

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



**ANNUAL REPORT TO CONGRESS  
JUNE 1994**

*“Whether or not gas will be employed in future wars is a matter of conjecture, but the effect is so deadly to the unprotected that we can never afford to neglect the question.”*

*General of the Armies John J. Pershing, 1919*

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# INDEX

PAGE

## **PART I:**

EXECUTIVE SUMMARY

## **PART II:**

NUCLEAR, BIOLOGICAL, AND CHEMICAL DEFENSE REPORT TO CONGRESS

INTRODUCTION.....	i
I. PURPOSE.....	iii
II. THREAT ASSESSMENT.....	iii
<i>NBC WARFARE INTELLIGENCE REQUIREMENTS ASSESSMENT</i> .....	vi
III. OVERVIEW OF CONTENTS .....	vii
CHAPTER 1    NBC DEFENSE MANAGEMENT.....	1-1
1.1 CURRENT NON MEDICAL MANAGEMENT STRUCTURE.....	1-2
1.2 CURRENT MEDICAL MANAGEMENT STRUCTURE.....	1-4
1.3 NEW MANAGEMENT DIRECTION .....	1-6
1.4 EMERGING NBC DEFENSE MANAGEMENT STRATEGY .....	1-6
<i>NBC DEFENSE PROGRAM MANAGEMENT ASSESSMENT</i> .....	1-9
CHAPTER 2    NON MEDICAL NBC WARFARE DEFENSE REQUIREMENTS AND RESEARCH AND DEVELOPMENT PROGRAM STATUS.....	2-1
2.1 REQUIREMENTS.....	2-2
2.2 NBC DEFENSE MISSION AREA.....	2-3
2.3 CONTAMINATION AVOIDANCE.....	2-9
2.4 PROTECTION.....	2-17
2.5 DECONTAMINATION.....	2-29
<i>NON-MEDICAL R&amp;D REQUIREMENTS ASSESSMENT</i> .....	2-34
CHAPTER 3    MEDICAL NBC WARFARE DEFENSE REQUIREMENTS AND RESEARCH AND DEVELOPMENT PROGRAM STATUS .....	3-1
3.1 REQUIREMENTS.....	3-2
3.2 MEDICAL CHEMICAL DEFENSE RESEARCH PROGRAM .....	3-3
3.3 MEDICAL BIOLOGICAL DEFENSE RESEARCH PROGRAM.....	3-5
3.4 MEDICAL NUCLEAR DEFENSE RESEARCH PROGRAM .....	3-7
<i>MEDICAL R&amp;D REQUIREMENTS ASSESSMENT</i> .....	3-10
CHAPTER 4    NBC WARFARE DEFENSE EQUIPMENT STATUS.....	4-1
4.1 INTRODUCTION.....	4-2
4.2 NBC DEFENSE LOGISTICS MANAGEMENT.....	4-2
4.3 QUANTITIES, CHARACTERISTICS, AND CAPABILITIES .....	4-3

4.4 LOGISTICS STATUS .....	4-4
4.5 PEACETIME REQUIREMENT.....	4-7
4.6 FUNDING.....	4-8
4.7 INDUSTRIAL BASE.....	4-8
<i>LOGISTICS SUPPORT ASSESSMENT</i> .....	4-10
CHAPTER 5    NUCLEAR, BIOLOGICAL AND CHEMICAL DEFENSE READINESS AND TRAINING.....	5-1
5.1 INTRODUCTION.....	5-2
5.2 JOINT DOCTRINE.....	5-2
5.3 STANDARDS, PROFICIENCY AND CURRENCY .....	5-2
5.4 INTEGRATION OF REALISM/WARGAMES/EXERCISES .....	5-5
5.5 TRAINING IN A TOXIC CHEMICAL ENVIRONMENT .....	5-7
5.6 INITIATIVES .....	5-8
5.7 REPORTING SYSTEM.....	5-10
<i>NBC DEFENSE TRAINING AND READINESS ASSESSMENT</i> .....	5-10
CHAPTER 6    PREPARATIONS FOR THE CHEMICAL WEAPONS CONVENTION.....	6-1
6.1 TRAINING FOR INSPECTORS.....	6-2
6.2 PREPARATION OF DEFENSE INSTALLATIONS .....	6-2
6.3 PROVISION OF TECHNICAL EXPERTISE.....	6-3
6.4 COOPERATIVE THREAT REDUCTION .....	6-3
6.5 CHEMICAL TREATY COMPLIANCE (ARMY).....	6-4
6.6 CWC NEGOTIATIONS AND PRPARATORY COMMISION SUPPORT (ARMY) .	6-4
6.7 DESTRUCTION TECHNOLOGY ASSISTANCE (ARMY).....	6-5
TABLES:	
TABLE 1 - CONTAMINATION AVOIDANCE.....	2-4
TABLE 2 - PROTECTION.....	2-6
TABLE 3 - DECONTAMINATION.....	2-8
TABLE 4 - JOINT REQUIREMENTS - CONTAMINATION AVOIDANCE.....	2-9
TABLE 5 - ARMY CONTAMINATION AVOIDANCE .....	2-12
TABLE 6 - AIR FORCE CONTAMINATION AVOIDANCE .....	2-14
TABLE 7 - NAVY CONTAMINATION AVOIDANCE.....	2-16
TABLE 8 - MARINE CORPS CONTAMINATION AVOIDANCE .....	2-17
TABLE 9 - JOINT REQUIREMENTS - PROTECTION.....	2-20
TABLE 10 - ARMY PROTECTION - INDIVIDUAL.....	2-23
TABLE 11 - ARMY PROTECTION - COLLECTIVE.....	2-24
TABLE 12- AIR FORCE PROTECTION .....	2-26
TABLE 13 - NAVY PROTECTION .....	2-28
TABLE 14 - MARINE CORPS PROTECTION .....	2-29
TABLE 15 - JOINT REQUIREMENTS - DECONTAMINATION.....	2-30
TABLE 16 - ARMY DECONTAMINATION .....	2-31
TABLE 17 - AIR FORCE DECONTAMINATION.....	2-32

TABLE 18 - NAVY DECONTAMINATION.....	2-33
TABLE 19 - MARINE CORPS DECONTAMINATION.....	2-34
TABLE 20 - MEDICAL NBC DEFENSE.....	3-9
TABLE 21 - LOGISTICS READINESS NBC REPORT DATA.....	4-11
TABLE 22 - LOGISTIC ASSESSMENT - MAJOR NBC DEFENSE ITEMS .....	4-17

ANNEXES:

ANNEX A - SPECIFICS OF ARMY AVOIDANCE PROGRAM.....	A-1
ANNEX B - SPECIFICS OF AIR FORCE AVOIDANCE PROGRAMS.....	B-1
ANNEX C - SPECIFICS OF NAVY AVOIDANCE PROGRAMS .....	C-1
ANNEX D - SPECIFICS OF MARINE CORPS AVOIDANCE PROGRAMS .....	D-1
ANNEX E - SPECIFICS OF ARMY PROTECTION (PROTECTIVE MASKS).....	E-1
ANNEX F - SPECIFICS OF ARMY PROTECTION (CLOTHING AND EQUIPMENT) .....	F-1
ANNEX G - SPECIFICS OF ARMY COLLECTIVE PROTECTION PROGRAMS.....	G-1
ANNEX H - SPECIFICS OF AIR FORCE PROTECTION PROGRAMS .....	H-1
ANNEX I - SPECIFICS OF NAVY PROTECTION PROGRAMS .....	I-1
ANNEX J - SPECIFICS OF MARINE CORPS PROTECTION PROGRAMS .....	J-1
ANNEX K - SPECIFICS OF ARMY DECONTAMINATION PROGRAMS.....	K-1
ANNEX L - SPECIFICS OF AIR FORCE DECONTAMINATION PROGRAM.....	L-1
ANNEX M - SPECIFICS OF NAVY DECONTAMINATION PROGRAM.....	M-1
ANNEX N - SPECIFICS OF MARINE CORPS DECONTAMINATION PROGRAMS.....	N-1
ANNEX O - MEDICAL CHEMICAL DEFENSE RESEARCH PROGRAM .....	O-1
ANNEX P - MEDICAL BIOLOGICAL DEFENSE RESEARCH PROGRAM .....	P-1
ANNEX Q - MEDICAL NUCLEAR DEFENSE RESEARCH PROGRAM .....	Q-1

FIGURES:

FIGURE 1.1 - CHEM/BIO DEFENSE MANAGEMENT STRUCTURE.....	1-8
FIGURE 3.1 - MEDICAL BIOLOGICAL DEFENSE COUNTERMEASURES.....	3-6
FIGURE 4.1 - FIELDDED CHEMICAL AND BIOLOGICAL DEFENSE ITEMS DATA ASSESSMENT .....	4-4

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# NUCLEAR, BIOLOGICAL, AND CHEMICAL DEFENSE

## FY 94 ANNUAL REPORT TO CONGRESS

### PART I

### EXECUTIVE SUMMARY



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The National Defense Authorization Act for Fiscal Year 1994, Public Law No. 103-160, Title XVII, Chemical and Biological Weapons Defense, section 1703, directs the Secretary of Defense to submit this assessment and a description of plans to improve readiness. 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).

For our forces to survive and fight under contaminated battlefield conditions, an integrated, balanced program is essential. Our forces must have aggressive, realistic training resources and defensive equipment that allows them to avoid contamination, if possible, and to protect, decontaminate, and sustain operations on the non-linear battlefield and provide medical casualty management.

Programs are in place to adequately equip our forces to accomplish their missions in an NBC environment. US equipment compares favorably to anything fielded by our allies and adversaries.

### **NBC Threat**

Several Third World nations now possess the technologies and capabilities to produce and deliver a wide range of chemical and biological (CB) agents. The potential for facing NBC conditions in all regions, including those with temperature extremes, has dramatically increased. 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 recent changes within Eastern Europe, the Middle East and Southwest Asia, the number of countries that have a CB weapons capability has increased significantly and may continue to increase.

The WMD threat has increased in potential diversity and frequency with which such weapons might be encountered. In meeting this changing and evolving threat, a strong NBC defense program is an essential part of DoD strategy for counterproliferation of weapons of mass destruction.

### ***NBC WARFARE INTELLIGENCE REQUIREMENTS ASSESSMENT***

\* Nations with CB warfare capabilities are increasing. Proliferation of weapons technology and precision navigation technology, and the development of chemical and biotechnology in developing nations is presenting the US with a complicated national security matter. Inadequate assets are devoted to collection, analysis, and production of responsive, useful intelligence documents. Intelligence assets are needed to assist in collecting and analyzing nation's "dual-use" chemical and biological industrial capability, and

developing the indications and warning of how nations are using their dual-use capabilities.

*SOLUTION:* The Intelligence Community should conduct a national review of CB warfare intelligence requirements and assess the adequacy of current assets to execute the required intelligence program.

## **NBC Defense Program Management**

### Current Management Structure

An improved management structure for the NBC defense program which responds to Congressional direction is currently being developed and will be reported in detail in a separate report to Congress.

