Vaccine-Advanced Development: PE63807, Project D809 - This project funds advanced development of vaccines and drugs to provide an effective medical defense against validated threat agents including bacteria, viruses and other agents of biological origin.

FY 1995 Accomplishments:

- Completed Phase II safety and immunogenicity trials of cell culture derived smallpox vaccine.
- Initiated Phase II trials of Type F Botulinum toxoid.
- Completed a Milestone I In-Process Review of Ricin Toxoid Vaccine.

2.b. Medical Biological Defense-Engineering Development: PE64807, Project D847
This project funds advanced engineering development of vaccines and drugs to provide an effective medical defense against validated biological threat agents including bacteria, toxins, viruses and other agents of biological origin.

FY 1995 Accomplishments:

- Completed consistency lot testing of tularemia vaccine in support of Product License Application.
- Completed a Milestone II In-Process Review for the Q Fever vaccine.

3. Non-Medical Biological Defense: PE605384D, Project DBD3 - Project will provide detection, identification, warning, and sample collection for verification that large area biological agent (BW) attack has occurred. BIDS consists of a shelter-configured detection suite mounted on a dedicated vehicle. The BIDS program includes a concurrent development effort to provide better, technology driven, sensitivity and timeliness for warning and identification. BW detection architecture also the Long-Range Biological Detection System (LRBSDS), Project DBD5. These early warning systems will enable commanders to gain early knowledge of possible BW attack so they may take action early to avoid exposing the force. The LRBSDS provides non-specific indication of newly deposited BW particulate clouds in the atmosphere. The U.S. Army did not conduct any studies involving human subjects for testing biological agents with these detectors.

FY 1995 Accomplishments:

- Conducted operational testing to type classify (limited procurement) the NDI BIDS.
- Conducted NDI LRBSDS Limited User Test.
- Initiated DEM/VAL for P3I BIDS components.
- Demonstrated fully automated Bio Detector technology being developed for P3I BIDS.
- Awarded P3I BIDS contracts to develop high performance detector antibodies.
- Awarded P3I BIDS operator automation software contract.
- Awarded P3I LRBSDS DEM/VAL development contract.

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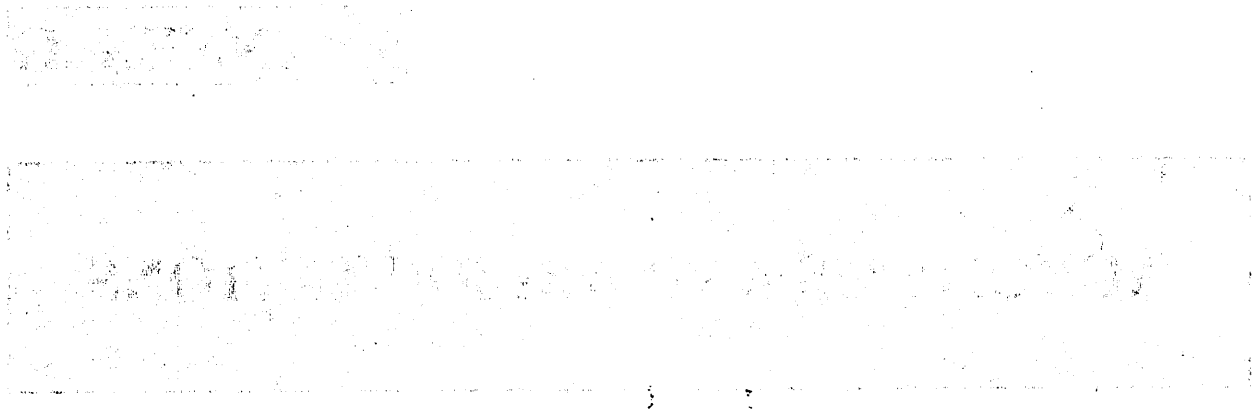
ANNEX G

ACRONYMS AND ABBREVIATIONS



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21CLW - Twenty-First Century Land Warrior

AARS - Advanced Airborne Radiac System
ACADA - Automatic Chemical Agent Detector
ACPG - Advanced Chemical Protective Garment
ACPLA - agent containing particle per liter of air
ACPM - Aircrew Protective Mask
ACTD - Advanced Concept Technology Demonstration
ADBO - Advanced Battle Dress Overgarment
ADCPE - Advance Deployable Collective Protective Equipment
ADS - Area Detection System
AERP - Aircrew Eye/Respiratory Protection
AFFRI - Armed Forces Radiobiology Research Institute
AICPS - Advanced Integrated Collective Protective System
AIDECONS - Aircraft Interior Decontamination System
AIDET - Aircraft Interior Detector
AMAD - Automatic Mustard Agent Detector
AMC - U.S. Army Materiel Command
AN/VDR-13 - Compact, digital whole body radiation meter
AN/VDR-2 - Portable dose-rate gamma/beta radiation meter
ANBACIS - Automatic Nuclear, Biological, and Chemical Information System
ASBREM - Armed Services Biomedical Research Evaluation and Management
ASD(HA) - Assistant Secretary of Defense for Health Affairs
ATD - Advanced Technology Demonstration
ATSD(AE) - Assistant to the Secretary of Defense (Atomic Energy), renamed ATSD(NCB)
ATSD(NCB) - Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, formerly ATSD(AE)
AUIB - Aircrew Uniformed Integrated Battlefield protective garment
AVAD - Automatic Vapor Agent Detector

BADS - Biological Agent Detection System
BD - biological detector
BDA - Bilateral Destruction Agreement
BDWS - Biological Detector and Warning System
BES - Budget Estimate Submission
BIDS - Biological Integrated Detection System
BMDO - Ballistic Missile Defense Organization
BRAC - Base Realignment and Closure

CAM - Chemical Agent Monitor
CANA - Convulsant Antidote, Nerve Agent autoinjector
CANE - Combined Arms in a Nuclear/Chemical Environment
CARDS- Chemical Agent Remote Detection System
CAWM - Chemical Agent Water Monitor
CB - chemical and biological (also C/B)
CBASK - Chemical Biological Agent Sample Kit
CBAWM - CB Agent Water Monitor
CBD - chemical and biological defense
CBDCOM - Chemical Biological Defense Command (U.S. Army)
CBMS - CB mass spectrometer
CBPS- CB Protective Shelter
CBR - chemical, biological, and radiological
CBR - chemical, biological, radiological
CBSD - CB Stand-off Detector
CBSD - Chemical Biological Stand-off Detector
CBW - chemical and biological warfare
CDE - Chemical Defense Equipment
CDEPAT - Chemical Defense Equipment Process Action Team
CDTF - Chemical Defense Training Facility (at the U.S. Army Chemical School)
CFY - Current fiscal year
CHATH - Chemically/Biologically Hardened Air Transportable Hospital
CIP - CANE Implementation Plan
CMAD - Chemical Miniature Agent Detector
CP - chemical protective (also, counterproliferation) (also, collective protection)
CPE - Collective Protection Equipment
CPS - Collective Protection System
CPU - Chemical Protective Undergarment
CTR - Cooperative Threat Reduction
CWC - Chemical Weapons Convention
CWCIWG - Chemical Weapons Convention Implementation Working Group
CWDD - Chemical Warfare Directional Detector (AN/KAS-1A)
CWDSO - Chemical Weapons Destruction Support Office
CWICS - Chemical Weapons Interior Compartment System

DAB - Defense Acquisition Board
DAP - Decontaminating Apparatus Portable
DATSD (CBM) - Deputy Assistant to the Secretary of Defense for Chemical and Biological Matters
DBOF - Defense Business Operations Fund

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