To leverage resources and ensure compatibility, the Services jointly plan and develop new and improved NBC defensive gear. The DoD has designated the US Army as the Executive Agent for the Chemical and Biological Defense RDA Program. Through the current Joint Service Agreement, the Army exercises its responsibilities for RDA planning and oversight, and chairs the Joint Service Review Group (JSRG), the Joint Panel on Chemical and Biological Defense (JP-CBD), and the Joint Directors Technology Panel on Chemical and Biological Defense to ensure that appropriate coordination and priorities are effected across the multi-Service program. Additionally, the Army chairs the Joint Service Coordination Committee (JSCC) to assist in logistics prioritization and allocation of resources worldwide.

On 28 June 1993, the Under Secretary of Defense for Acquisition and Technology approved the formation of a Joint Program Office for Biological Defense (JPO-BD). The JPO-BD provides intense, centralized management of all assigned DoD Biological Defense initiatives, including vaccine production and biological detection equipment. The Under Secretary of Defense for Acquisition and Technology and the Defense Acquisition Board will review the JPO's progress at six month intervals. The Deputy Assistant to the Secretary of Defense for Atomic Energy (Chemical and Biological Matters) and a Joint General Officer Steering Group will provide additional oversight. This restructuring captures the Services' Biological Defense development and procurement funding resources and assigns them to the JPO-BD. Two distinct projects now represent medical and non-medical tasks which are the Services' on-going programs associated with funding in FY 95. The Army's on-going programs will provide a core non-developmental (NDI), fixed/mobile platform based, point Biological Integrated Detection System (BIDS), and a Long Range Biological Stand-off Detection System (LR-BSDS) fielding capability for an air platform in FY96. The Navy's on-going effort will provide a rapid prototype point detection system fielding capability for ship platforms in FY95.

For medical NBC defense programs the Army is the executive agent, to include the DoD Biological Defense Immunization Policy. The US Army Medical Research Development, Acquisition and Logistics Command (USAMRDAL) is responsible for

planning, programming, and budgeting for medical research requirements for all the military departments. The Congressionally mandated Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee was chartered in 1981. This committee is co-chaired by the Director, Defense Research and Engineering (DDRE) and the Assistant Secretary of Defense (Health Affairs) (ASD(HA)). 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.

### Proposed Management Structure

On 25 February in response to Public Law 103-160, the Secretary of Defense (SECDEF) designated the Office of the Assistant Secretary of Defense for Atomic Energy (Chemical and Biological Matters) (OATSD(AE)(CM)) the single office within OSD responsible for the management and oversight of the DoD chemical and biological defense (CBD) program and coordination of policy issues with the Assistant Secretary of Defense for Nuclear Security and Counterproliferation (ASD(NS&CP)). Additionally, ATSD(AE) is responsible to ensure close and continuous coordination between the medical and non medical CBD programs.

The SECDEF also designated the Army as the Executive Agent (EA) for the DoD to coordinate and integrate RDT&E and acquisition; and military construction requirements for the military departments for the DoD CBD program to include chemical demilitarization and chemical and biological weapons treaty compliance and verification.

On 13 April 1994, the CBD Management General/Flag Officer Steering Committee (SC) selected a new management structure. This structure establishes a Joint NBC Defense Board with a process to interact with two groups, a Joint Service Integration Group (JSIG) representing the combat developers who coordinate and integrate Joint requirements, doctrine, and professional training; and a Joint Service Materiel Review Group (JSMG) representing materiel developers who coordinate and integrate RDT&E. All board/group members would be ad hoc, with few, if any, full time staff. The management structure would provide each Service with one vote. The process will allow issues to be resolved at the lowest level while providing a mechanism for appeal, if necessary. A new JSA was also recommended which also provides guidance for the implementation of the management strategy. These documents are being forwarded to OSD for approval.

OSD will retain control of overall NBC defense funds and will pass funds directly to executing agencies and in compliance with Public Law 103-160, it is envisioned that oversight of the departments' NBCD programs be elevated to a Defense Acquisition Board (DAB) Executive Level review forum chaired by the Defense Acquisition Executive (DAE). The purpose of the DAB review will be to ensure all Services' NBCD programs are reviewed at the highest level to ensure integration and coordination.

## ***NBC DEFENSE PROGRAM MANAGEMENT ASSESSMENT***

\* The overall DoD NBC defense program is not integrated and lacks joint emphasis. With diminishing research, development and acquisition funds, requirements must be carefully reviewed to prevent duplication and to ensure that valid requirements are addressed.

*SOLUTION:* DoD is developing and will implement management improvement direction outlined in Section 1702, Public Law 103-160. The provisions of the law should provide the basis for the following management and decision-making improvements.:

- Single office at OSD level, OATSD(AE), responsible for the overall coordination and integration of the NBC defense program. This includes the medical and non-medical aspects of the program.
- Establish an Executive Steering Committee to oversee and review Service NBC defense programs and to establish policy and prioritization to research, development, and acquisition.
- OSD oversight of research, development and acquisition of NBC defense equipment utilizing the Defense Acquisition Board (DAB) process.
- Coordination and integration of an integrated, consolidated NBC defense budget with overall funding consolidated as a Defense program at the OSD-level.
- Development of a management approach with improved joint emphasis on research, development and acquisition; training; doctrine; and logistics requirements. The management approach will include an enhanced, workable method to ensure that the Army, as DoD's Executive Agent for NBC defense, coordinates, reviews and integrates the individual Service NBC defense programs into a consolidated DoD program.
- Explore ways to resource a small core of full time Joint NBC defense requirements experts charged with the responsibility of developing and integrating NBC defense requirements among the Services.

### **NBC Defense Requirements**

The NBC modernization strategy reinforces a modernization vision. The most promising technology insertions and leap-ahead technologies focus on scarce resources to provide horizontal integration of NBC capabilities across all mission areas to protect the force. Specifically, this strategy is designed to achieve technological solutions in the following areas:

- *Ensure successful battlefield operations in an NBC environment;*
- *Maximize combat power and survivability of the forces.*

In the past, each Service identified its NBC defense requirements independently. These Service unique requirements led to Service-specific procurement and duplication in capabilities. The Services are aware of this problem and are working jointly to resolve it.

### **Non Medical NBC Defense Requirements**

Non medical and medical requirements and research, development and acquisition (RDA) programs have been jointly developed and funded to improve existing equipment and fill current gaps in defensive capabilities. Joint Service RDA is actively pursuing state of the art solutions to NBC defense equipment shortcomings.

The four Services are working together on a Joint Service Lightweight Integrated Suit Technology (JSLIST) program which is evaluating advanced technologies, both domestic and foreign, for the next generation chemical protective suits for all Services. It takes advantage of resource and standardization economies of scale to achieve a reduction in individual services' development, acquisition and logistics costs. These new suits are expected to be fielded in FY97.

The Army, Navy, Air Force, and Marine Corps have both Joint and Service unique programs in place to adequately equip servicemen and women to accomplish their missions in an NBC environment. US chemical defense equipment (CDE) compares favorably to anything fielded by our allies and adversaries.

Current CDE will allow soldiers to survive and continue their mission on the contaminated battlefield. The United States can fight and win in a chemically contaminated environment. Our CDE is the best available to address a global mission. Opportunities for improvement and corrections of shortcomings exist and must be fully resourced to maintain an NBC ready force.

### ***NON MEDICAL R&D REQUIREMENTS ASSESSMENT***

\* DoD perspective is that CB detection programs require focusing and prioritization. Priority must be given to those shortcomings identified in the Title V Report to Congress. DoD must field expeditiously a biological detection and identification capability and to expedite the fielding of stand-off technology for both chemical and biological detectors.

*SOLUTION:* Conduct a Joint Service program review and Joint Mission Area Analysis to baseline the requirement for detection.

\* OSD view is that collective protection was identified by the Services

as a significant shortcoming in Title V, Persian Gulf Report. The Services are not adequately pursuing the necessary programs to correct the identified deficiencies particularly mobile, tactical shelters to support tactical forces. Medical collective protection is programmed to provide for force package one FY95/96. It is critical this be accomplished.

*SOLUTION:* Conduct a Joint Service program review and Joint Mission Area Analysis to baseline the requirement for collective protection.

\* Decontamination continues to be a labor-resource intensive process and relies on a water-based system. More resources are needed to develop and field improved systems based on non-water approaches and systems. Ecologically sound decontaminants must also be developed and fielded.

*SOLUTION:* Conduct a Joint Service program review and Joint Mission Area Analysis to baseline the requirement for decontamination.

\* Requirements process lacks joint focus and senior leadership review. commander in chief (CINC) involvement in the process is lacking. Army, as Executive Agent, lacks sufficient authority to make programmatic decisions and cannot adequately integrate the NBC defense program.

*SOLUTION:* Develop and implement an improved management concept to review, coordinate, and integrate Service NBC defense programs. Ensure that the Joint Staff and joint approval process includes feedback and input from each CINC. Form a small requirements team to review, coordinate, and integrate NBC defense requirements.

### **Medical NBC Defense Requirements**

The medical NBC defense research programs have 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 following programs are being executed. The Medical Chemical Defense Research Program (MCRDP) will provide new pretreatments, antidotes, and topical skin protectants for chemical warfare agents, and will develop novel therapies for chemical agent casualties. The Medical Biological Defense Research Program (MBDRP) will provide medical countermeasures to deter, constrain, and defeat the use of biological threat agents, as well as advanced diagnostic defenses. 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.

Immunization is required to provide effective individual protection against biological

warfare (BW) agents. Our priorities are to develop new or improved vaccines against known BW 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 stocks to inoculate US forces in accordance with recently issued DoD Directive. Complete the review on the best procurement option, e.g., government-owned and government-operated facility (GOGO), government-owned and contractor-operated facility (GOCO); contractor-owned and contractor-operated facility (COCO). DoD will need congressional support and additional funding to procure required vaccines.

## **NBC Logistical Readiness**

Logistical readiness of NBC defense equipment is improving. Services have made significant improvements in the stockage of most NBC defense equipment items since Operations Desert Shield/Storm. Significant progress has been made in the area of individual protection items. Industrial base strategy for CB defense items remains a concern and is being actively worked by all Services. A number of problems regarding accountability and management of chemical and biological defense items continues to exist, in particular limited asset visibility of most items below the wholesale level. The Services are aware of these problems and are actively working through joint committees to resolve them.

### **NBC Defense Equipment Availability**

During the collection of data, several problems were highlighted regarding the accountability and management of NBC defense item inventories. First, the Services have very limited asset visibility of most chemical and biological items below the wholesale level. Second, Services procure NBC items through multiple separate and distinct funding authorizations. For example, most individual protection items are procured using Operations and Maintenance (O&M) account moneys 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 are aware of these problems and are working jointly to resolve them.

### **Industrial Base**

The equipment assessments for this report were made from a review of three DoD studies conducted during the last three years. The studies all confirm that the NBC industrial base sector is primarily composed of small to medium size companies. These companies are heavily dependent 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. Hence, this sector is extremely fragile. One measure the DoD is using to sustain this base is the “War Stopper” program. Selected items (battledress overgarment, chemical gloves, and nerve agent autoinjectors) have been included in the “War Stopper” program for which Congress provides specialized funding to sustain designated industrial base capabilities. DoD is reviewing its industrial base strategy for all items in this sector.

### ***LOGISTICS SUPPORT ASSESSMENT***

\* DoD lacks a Joint, integrated system to maintain asset visibility of CDE below wholesale level and also lacks a standardized war reserve program for CDE.

*SOLUTION:* DoD determine the requirement for asset visibility; review existing systems and procedures, both for peacetime and war time reporting. Services need to address NBC defense asset visibility deficiency under the auspices of the Total Asset Visibility initiative. Review war reserve process. Congressional support may be required if a major automated system is determined as needed.

### **NBC Defense Training and Readiness**

Each of the Services has established adequate training standards and programs to sustain unit NBC training and readiness, however, it is not certain if allocated resources will provide adequate sustainment during DoD funding reductions. Integration of realistic NBC situations into joint and multi-national exercises as well as Service specific exercises and evaluations has been accomplished. Realism has also been incorporated into wargames and battlefield simulations.

The Services have embarked on a course that will highlight their capability to conduct warfare in an NBC environment. Beginning in FY 94 the measured units will begin reporting status of training and equipment for operations in an NBC environment. This reporting will be accomplished through the Status of Resources and Training System (SORTS).

Additionally, to add emphasis and provide joint doctrine, proposed Joint Pub 3-11 (Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense) was approved for publication 15 April 1994. Joint Pub 3-11 sets forth principles and doctrine to govern the joint operations for nuclear, biological, and chemical (NBC) defense of the Armed Forces of the United States. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders and prescribes doctrine for joint NBC operations and training. This marks the beginning of the development of needed Joint operational NBC defense doctrine.

Each of the Services has established adequate training standards and programs to sustain unit NBC training and readiness. In a post Operation Desert Storm environment the Services have adopted an aggressive posture in integration of realistic NBC situations into joint and combined exercises as well as Service specific exercises and evaluations. Realism has also been incorporated into wargames and battlefield simulations. The Services are fully utilizing the Chemical Defense Training Facility at the Army's Fort McClellan, Alabama, to train NBC experts and leaders in a lethal agent environment. The number of NBC experts and leaders attending this training is increasing each year. By the end of FY 94, NBC defense professional training for all the Services will be consolidated at the US Army Chemical School.

### ***NBC DEFENSE TRAINING AND READINESS ASSESSMENT***

\* DoD lacks a feedback mechanism on the status of training, equipment, and readiness. Need a mechanism for assessing operational force capabilities from both the Department perspective and the operational/CINC perspective.

*SOLUTION:* Develop and implement adequate NBC defense reporting information in the Joint Status of Resources and Training System (SORTS) currently in-use by the Joint Staff and the CINCs.

\* DoD lacks integrated joint NBC defense doctrine.

*SOLUTION:* Explore new concepts during the development of the new NBC defense program management strategy that will improve the integration of Services NBC defense doctrine to facilitate joint operations.

\* Possibility that DoD will de-emphasize NBC defense readiness with the ratification and implementation of chemical and biological weapons arms control agreements.

*SOLUTION:* Use the OSD Executive Steering Committee and the DAB process to ensure that NBC threat and NBC defense readiness is balanced and in-place. Continue emphasis on Joint NBC Training Center, joint doctrine, joint exercises, and high-level DoD policy reviews to focus on CB defense readiness improvement policies and programs. Baseline the planning, programming, and budget process to ensure that CB defense funding is maintained at a adequate level to support CB defense readiness.

## **Chemical Weapons Convention Issues**

The On-Site Inspection Agency and the Army have an aggressive and active program which is planning for the implementation of the Chemical Weapons Convention.

## **Conclusion**

The DoD NBC defense program addresses individual Service requirements, while at the same time promoting Joint Service cooperation. Shortcomings still exist; many shortcomings will be resolved during this decade by executing current procurement plans and adapting available technologies. Funding constraints are delaying modernization and could effect training realism. For programs which demand state of the art solutions, a continued commitment of time and resources is required. Together with coherent and improved management initiatives, proactive programs, and balanced funding in consonance with overall reduced DoD funding, US capabilities can improve into the future.

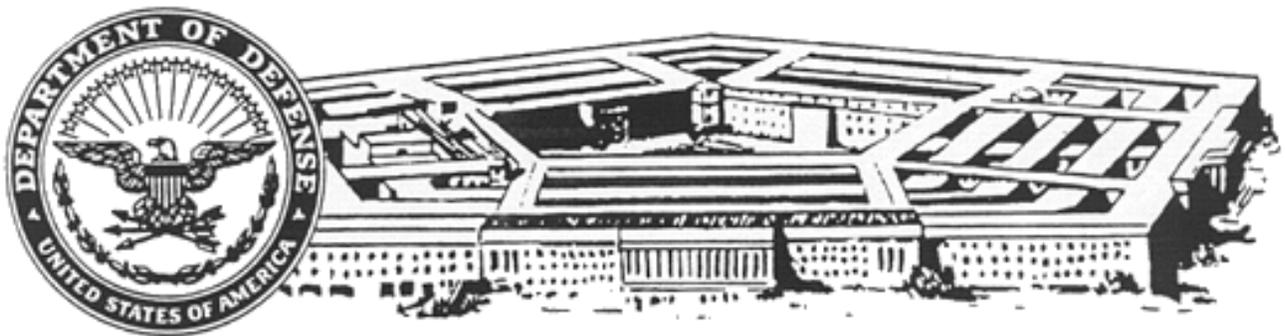
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# **NUCLEAR, BIOLOGICAL, AND CHEMICAL DEFENSE**

## **FY94 ANNUAL REPORT TO CONGRESS**

### **PART II**

#### **INTRODUCTION**



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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. The National Defense Authorization Act for Fiscal Year 1994, Public Law No. 103-160, Title XVII, Chemical and Biological Weapons Defense, section 1703, directs the Secretary of Defense to submit this assessment and a description of plans to improve readiness.

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).

Our current Defense Strategy stresses initiatives to meet the four dangers highlighted in our new global security environment. These dangers include:

- √ **dangers posed by nuclear weapons and other WMD**
- √ **regional dangers posed primarily by the threat of large scale aggression by major regional powers.**
- √ **dangers to democracy and market reform in the former Soviet Union, Eastern Europe, and elsewhere.**
- √ **economic dangers to national security, which could result if the United States fails to restore a strong, competitive, and growing economy.**

The DoD NBC defense program continues to invest in future technology in order to provide improved effective protection with minimal adverse impact on our war fighting capability. The overall goal is to reduce the size, weight, and overall logistical resources currently required to survive and fight on the contaminated battlefield. For our forces to survive and fight under contaminated battlefield conditions, an integrated, balanced program is essential. Our forces must have aggressive, realistic training resources and defensive equipment that allow them to avoid contamination, if possible, and to protect, decontaminate, and sustain operations on the non-linear battlefield and provide medical casualty management.

## 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 US 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.

Some of the causes of proliferation and some of the most dangerous proliferation threats, spelled out by the Director of Central Intelligence, R. James Woolsey before the House Foreign Affairs Committee July 1993, hold true today:

*“Nations continue to seek these weapons for a wide variety of reasons. Most nations perceive real benefits from the destructive power these weapons represent to their national security. Others value them for the prestige that leaders believe they convey, while some seek them to dominate their neighbors. A few countries, such as Iraq, develop these weapons not just for symbolic reasons, but to actually use - against their enemies in war or, tragically, on their own people. Others think that the only way to offset a hostile neighbor's threatening weapons is to develop similar capabilities. We can see this particularly in South Asia, where mutual Indian and Pakistani suspicions have fueled a nuclear arms race, increased the risk of conflict, and gravely increased the cost of war if it occurs. Still others view these weapons as a way to buy security on the cheap, a shortcut to achieving a military capability that they believe will serve as a compelling psychological deterrent.”*

Of all the trouble spots in the world, the one 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 and could, on short notice, assemble nuclear weapons. Other areas such as the Mid-East and Far-East have the potential for similar action, but for now it seems less likely. 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:*** With the disintegration of the Soviet Union, and collapse of the Warsaw Pact, the chemical and biological weapons (CBW) threat from these sources has diminished. However the capabilities which have been attributed to developing nations pose a most serious threat. The Iran-Iraq War revealed both the extent and impact

chemical weapons proliferation has had on Third World regions in which the United States maintains vital interests. The FY 1991 Joint Military Net Assessment by the Joint Chiefs of Staff states:

*“Approximately 20 countries have confirmed or suspected offensive chemical warfare programs and a slightly smaller number have confirmed or suspected offensive biological warfare programs. These numbers are expected to increase over the next decade.”*

Most of the major countries in the Middle East, such as Egypt, Iraq, Iran, Libya, and Syria either have, or are suspected of having chemical and biological weapons programs. In Asia, these countries include China and North Korea. There are several reasons for this proliferation:

Third World perceptions of the political-military utility of CBW has stimulated their proliferation. For example, one of the most significant potential values of CBW is as a strategic deterrent. A Third World nation wishing to insure itself against coercion by a neighbor with stronger conventional forces might see considerable value in a capability to make long-range strikes with CBW against the neighbor's cities.

Another potential value of CBW for Third World nations is as a deterrent to invasion by superpower expeditionary forces. Considerable difficulty would be encountered in making an amphibious assault if the defending nation could strike amphibious ships with CBW or hit beachheads with such munitions. Moreover, the knowledge that a Third World country could retaliate with a CBW attack against US coastal cities launched from apparently benign merchant shipping vessels might deter the US from challenging the Third World country in the first place. Such scenarios are nearing reality, and soon must be factored into the calculus of dealing with Third World belligerents.

Compounding the problem is the ease with which proliferating nations can start CBW programs.

*“...First and perhaps foremost, the technologies used in these weapons are more available and more easily absorbed by Third World countries than ever before...Second, most of these technologies are so-called dual use technologies...they have legitimate civilian applications...Chemicals used to make nerve agents are also used to make plastics and foodstuffs. Moreover, a modern pharmaceutical industry could produce biological warfare agents as easily as vaccines and antibiotics...We are closely watching the brain drain from the Soviet republics...The most worrisome problem is probably those individuals whose skills have no civilian counterpart, such as...engineers specializing in weaponizing CW and BW agents”*

*Robert Gates  
Director, Central Intelligence Agency  
15 January 1992 Testimony to US Senate,  
Government Affairs Committee*

Though the 1972 Biological and Toxin Weapons Convention banned the development of offensive capabilities, and the 1925 Geneva Protocol banned the use of chemical weapons, there have been sufficient violations of existing treaties to justify maintaining a strong NBC defense posture. The CWC, which bans the possession, manufacture or use of chemical warfare (CW) agents and provides for control of selected precursor chemicals, has been signed by over 154 nation states. However, many Third World countries possessing CB weapons may refuse to become signatories, or may sign and cheat. Therefore, a strong training program coupled with a balanced Research, Development and Acquisition (RDA) program remains a high priority to serve both as a deterrent and to reduce the military impact should violations occur.

## **NBC WARFARE INTELLIGENCE REQUIREMENTS ASSESSMENT**

\* Nations with CBW capabilities are increasing. Proliferation of weapons technology and precision navigation technology, and the development of chemical and biotechnology in developing nations is presenting the US with a complicated national security matter. Inadequate assets are devoted to collection, analysis, and production of responsive, useful intelligence documents. Intelligence assets are needed to assist in collecting and analyzing nation’s “dual-use” chemical and biological industrial capability, and developing the indications and warning of how nations are using their dual-use capabilities.

**SOLUTION:** 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 management and coordination of the NBC defense program.
- *Chapter 2* provides non medical NBC defense requirements and research and development programs information. Both requirements (equipment capabilities, development and readiness) and the status of research and development assessments are conducted 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 for implementation of the CWC

**CHAPTER 1**

**NBC DEFENSE MANAGEMENT**

## 1.1 CURRENT NON MEDICAL MANAGEMENT STRUCTURE

### *DOD*

The Deputy Assistant Secretary of Defense for Atomic Energy, Chemical and Biological Matters (ATSD (AE)(CM)) provides oversight and focal point responsibilities for the DoD NBC defense program. To leverage resources and ensure compatibility, the Services jointly plan and develop new and improved NBC defensive equipment.

#### Joint Program Office for Biological Defense

On 28 June 1993, the Under Secretary of Defense for Acquisition and Technology approved the formation of a Joint Program Office for Biological Defense (JPO-BD). The JPO-BD provides intense, centralized management of all assigned DoD Biological Defense initiatives, including vaccine production and biological detection equipment. The Under Secretary of Defense for Acquisition and Technology and the Defense Acquisition Board will review the JPO's progress at six month intervals. The Deputy ATSD(AE)(CM) and a Joint General Officer Steering Group will provide additional oversight. This restructuring captures the Services' Biological Defense development and procurement funding resources and assigns them to the JPO-BD. Two distinct projects now represent medical and non medical tasks which are the Services' on-going programs associated with funding in FY 95. The Army's on-going programs will provide a core non-developmental (NDI) , fixed/mobile platform based, point Biological Integrated Detection System (BIDS), and a Long Range Biological Stand-off Detection System (LR-BSDS) fielding capability for an air platform in FY96. The Navy's on-going effort will provide a rapid prototype point detection system fielding capability for ship platforms in FY95.

### *ARMY*

The DoD has designated the US Army as the Executive Agent (EA) for the Chemical and Biological Defense RDA Program. Through a Joint Service Agreement (JSA), the Army exercises its responsibilities for RDA planning and oversight, and chairs the Joint Service Review Group (JSRG), the Joint Panel on Chemical and Biological Defense (JP-CBD), and the Joint Technology Panel on Chemical and Biological Defense to ensure that appropriate coordination and priorities are effected across the Multi-Service program. Additionally, the Army chairs the Joint Service Coordination Committee (JSCC) to assist in logistics prioritization and allocation of resources worldwide.

Within the Army the Commandant of the Chemical School is designated the "Chief of Chemical". In that role, he has the responsibility for all Army NBC defense program requirements, training, and management. He exercises these responsibilities through the assets of the Chemical School (Directorates of Training and Combat Developments) proposing policy, developing doctrine, organizing force structure, devising training, preparing leaders, specifying materiel requirements, and integrating all NBC defense actions within the Army through the Battle Laboratory and the Enhanced Concept Based Requirements System (ECBRS) processes. On the materiel side, the Commander of the

Chemical and Biological Defense Command, is responsible for translating the requirements developed by the Chemical School and producing NBC defense equipment for the fighting forces.

### *AIR FORCE*

Management of the US Air Force NBC defense program, rests with the Office of The Civil Engineer, Operations and Maintenance Directorate, Readiness Programs Division. The Air Force does not have a dedicated NBC Corps. Day-to-day management of the program falls under the purview of the disaster preparedness specialty. This multi-function career field is charged with training our personnel in NBC defense measures during peacetime and overseeing the NBC defensive measures taken during conflict. These same personnel are responsible for the Air Force emergency management program. Whether it is a natural or manmade disaster, these experts are entrusted to develop and implement plans for preparedness, response, mitigation and recovery. In this regard, the Air Force NBC program management function differs significantly from other service components. The Air Force has aligned this management responsibility under the auspices of the civil engineer community. This initiative will allow synergistic interaction between like functions. This effort also provides a command structure that is responsive to the needs of the using community and sufficiently staffed to address issues at the air staff level. Similar efforts at the major command and base levels have produced comparable results.

### *NAVY*

The Chief of Naval Operation's focal point for Chemical, Biological and Radiological Defense (CBR-D) is the Director, Ship Safety and Survivability (SSS) Office. The office is responsible for managing the transition to the next generation of CB agent detectors, individual/collective protection systems and decontamination equipment. While requirements are normally generated at the fleet level, the SSS Office is the resource sponsor tasked with coordinating the efforts of the Systems Commands and the research facilities to ensure the most advanced and cost effective equipment is fielded. The optimal course of action for US forces to preserve combat readiness on an NBC battlefield or at sea is to remain unburdened by those NBC protective measures which degrade operational performance.

### *MARINE CORPS*

Though the mechanism for prioritizing equipment requirements in the Marine Corps Master Plan (MCMP) may change, NBC modernization Program Objective Memorandum (POM) initiatives will remain among the highest identified in the plan. The MCMP establishes the operational foundation for the mid-range (1994-2004) force development of Marine Air-Ground Task Forces (MAGTFs). The MCMP provides planning objectives designed to enhance the naval expeditionary capabilities of the MAGTF and identifies required supporting actions in the areas of MAGTF doctrine, structure, training, education, and equipment. The MCMP is one of three service plans integral to the Marine Corps force development process. It abolished in the Marine Corps Long Range Plan and the current

focus of the Commandant's Planning Guidance into specific mid-range combat development objectives. The MCMP includes the FMF and the supporting establishment in a single plan that provides a roadmap for our Corps in the dynamic years ahead. It defines objectives and required capabilities to support the National Military Strategy and meet our global commitments.

## **1.2 CURRENT MEDICAL MANAGEMENT STRUCTURE**

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

The Congressionally mandated Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee was chartered in 1981. This committee is co-chaired by the Director, Defense Research and Engineering (DDRE) 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 (RDT&E) activities pertinent to the missions of the Army, Navy, and Air Force, the Commander of the USAMRDAL, the Commander of the Naval Medical Command for Fleet Readiness and Support, and the Commander of 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.

The continuing business of the ASBREM Committee is conducted through a joint secretariat, composed of a personal representative of each Military Department's ASBREM member and seven Joint Technology Coordinating Groups (JTTCGs). JTTCGs exist for Medical Chemical Defense and Medical Biological Defense, among others. The ASBREM committee is a premier example of Joint Service program coordination and has been cited as a model for other tri-service programmatic coordination and oversight groups.

Military medical research responds to military unique needs. The threats (NBC, directed energy, endemic diseases, etc.), health hazards, and health care delivery environments are different than those addressed by the private sector or non-military federal programs. The existing medical research structure delivers mission critical products, such as the NBC defense products described herein, to the service member while protecting the individual's rights and safety as they participate in the research process.

## Program Organization

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 and, as such, the Army is the lead requirements coordinator. The Joint Technology Coordinating Group (JTTCG) 3 (Medical CW Agent Defense) and JTTCG 4 (Medical BW Agent Defense) of the Armed Services Biomedical Research Evaluation and Management Committee (ASBREM) are responsible for the research program's consolidation, coordination, and integration. The ASBREM maximizes efficiency by coordinated planning, and minimizing 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 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 DoD in-house and extra mural 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, the Assistant to the Secretary of Defense for Atomic Energy, 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 are managed by Science and Technology Objectives and by 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 fields leading to novel advances in medical countermeasures. Next generation products and future systems development flow from the maintenance of a strong technology/science base. Therefore, it is imperative to adequately resource the medical biological defense technology/science base during the budget formulation process. Current management challenges include balancing resource allocation as the DoD downsizes, and 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 NEW MANAGEMENT DIRECTION**

The FY94 National Defense Authorization Act provides management direction. Highlights of Public Law 103-160 state the following:

- There must be a single office at the Office of the Secretary of Defense (OSD) level responsible for the overall coordination and integration of the chemical and biological warfare defense program, including both the medical and non-medical aspects of the program.
- OSD must exercise oversight over the CB defense program through the Defense Acquisition Board (DAB) process.
- OSD must coordinate and develop an integrated and consolidated budget, which consists of single program elements for each category of RDT&E, Acquisition and Military Construction. Funding for the CB defense program may not be included in the budget accounts of the military departments.
- OSD must develop and emphasize more joint emphasis on research, development and acquisition, training, doctrine and logistics requirements of the CB defense program.
- Designate the Army as the Executive Agent for the overall program and the Secretary of the Army shall review all funding for the CB defense program.
- Review the preceding guidance and submit a special report to Congress in May 1994, which outlines OSD's plan for improvement of the overall management of the CB defense program.

OSD is preparing a detailed report on improved management and execution of CB defense program. The following discussion is a summary management strategy development initiatives.

### **1.4 EMERGING NBC DEFENSE PROGRAM MANAGEMENT STRATEGY**

#### **1.4.1 Proposed Management Structure**

On 25 February in response to Public Law 103-160, the Secretary of Defense (SECDEF) designated the Office of the Assistant Secretary of Defense for Atomic Energy (Chemical and Biological Matters) (OATSD(AE)(CM)) the single office within OSD responsible for the management and oversight of the DoD chemical and biological defense (CBD) program and for coordination of policy issues with the Assistant Secretary of Defense for Nuclear Security and Counterproliferation (ASD(NS&CP)). Additionally, ATSD(AE) is responsible to ensure close and continuous coordination between the medical and non medical CBD programs.

The SECDEF also designated the Army as the EA for the DoD to coordinate and integrate RDT&E and acquisition; and military construction requirements for the military departments for the DoD CBD program to include chemical demilitarization and chemical and biological weapons treaty compliance and verification.

SECDEF asked the Secretary of the Army to provide a chairperson for an OSD chartered task force to provide an implementation plan for the EA management role for the DoD CBD program.

The task force consisted of members from OSD, the Joint Staff, the DoD components and the military departments. Several management alternatives were developed as well as a new Joint Service Agreement (JSA) and implementation plan.

On 13 April 1994, the CBD Management General/Flag Officer Steering Committee (SC) met to consider the task force recommendations. The SC selected the alternative pictured in Figure 1.1. This management structure establishes a Joint NBC Defense Board with a process to interact with two groups, a Joint Service Integration Group (JSIG) representing the combat developers who coordinate and integrate Joint requirements, doctrine, and professional training; and a Joint Service Materiel Review Group (JSMG) representing materiel developers who coordinate and integrate RDT&E. All board/group members would be ad hoc, with few, if any, full time staff. The management structure would provide each Service with one vote. The process will allow issues to be resolved at the lowest level while providing a mechanism for appeal, if necessary. A new JSA was also recommended which also provides guidance for the implementation of the management strategy. These documents are being forwarded to OSD for approval.

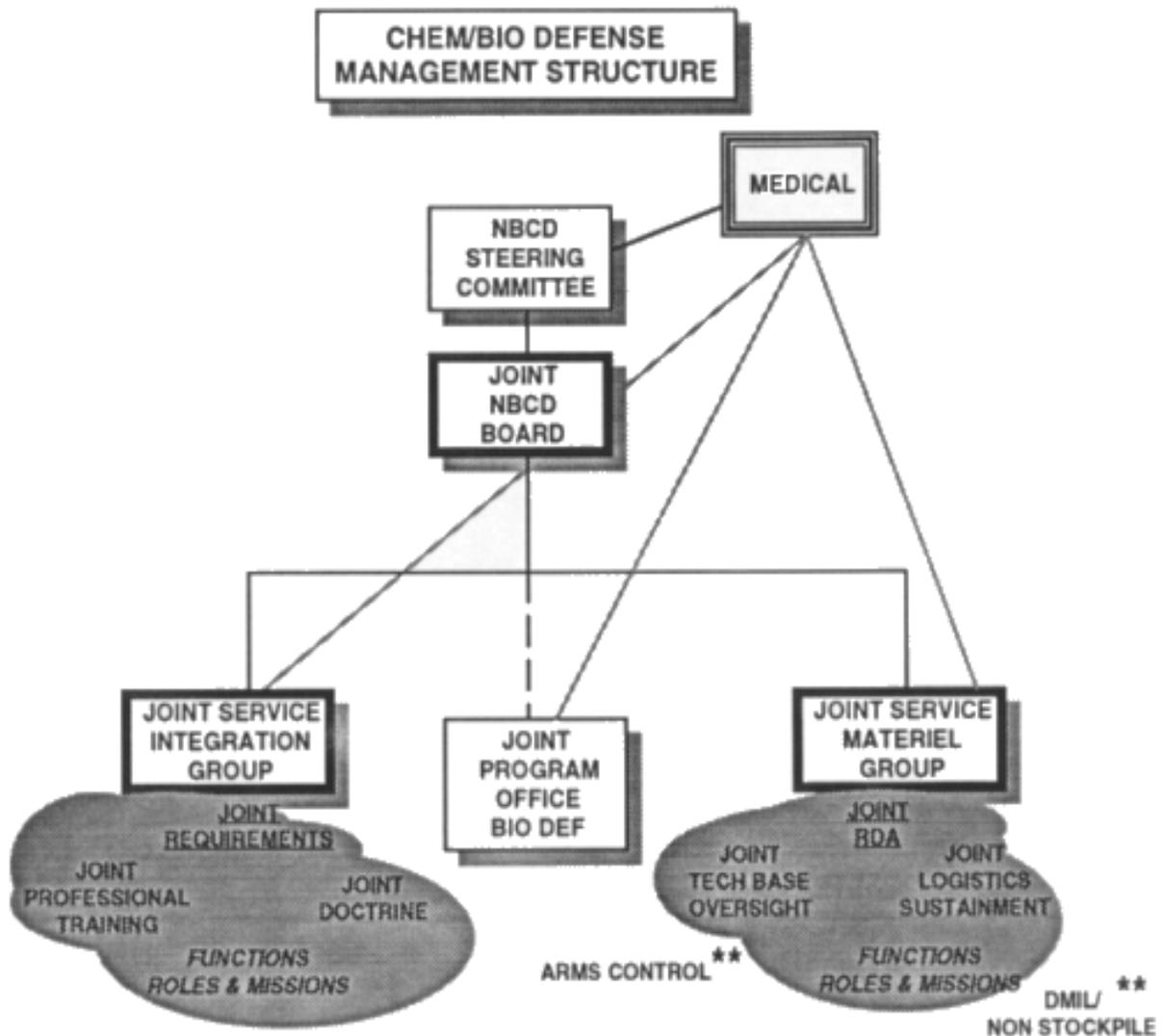


FIGURE 1.1

### 1.4.2 Funding Process

OSD will retain control of overall NBC defense funds and will pass funds directly to executing agencies. The management scheme will, where possible, use existing systems and infrastructure. All Services must fully participate in the program development and execution. OSD will establish an Executive-Level Steering Committee which will provide a link to the DAB process. This will be a senior level review forum for Service appeals of EA actions, and will address operational, policy, and other non-acquisition issues. The ATSD(AE) will chair this committee.

### **1.4.3 Defense Acquisition Board Level Review**

Public Law 103-160 requires oversight of the departments' NBCD programs be elevated to a Defense Acquisition Board (DAB) Executive Level review forum chaired by the Defense Acquisition Executive (DAE). The DAB Executive Level review, held periodically, will not be constrained by DoD Directive 5000.1 milestone reviews. The purpose of the DAB review will be to ensure all Services' NBCD programs are reviewed at the highest level to ensure integration and coordination.

#### **NBC DEFENSE PROGRAM MANAGEMENT ASSESSMENT**

**\* The overall DoD NBC defense program is not integrated and lacks joint emphasis. With diminishing research, development and acquisition funds, requirements must be carefully reviewed to prevent duplication and to ensure that valid requirements are addressed.**

***SOLUTION:*** DoD is developing and will implement management improvement direction outlined in Section 1702, Public Law 103-160. The provisions of the law should provide the basis for the following management and decision-making improvements.:

- Single office at OSD level, OATSD(AE), responsible for the overall coordination and integration of the NBC defense program. This includes the medical and non medical aspects of the program.
- Establish an Executive Steering Committee to oversee and review Service NBC defense programs and to establish policy and prioritization to research, development, and acquisition.
- OSD oversight of research, development and acquisition of NBC defense equipment utilizing the DAB process.
- Coordination and integration of an integrated, consolidated NBC defense budget with overall funding consolidated as a Defense program at the OSD-level.
- Development of a management approach with improved joint emphasis on research, development and acquisition; training; doctrine; and logistics requirements. The management approach will include an enhanced, workable method to ensure that the Army, as DoD's EA for NBC defense, coordinates, reviews and integrates the individual Service NBC defense programs into a consolidated DoD program.
- Form a small Joint working group to focus efforts of the Services. Demand integrated programs through the use of funding controls and action officer level coordination.

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## **CHAPTER 2**

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

***Requirement: A Service need to overcome a mission deficiency***

## **2.1 REQUIREMENTS**

The evolving NBC threat places demands on warfighting operations that require our forces to be equipped with adequate NBC defense equipment. 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 require joint forces to progressively capture and apply leverage to technological advances to provide the best NBC defense equipment for the forces. We must continue to build on the fundamentals of NBC defense doctrine.

The key to successful implementation of Research, Development, and Acquisition (RDA) strategy is the concept of continuous modernization. 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. Under the proposed JSA, the Army, as Executive Agent, will in cooperation with the other Services coordinate, integrate, and review the DoD NBCD program and provide DoD with a Joint Service Modernization Plan; a Joint Service RDA Plan; and a consolidated NBCD program POM.

Through the process of requirements identification and analyses, Services decide if a material 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.

With a changing threat and fiscal constraints, DoD has revised its acquisition approach. This new approach increases emphasis and investment in Science and Technology programs which lead to a broad range of Advanced Technology Demonstrations (ATDs). Technological advances will be incorporated more often into systems through upgrades rather than through start ups of new systems.

This chapter provides a consolidation of Joint and Service 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 tenets of NBC defense doctrine for the mission area:

- **Contamination Avoidance**
  - **Force Protection**
    - **Decontamination**

## 2.2 NBC DEFENSE MISSION AREA

### 2.2.1 Contamination Avoidance

NBC reconnaissance, detection and warning 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 remote detection, miniaturization, lower detection limits, logistics supportability and biological detection capability. Table 1 shows the status of the contamination avoidance programs and Service involvement.

**TABLE 1. CONTAMINATION AVOIDANCE**

Equipment Category	Nomenclature	Status*	USA	USAF	USMC	USN
Manuel Chemical Point	- M8/M9 Paper	Inventory	Fielded	Fielded	Fielded	Fielded
	- M256A1 Detection Kit/M256A1 Trainer	Inventory	Fielded	Fielded	Fielded	Fielded
	- M272 Water Test Kit	Inventory	Fielded	Fielded	Fielded	Fielded
	- M274 NBC Marking Set	Inventory	Fielded	Fielded	Fielded	Fielded
	- Tube Phosgene	Inventory				Fielded
Continuous Chemical Point	- M8A1 Chemical Agent Alarm	Inventory	Fielded	Fielded	Fielded	Fielded
	- Chemical Agent Point Detector System (CAPDS)	Inventory				Fielded
	- Individual Chemical Agent Detector	Production	Interest	Interest	Interest	Fielded
	- Automatic Liquid Agent Detector	Production		Rqmt		
	- Cockpit Vapor Detector and Alarm	RDTE	Interest	Rqmt	Interest	Interest
	- XM22 Automatic Chemical Agent Detector Alarm (ACADA)	RDTE	Rqmt	Rqmt	Rqmt	
	- Shipboard Improved Point Detector System (IPDS)	RDTE				Rqmt
	- Shipboard Automatic Liquid Agent Detector (SALAD)	RDTE				Rqmt
- In-Line Water CB Detection System	RDTE		Rqmt	Rqmt		
- Lightweight Chemical Agent Detector	RDTE		Interest	Rqmt		
Biological Point	- Biological Sampling & Identification System	RDTE		Interest	Rqmt	
	- Individual NBC Detector	RDTE		Interest	Rqmt	
	- Biological Agent Detection System (BADs)	RDTE	Interest	Rqmt	Rqmt	Rqmt
	- Biological Detection Kit	RDTE				Rqmt
	- CB Mass Spectrometer	RDTE	Rqmt		Rqmt	
	- BW Detector	RDTE	Rqmt		Rqmt	
- Biological Integrated Detection System (BIDS)	RDTE	Rqmt		Rqmt		
Monitor	- Chemical Agent Monitor (CAM)	Production	Fielded	Fielded	Fielded	Interest
	- Improved Chemical Agent Monitor (ICAM)	RDTE	Rqmt		Rqmt	
	- Shipboard Chemical Agent Monitor-Portable (SCAMP)	RDTE				Rqmt
	- CW Interior Compartment Sensor (CWICS)	RDTE		Rqmt		Rqmt
	- Equipment Contamination Sensor	RDTE		Rqmt	Interest	Interest
	- Aircraft Interior Detector	RDTE		Rqmt		Interest
	- Automatic Mustard Agent Detector (AMAD)	RDTE		Rqmt		

\*Replace = To be replaced by newer item

Rqmt = Service or Joint Service Requirement

UF = Unfunded

**TABLE 1. CONTAMINATION AVOIDANCE (Con't)**

Equipment Category	Nomenclature	Status*	USA	USAF	USMC	USN
Stand-off	- AN/KAS-1	Production				Fielded
	- XM21/M21 Remote Sensing Chemical Agent Alarm (RSCAAL)	Production	Rqmt	Rqmt	Fielded	Interest
	- Chemical Agent Remote Detection System (CARDS)	RDTE				Rqmt
	- Lightweight Passive Stand-off Chemical Agent Detector (LSCAD)	RDTE	Rqmt		Rqmt	
	- Long Range Stand-off Biological Agent Detector (LR BSDS)	RDTE	Rqmt	Interest		Rqmt
Recon	- Laser Stand-off Chem. Detector (LSCD)	RDTE	Rqmt (UF)	Rqmt	Interest	Interest
	- M21 (On the Move, HMMWV mounted)	RDTE			Rqmt	
Radiacs	- NBC Reconnaissance System (NBCRS) FOX XM93	Inventory	Fielded		Fielded	
	- XM93A1 NBCRS System Improvement Phase (SIP)	RDTE	Rqmt			
	- NBCRS on HMMWV/LAV	RDTE	Interest		Rqmt	
Radiacs	- AN/PDR-27 Radiac Set	Inventory	Replace	Fielded	Replace	Fielded
	- AN/PDR-43 Radiac Set	Inventory		Fielded		Fielded
	- IM-9/PD Radiac Meter	Inventory	Replace	Fielded	Fielded	Fielded
	- IM-93A/PD Radiac Meter	Inventory	Replace	Fielded		Fielded
	- IM-135/PD Radiac Meter	Inventory		Fielded		Fielded
	- IM-143/PD Radiac Meter	Inventory		Fielded		Fielded
	- IM-147/PD Radiac Meter	Inventory	Replace			
	- IM-174/PD Radiac Meter	Inventory	Replace		Replace	
	- AN/PDR-56 Radiac Set	Inventory	Replace	Fielded	Fielded	Fielded
	- AN/PDR-60 Radiac Set	Inventory	Replace			
	- AN/PDR-65 Shipboard Mast-Mounted Radiac Set	Inventory	Replace			Fielded
	- DT60 Dosimeter	Inventory				Fielded
	- AN/PDR-77 Radiac Set	Production	Rqmt			
	- AN/PDR-75 Radiac Set	Production	Fielded			Fielded
	- AN/VDR-2 Radiac Meter	Production	Fielded			Fielded
	- Multi-Function Radiac Set	RDTE			Rqmt	
	- Point Radiation Detection Equip.	RDTE			Rqmt	
- AN/VDR-13 Pocket Radiac	RDTE	Rqmt				
- Advanced Airborne Radiac	RDTE	Rqmt (UF)				
Warning	- Remote Individual Chemical Agent Detector	RDTE			Rqmt	
	- Automated NBC Reporting System	RDTE		Rqmt	Rqmt	Interest
	- Multi-purpose Integrated Chemical Agent Detector (MICAD)	RDTE	Rqmt (UF)			
	- NBC Hazard Warning Information System	RDTE				
	- NBC Detector/Monitor	RDTE				
	- NBC Recon System	RDTE			Rqmt	
- Chemical Aerial Standoff Detector	RDTE			Rqmt		
- Automated NB and C Information System (ANBACIS)	RDTE		Rqmt (UF)		Rqmt	

\*Replace = To be replaced by newer item

Rqmt = Service or Joint Service Requirement

UF = Unfunded

**2.2.2 Force Protection**

When early warning is not possible or units are forced to occupy contaminated environments, protection provides life sustainment and continued operational capability in the NBC environment. The two types of protection are individual and collective:

- **Individual protection** equipment includes protective masks and protective clothing. Protective masks that improve compatibility

with weapon sighting systems and reduced weight and cost are being developed. Technological advances are being pursued to produce mask systems that provide fully compatible vision capabilities, laser/ballistic protection as well as further reduction in logistics burden. Protective clothing is being developed which will reduce the weight and heat stress burden of the 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.

Table 2 provides a summary of the status of individual and collective protection programs and Service involvement.



**TABLE 2. PROTECTION (Continued)**

Equipment Category	Nomenclature	Status*	USA	USAF	USMC	USN
Environ-Mental Cooling Equipment	- M1A1 Microclimate Cooling System (MCS)	Inventory	Fielded		Fielded	
	- Multi-Man Intermittent Cooling System (MICS)	Inventory		Fielded		Interest
	- Individual Microclimate Cooling System (IMCS)	RDTE	Rqmt	Interest	Interest	Interest
Gloves	- Chemical Protective Gloves, 25 Mil	Production	Fielded	Fielded	Fielded	Fielded
	- Chemical Protective Gloves, 7 and 14 Mil	Production	Fielded	Fielded	Fielded	Fielded
	- Tactile CB Glove	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
Boots	- Chemical Protective Footwear Covers	Inventory	Replace	Replace	Fielded	Fielded
	- Green/Black Vinyl Overshoe (GVO/BVO)	Production	Fielded	Fielded		Fielded
	- Multipurpose Overboot (MULO)	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
Equipment Category	Nomenclature	Status*	USA	USAF	USMC	USN
Collective	- M51 Collective Protection Shelter	Inventory	Replace			
	- Modular CPE	Inventory	Fielded	Fielded		
	- M20 Simplified CPE	Inventory	Fielded			Fielded
	- Fixed-Site Collective Protection System	Inventory				Fielded
	- Shipboard Collective Protection System	Inventory				Fielded
	- Selected Area Collective Protection System	Inventory				Fielded
	- Portable Collective Protection System (PCPS)	Production	Interest		Fielded	Interest
	- M20E1/M28 Simplified CPE	Production	Rqmt			Interest
	- Standardized Integrated Command Post System and Tent (SICPS)	RDTE	Rqmt			
	- SICPS P3I	RDTE	Rqmt			
	- CB Protected Shelter (CBPS)	RDTE	Rqmt (UF)		Interest	
	- Transportable Collective Protection System (TCPS)	RDTE	Interest			Interest
	- Advanced Deployable Collective Protection for Fixed-Site	RDTE	Interest			Interest
	- Advanced Integrated Collective Protective Shelter	RDTE	Interest			Interest
	- CB Protected Deployable Medical Systems (DEPMEDS)	Production	Rqmt	Rqmt	Interest	Interest
	- CPE for Vehicle, Shelters, & Units	RDTE	Interest		Interest	Interest
- Chemical Protective Boot Coating	RDTE			Rqmt		
- Chemical Protective Socks	RDTE			Rqmt		

\*Replace = To be replaced by newer item

Rqmt = Service or Joint Service Requirement

UF = Unfunded

FUE = First Unit Equipped

### 2.2.3 Decontamination

When contamination avoidance fails, 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. Table 3 provides the status of decontamination programs and Service involvement.

**TABLE 3. DECONTAMINATION**

Equipment Category	Nomenclature	Status	USA	USAF	USMC	USN
Personnel	- M258A1 Personal Decontamination Kit/ M58A1 Trainer	Inventory	Replace	Replace	Replace	Replace
	- M291 Decontamination Kit	Production	Fielded	Fielded	Fielded	Fielded
Combat Equipment, Vehicles, and Aircraft	- ABC M-11 Portable Decontaminating Apparatus	Inventory	Fielded	Fielded	Fielded	Fielded
	- M12A1 Power-Driven Decontamination System	Inventory	Fielded	Fielded	Fielded	Fielded
	- M13 Portable Decontamination Apparatus	Inventory	Fielded		Fielded	Fielded
	- Countermeasure Water Wash-Down System	Inventory				Fielded
	- M17A2/A3 Lightweight Decontamination System	Production	Fielded	Fielded	Fielded	Fielded
	- M295 Decontamination Kit	RDTE	Rqmt	Rqmt	Rqmt	Rqmt
	- Laundry and Decontamination Drycleaning System (LADDS)	RDTE	Rqmt	Interest	Interest	Interest
	- XM21/XM22 Modular Decontamination System	RDTE	Interest	Rqmt	Interest	Interest
	- Aircraft Interior Decontamination System	RDTE	Rqmt	Rqmt	Interest	Interest
	- XM19 Non-Aqueous Equipment Decontamination System (NAEDS)**	RDTE	Rqmt			
Decontaminant Solutions And Coatings	- Super Tropical Bleach	Inventory	Fielded	Fielded	Fielded	Fielded
	- Decontaminating Solution 2	Inventory	Fielded		Fielded	Fielded
	- Sodium/Calcium Hypochlorite	Inventory	Fielded	Fielded	Fielded	Fielded
	- Dry Sorbent Powder	RDTE		Fielded		
	- Sorbent Decontamination System	RDTE	Rqmt	Interest	Interest	Interest
	- Catalytic Coating	RDTE	Rqmt	Interest	Interest	Interest
	- Decontaminating Enzymes	RDTE	Interest	Interest	Interest	Interest

\*Replace = To be replaced by newer item

Rqmt = Service or Joint Service Requirement

UF = Unfunded

\*\* Development on hold awaiting a suitable replacement for freon.

The following discussion is organized to present each of these NBC defense functional areas. Those programs that are Joint or have multi-Service application are presented first followed by each Service. The tables in the following sections are designed to provide detailed strategy across a timeline showing past capabilities; what is currently fielded; and what is being developed/planned for near-, mid, and far-term capabilities.

## 2.3 CONTAMINATION AVOIDANCE

*Goal: To provide the best capability to avoid NBC contamination hazards. Improvements in contamination avoidance combine an aggressive reconnaissance capability with a fully integrated detection and warning network.*

The increased lethality and heightened operational tempo of the future battlefield demands responsive NBC reconnaissance, detection, identification and warning/reporting systems to reduce the chance of force degradation caused by contamination.

### 2.3.1 Joint Requirements (Multi-Service Interest)

Joint contamination avoidance program integration needs emphasis. Services are looking at detection program to see how best to exploit technology to fit Service needs. There are still too many detection systems being developed and compatibility with existing and planned network warning and reporting systems need close scrutiny. A matrix summary of Joint requirements for contamination avoidance at Table 4 depicts a summary of requirements that are common to some or all of the Services.

**TABLE 4**  
**JOINT REQUIREMENT**  
**CONTAMINATION AVOIDANCE**

PAST	PRESENT	NEAR (FY94-97)	MID (FY98-02)	FAR (FY03-08)
Automatic point detection and warning of chemical vapors and aerosols	Hand-held automatic chemical vapor detector  Significantly increased logistics supportability and reliability	Programmable agent detection capability; surface sampling capability  Increased logistics supportability	Biological agent detection and identification  Automatic activation of collective protection systems; automatic wide area transmission of chemical events	Detection of all known biological and chemical agent capability
Manuel point detection and identification of chem agents; kit for vapor, paper for liquids	Increased sensitivity for chemical detection; limited biological agent detection	Capability to detect additional biological agents	No change	Individual soldier detector
Manual reconnaissance; very slow, ineffective	High speed semi-automatic chemical agent recon	Mobile automatic integration of sensors and data; reduced crew size; 5 km standoff on-the-move capability; modeled chemical and biological hazards	Addition of biological detection and identification interface capability	Standoff biological and chemical agent detection, ranging and mapping  Chemical sensor for strategic reconnaissance

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

### **2.3.2 Army Contamination Avoidance Requirements**

The Army is developing or is planning development of the programs depicted in Table 5 in order to modernize its contamination avoidance strategy. Detailed descriptions of these Army contamination avoidance programs are in Annex A.

In the *near-term*, unit detection of chemicals will be complemented with immediate identification of chemical agents and significantly improved communications and delivery methods for NBC messages. The Automatic Chemical Agent Detector Alarm (ACADA) will increase point detection sensitivity, decrease response time, and provide concurrent nerve and blister agent detection and identification. It will also provide an ability to be programmed to detect new chemical agents. This system, coupled with the Multiple Integrated Chemical Agent Detector (MICAD), will provide a capability to transmit and communicate near-real time data from point detectors in the field to adjoining units and higher echelons. The MICAD system also provides an integrated detection and warning capability which will automatically activate existing collective protection on vehicles, vans, and shelters during attack and automatically transmit NBC alerts and reports in digital format.

Unit detection of toxins and biological agents will also be expanded. Advanced biological detection kits and sampling devices will be introduced to extend detection to new and additional threat agents. The on-going Army biological defense program, now managed by the JPO-BD, will provide the Biological Integrated Detection System (BIDS) and as Non Developmental Item (NDI) Long Range-Biological Stand-off Detection System (LR-BSDS) fielding capability for an air platform. The Stand-off detection programs (LR-BSDS and Short Range Biological Stand-off Detection System (SR-BSDS) are part of a biological defense “system of systems” architecture for detecting warfare agents on the battlefield. The LR-BSDS (mounted on an aerial platform) will identify the presence of particulate clouds at long range, but cannot distinguish if biological agents are present. The SR-BSDS, which operates at much shorter ranges, has the capacity to identify the presence of a biological agent within a cloud, but not which specific agent. The BIDS will identify the agent type. The architecture is complementary in nature, without the duplication of detection technologies.

Reconnaissance capabilities will be further improved by fielding of an automatic alarm for stand-off detection of chemical agent vapor clouds. The Remote Sensing Chemical Agent Alarm (RSCAAL) detects nerve and blister agent vapors by scanning horizontally 60 degrees and at line-of-sight distances up to five kilometers, providing the battlefield commanders enough warning to take defensive measures accordingly. Also, an improved NBC Reconnaissance System (NBCRS) will be available with several enhancements over the current system. Automation will reduce the crew from four to three. The system’s point detection (immediate area) capability will be augmented with the RSCAAL’s remote sensing capability. The improved Fox NBCRS will automatically integrate contamination information with input from on-board navigation and meteorological systems, and process and transmit the NBC warnings. It will incorporate built-in-test diagnostics to make it more maintainable.

In the *mid-term*, unit detection of both chemical and biological agents will be augmented with the introduction of a BW detector. The system will offer automatic and continuous biological detection capability and decreased response time, while increasing detection reliability. The BW detector will serve as a component to the BIDS and provide a display of agent class and concentration, as well as all-clear conditions. Future improvements in detection technology will allow the NBCRS to identify new chemical threat agents in the form of liquid droplets and vapors.

In the *far-term*, automatic and continuous unit detection capabilities will be provided for an unlimited number of chemical and biological agents. Long range reconnaissance capabilities as well as individual soldier detectors will be introduced. Additionally, stand-off detection of biological agents and stand-off chemical liquid agent detection, mapping, and ranging will become possible.

**TABLE 5  
ARMY  
CONTAMINATION AVOIDANCE**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Automatic point detection of chemical vapors and aerosols ( <b>M8 alarm</b> )	Improved automatic point detection of nerve agent vapors and aerosols ( <b>M8A1 alarm</b> )	No change	Automatic, digital-compatible point detection for nerve and blister agent aerosols and vapors ( <b>ACADA</b> )	Improved all-agent, programmable, automatic point detection
No unit-level standoff point detection for chemical agents	No change	No change	Lightweight ground-mounted short-range standoff detection of chem agent vapors ( <b>LSCAD-unfunded</b> )	UAV mounted standoff detection for chem agent liquids and vapors. (Unfunded) Long-range standoff chem agents detection and identification
Manual point detection and identification of chem agents ( <b>M256 Kit</b> for vapor, <b>M8 paper</b> for liquids)	Improved manual point detection and identification of chem agents vapors ( <b>M256A1 Kit</b> )	No change	No change	No change
Limited mobile NBC reconnaissance (recon) capability: Manual point detection and identification of chem agent ( <b>no special equipment</b> )	Improved mobile NBC recon with limited semi-automatic point detection of chem agent liquids ( <b>XM 93 NBCRS/FOX</b> )	Stationary standoff chem vapor detection capability ( <b>XM21 RSCAAL</b> ), limited automatic point detection of chem agent liquids, digital transmission of NBC hazard information ( <b>XM93E1 NBCRS-SIP</b> )	Programmable automatic point detection of chem and bio agent vapors/liquids ( <b>CB Mass Spectrometer</b> )	Mobile standoff chem agent vapor/liquid detection ( <b>LSCAD/LSCD</b> )
No bio agent detection capability; limited point sampling for bio agents	Extremely limited bio agent detection ( <b>M2 Sampler</b> )	Limited (manual) point detection and identification of bio agents ( <b>BIDS-NDI</b> )	Improved, automatic detection & identification of bio agents ( <b>BIDS P3I</b> )	-Improved agent identification ( <b>BIDS-Objective</b> ). -Standoff detection of bio agents
Inaccurate analog radiation monitoring and detection ( <b>IM-174, PDR-27</b> )  Limited capability to monitor alpha radiation ( <b>PDR-56/60</b> )  Inaccurate whole body radiation dose measurement ( <b>IM-93</b> )	Highly accurate, digital radiation monitoring & detection ( <b>VDR-2/PDR-75</b> )  No change	No change  Improved accuracy, digital capability ( <b>PDR-77</b> )	No change  Highly accurate, digital whole body radiation measurement ( <b>UDR-13 Pocket Radiac</b> )	Standoff detection and measurement of radiation ( <b>Standoff Radiac</b> )

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

### **2.3.3 Air Force Avoidance**

One of the most crucial requirements is to have reliable detection systems, which can quickly and accurately identify agents employed in an attack. The Air Force is developing a family of detectors that will detect the most common NBC agents before they reach a base; immediately upon arrival at a base and in critical resources such as aircraft, facilities, and water treatment systems. To address future needs, the Air Force has implemented a multi-

faceted approach. Threat assessments are being projected out to ten years. Several USAF agencies have contributed to developing a threat-based CB road map, which will provide capability assessments against the current threat and project future capabilities against the emerging threat. Equipment requirements are revalidated several times each year. At least annually, leaders in the USAF CB community gather to discuss potential challenges for the future and use creative thinking to predict programs which will enhance survivability and operability over the next ten years or more. These processes should be reflected in the CB road map, which will be published during the next year.

The Air Force had an early model nerve agent vapor detector, but discontinued it when maintenance became impractical. It then bought some Army M8A1s and Chemical Agent Monitors (CAMs). The M8A1s have not been received well by the users because of a report from Operation Desert Storm that the detectors were susceptible to false alarm and choked up too quickly. The Air Force developed, in cooperation with the Army, an Automatic Liquid Agent Detector (ALAD) and has bought some, which have not been fielded for lack of user requisitions. The Army decided not to buy the ALAD because their analysis showed questionable value in Army scenarios. The Air Force, recognizing CB detector shortfalls in Desert Storm operations, has bought 120 mustard/nerve agent vapor detectors. The Air Force has a program to procure, with minimal development, an automatic vapor agent detector.

Under the management of the JPO-BD, the biological defense needs and requirements of the Air Force will be assessed against evolving threat. A tiered theater strategy will be developed or modified to meet specific Service needs. The thrust will be to provide value added bio detection technologies configured for Air Force application in the mid- to far-term.

New detection equipment scheduled for fielding to include Automatic Vapor Agent Detector (AVAD), Biological Detector, Aircraft Interior Detectors (AIDET), Individual Vapor Detectors (IVD), and Multi-Function Radiation Detectors (MFR). Detailed descriptions of Air Force contamination avoidance programs are found in Annex B.

Table 6 summarized Air Forces' contamination avoidance programs from fielded to proposed systems.

**TABLE 6**  
**AIR FORCE**  
**CONTAMINATION AVOIDANCE**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
No automatic point detection capability	Automatic point detection of nerve agent vapors and aerosols ( <b>M8A1 alarm</b> ) Limited fielding of nerve and blister agent vapor and aerosol detection ( <b>M90</b> )	Improved, programmable automatic point detection of all agent vapors ( <b>Automatic Vapor Agent Detector (AVAD)</b> )	No change	Integrated, automatic NBC Reporting System
No standoff detection capability for chemical agents	No change	No change	No change	Transportable, standoff detection system of scan air space around an air base to locate, detect and warn of impending arrival of chemical warfare agents
Manual point detection and identification of chemical agents ( <b>M18, M256 Kist for vapor, M8/M9 paper for liquids</b> )	Improved manual point detection and identification of chemical agents vapors ( <b>M256A1 Kit</b> )	No change	No change	No change
No automatic surface contamination detection or identification capability of chemical agents	No change	No change	Aircraft interior chemical agent detection and identification capability Individual detectors for vapor agents	Chemical agent detection for flight line surfaces, equipment, and personnel. In-line detection of CB contamination of water supply systems
No biological agent detection or identification capability	Extremely limited bio agent detection ( <b>M-2 Sampler</b> )	No change	Biological agent detection and identification capability ( <b>Morningsong or BIDS-NDI</b> )	No change
Inaccurate analog radiation monitoring and detection ( <b>PAC-1S, AN/PDR-43, AN/PDR-27</b> )	Ruggedized, broader spectrum radiation measurement capability ( <b>AN/PDR-56F</b> ) and multi-function, digital radiacs ( <b>ADM 300</b> )	Improved multi-function, digital radiac equipment	No change	No change
Inaccurate whole body radiation dose measurement ( <b>IM-93</b> )	No change	No change	No change	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

#### **2.3.4 Navy Avoidance**

The Naval forces face a two-fold challenge to contamination avoidance. The Navy must consider both open sea threats and threats in port. With the increased role of the Navy in “brown water” operations, the need for detection and warning of contamination from the effects of WMD is becoming increasingly important.

For Naval forces at sea, prompt or remote detection of NBC agents provides a real opportunity to either avoid or minimize contamination. Accordingly, the Navy has invested in the development of a variety of detection devices.

The Navy’s on-going biological defense efforts now managed by the JPO-BD, will provide a core biological detection capability through rapid prototype Interim Biological Detector System (IBADS) for ship platforms. Concurrent development for the objective Biological Agent Detector System (BADS) will provide a fully automated, shipboard, point detection and stand-off capability to be integrated into the tiered detection strategy. BADS will also provide monitoring capability for decontamination assessment. The Navy contamination avoidance programs are described in detail in Annex C.

Table 7 contains the Navy’s programs for contamination avoidance. Near term requirements include the capability to detect nerve and blister agent vapors (IPDS); a multi-function detector for radiation (MFR); and a biological detector (IBAD). Mid-term requirements include a detection capability for liquid agents (SALAD); improved, portable detector for nerve and blister agents (SCAMP); and a biological detection capability (BAD) which improves the IBAD. Future capability requirements focus on a stand-off chemical agent detector (CARD) and a Chem/Bio detector.

**TABLE 7**  
**NAVY**  
**CONTAMINATION AVOIDANCE**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Manual point sampling for liquid nerve, blister and blood agents (M8/M9)	Improved manual point sampling for liquid, nerve, blister and blood agents (M256A1)  Manual, portable water sampling kit to detect nerve, lewisite, cyanide and mustard agents in raw or treated water (M272 Kit)	No change  No change	Shipboard automatic chemical liquid agent detection (SALAD)  No change	Single molecular recognition by proximal probe (Chemical and Biological)  No change
No standoff point detection capability for chemical agents	Shipboard mounted, portable standoff detector for nerve agent clouds (AN/KAS-1)	No change	No change	Standoff chemical Agent detection (CARD)
No automatic point detection capability	Shipboard mounted, automatic point detector for nerve agent vapors (CAPDS)	Improved shipboard automatic point detector for nerve and blister agent vapors capable of identifying known interferents (IPDS)	Portable, shipboard chemical agent monitor capable of detecting nerve and blister agent vapor (SCAMP)	No change
No biological agent detection or identification capability	Manual flow thru assays to ID a limited number of biological warfare agents	Biological agent point detection utilizing particle sampler and improved assays (IBAD)	Automatic, multi-tiered biological agent detection system capable of remote, point and portable detection (BADs)	No change
Portable RADIACS and dosimeters for radiological contaminants (AN/PDR-27, 43, 65 and IM-143)	No change	Improved, multi-function radiac (MFR) Combines function of AN/PDR -27 and -43	No change	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to and existing capability, only the improvements is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

### **2.3.5 Marine Corps Avoidance**

The Marine Corps has similar concerns as the Army for contamination on the battlefield. The Corps is looking toward requirements that will provide an integration of capabilities to include stand-off detection, contaminated area marking, and interface with NBC hazard and warning systems. The Marine Corps also requires a biological detection capability. A summary of the programs is outlined in Table 8. Details of specific Marine Corps avoidance programs are in Annex D.

**TABLE 8**  
**MARINE CORPS**  
**CONTAMINATION AVOIDANCE**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Manual point sampling for chemical agents (kits for vapor and paper for liquid)	No change	No change	No change	No change
Automatic point detection capability for chemical vapors and aerosols	Automatic hand-held point detection for monitoring chemical agent contamination of personnel and equipment for blister and nerve agents ( <b>ICAD/CAM</b> )	Improved CAM will provide addition agent detection capability	No change	No change
Not satndoff point detection capability for chemical agents	Standoff capability to detect nerve and blister agent vapor at ranges up to 5 km in stationary mode ( <b>M21</b> )	Standoff capability to detect nerve and blister agent vapors at ranges up to 5 km in the stationary mode or on-the-move ( <b>LSCAD</b> )	No change	No change
No biological agent detection or identification capability	Manual point sampling for biological agents	Automatic detection of biological agents ( <b>Bio Point Detector</b> )	Hazard and warning capability expanded to include biological detection and identification ( <b>Advanced Bio Detector</b> )	Expanded capability to detect and identify all known chemical and biological agents ( <b>Advanced Bio Detector</b> )
	No hazard and warning system capability	Hazard and warning system to provide early warning of chemical contamination ( <b>NBC HAZWARN</b> )		
No nuclear detection capability	Portable radiacs and dosimeters to detect radiological contaminants	Improved, multi-function radiac ( <b>MFR</b> )	No change	No change
Manual reconnaissance; very slow, ineffective	High speed semi-automatic chemical agent recon	Mobile automatic integration of chemical detection technologies with 5 km standoff on-the-move capability; marking of contaminated areas; interface with NBC hazard and warning system ( <b>NBCRS</b> )	Addition of biological detection and identification interface capability	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

## 2.4 PROTECTION

It is not reasonable to assume all forces can avoid NBC hazards. Despite advances in theater missile defense, enemy missiles may possibly penetrate and there will still be a threat to forward deployed forces. Combatants must be adequately protected. The protection provided must not degrade the performance of people, weapons, or equipment or, if

degradation is unavoidable, it must be minimized. In some cases, vehicular collective protection, which reduces the need for mission oriented protective posture (MOPP) gear, provides a reasonable solution. The degradation associated with MOPP could jeopardize operations in all stages of battle.

When forces cannot avoid NBC hazards, they must take protective measures. Commanders adopt MOPP levels based on their analysis of the situation. Protective measures consist of two categories: individual and collective protection.

### ***Individual Protection***

With Operation Desert Storm (ODS) and the end of the Cold War, the focus for a chemical threat changed to include the hot, dry desert environment, such as Southwest Asia. Chemical protective garments such as the Battledress Overgarment (BDO) provide excellent protection and durability. However, there are detriments to consider in terms of heat stress, weight and bulk. Although Army studies show that there may be no “clothing only” solution to the heat stress problem at temperatures above 100°F, there are physiological benefits from garments with reduced bulk and weight, especially at moderate temperatures.

Individual protective equipment (IPE) consists of both respiratory and percutaneous protection: a mask with hood and protective garments, boots, and gloves. The IPE issued to US forces provides full protection against all threat CB agents. The capabilities of this equipment are demonstrated almost daily through use with actual chemical agents in the Chemical Defense Training Facility (CDTF) at the US Army Chemical School, Fort McClellan, Alabama. Providing the required level of protection against liquid and vapor CB hazards requires trade-offs between protection and the operational degradation which it imposes. DoD is actively pursuing improvement and modernization programs, as shown in Table 9, to minimize degradation and improve the individual’s combat effectiveness.

### Joint Service Lightweight Integrated Suit Technology (JSLIST) (A Joint Service Cooperation Success Story)

Many new material technologies, both domestic and foreign, have become available which offer promise for chemical protective clothing which can maintain current protection and durability levels with reduced bulk and weight. The four Services have consolidated their requirements into a first truly joint evaluation program for the next generation chemical garments-the Joint Service Lightweight Integrated Suit Technology (JSLIST) program. 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 USMC 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. There will be one overgarment design, one design for a primary garment, and an undergarment design. Inter-Service compatibility will be maximized. Material components used in the designs can be varied to support Service unique requirements. Commonality, minimized number of suits and inter-Service use will be promoted.

Source selection and award of an integrated procurement contract will occur in FY94. The Development Testing/Operational Testing (DT/OT) will be conducted in FY95-96. The garments will be type classified in FY96, and an Low Rate Initial Production (LRIP) quantity will be fielded in early FY97.

Plans are underway in the JSLIST to create an avenue for new candidate chemical protective materials and prototype ensembles to be evaluated for technical merit and performance for technology insertion into the Service garments.

This consolidation of development will ensure that the best technology is available to all Services. The variations in suits will be minimized; yet there will be maximized economy of scale which will enhance the industrial production base. All materials which meet the Services' requirements will be placed on a Qualified Materials list to encourage multi-source competition and to provide surge capability. And the Service resources will be conserved to the maximum extent possible.

Long term efforts will focus on a more integrated protection scheme called "The 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 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 of chemistry and physics.

### ***Collective Protection***

Collective protection (CP) systems, provide NBC protection at the crew, unit level, and naval ship level. CP fills two critical combat needs:

- "Clean" environment for critical operations where IPE otherwise places an unacceptable burden upon the service member in performing duties
- Essential rest and relief for the service member operating with the burden of IPE. In the past CP has been integrated into a limited number of combat vehicles, critical command posts, ships, medical facilities, and critical weapons control systems.

A summary (Modernization Strategy) of Joint Protection Requirements is depicted at Table 9.

**TABLE 9**

**JOINT REQUIREMENTS  
(MULTI SERVICE INTEREST)  
PROTECTION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY 98-02)</b>	<b>FAR (FY03-08)</b>
<b>INDIVIDUAL</b>  Protective mask with adequate fit and protection, filter good for multiple attacks	Mask with improved fit, protection, and comfort; easy to change high capacity filters; enhanced optical compatibility and communications coupling; NATO standardized filter kit  Aircrew mask compatible with integrated helmet and display system for AH-64 aircrew, drinking compatibility	Voice amplification  Laser/ballistic eye Protection  Aircrew mask compatible with all helicopter sighting systems and night vision goggles, protection against future threat agents	Reduced physiological burden, improved comfort, enhanced optical and communications coupling  Light forces protective mask	Advanced Integrated Individual Soldier Protection System (Future Soldier System)  Improved multiple agent protection
Limited liquid and vapor protective clothing	Improved protection	Lightweight reduced heat stress integrated with all respiratory and microclimatic cooling systems	Integrated multiple threat modular protection (chemical, biological, environmental, ballistic, directed energy, and flame)	No change
<b>COLLECTIVE</b>  Filtered pressurized air (allows shirt sleeve operations-no mask or protective clothing needed)	Improved protective shelters (easier to setup, transport, & maintain)  Increased over pressure application on vehicles	Higher entry/exit rates, Medical airlock for litter patients	Regenerable protective filtration; reduces logistics burden, size, weight, power needs; protects against future threat agents	Advanced protective filtration systems for Low Observable Vehicles; light forces

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

**2.4.1 Army Protection**

***Individual Protection***

Individual protection for the soldier consists of both physical (respiratory and whole body) protection and immunization. Protective masks provide respiratory protection. A protective uniform (with boots and gloves) protects the rest of the body. Future protective ensembles (mask plus uniform) integrate NBC protection with environmental, ballistic, directed energy, and flame protection to maximize soldier effectiveness and minimize performance degradation. Detailed description of Army protective masks programs are in

Annex E and protective clothing programs are in Annex F.

The soldier's protective mask is the first line of defense against CB agents when contamination cannot be avoided. Although of older design, the currently-fielded masks (M17 series field mask; M24 aviator mask; and M25 combat vehicle crewman mask) provide adequate protection against multiple attacks of all known threat agents.

Fielding of the M40 series masks is currently underway. The M40 and M42 masks (for individuals and armored vehicle crewmen, respectively) will 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 weapons system optics and sights. The M43 and M43A1 aviator protective masks will replace the M24 series masks. The M43 mask, designed for Apache helicopter crewmen, provides compatibility with the Apache's unique "heads-up" helmet display sighting system and night vision goggles. The M43A2 will be issued to all other aviators. Thus, over the next four years the Army will accomplish a complete mask changeover, providing the soldier with the best available protection and reduced degradation of combat effectiveness.

As the new masks are fielded, the Army will continue to seek further improvements to this critical item. A pre-planned product improvement program will incorporate laser and ballistic protection to the mask lens. Research and development will also focus on improved charcoals and filtering technologies, as well as improved masks for Light and Special Operations Forces (SOF).

Chemical protective clothing is the second critical component of the soldier's Individual Protective Equipment (IPE). The Battledress Overgarment (BDO) was fielded in 1984 and is the Army's current chemical protective garment. The BDO was originally developed to defeat a Warsaw Pact threat in a Middle European environment. The BDO provides excellent CB protection. As demonstrated in Operation Desert Storm (ODS), the bulk and weight can create a heat stress burden after a period of time in hot environments unless heat stress management practices are employed. In ODS, training and doctrinal procedures for wear and use of the BDO, including work-rest cycles, helped mitigate the effects of the desert environment. Testing has confirmed that the BDO has a shelf-life of 12 years. Once the current procurement of BDOs is delivered in FY94, there will be enough BDOs in inventory to support Army needs until the next generation chemical protective garments are fielded via the JSLIST program. Should any procurements be required before the JSLIST garments are fielded, the Army has adopted the Saratoga uniform, with some design changes, as an alternative to the BDO.

Army aircrews have adopted the Aircrew Uniform Integrated Battlefield (AUIB) as a flame resistant and CB protective uniform (in place of the BDO worn over the Nomex flight suit). Army armor crews have recently adopted the Chemical Protective Undergarment (CPU) which is worn under the Nomex coveralls for chemical protection (in place of the BDO worn over the Nomex suit). A Vapor Protective Flame Resistant Undergarment will be the next generation garment for Army combat vehicle crew.

The Army, like the USAF and USMC, wears the green vinyl overboot (GVO) for environmental protection and chemical protection. The GVO replaced the fishtail footwear. A black modification of the GVO, with improved closures, has been adopted; the BVO will replace the GVO as stocks are exhausted. The Army is conducting a development program for a Multipurpose Overboot which will replace the current black vinyl overboot with a boot that has greater durability, better traction on all surfaces and improved protection. For chemical protection of the hands, the Army wears the 25 mil butyl glove used by all Services. The 7 or 14 mil gloves are available for missions requiring greater tactility. A program is underway for an Improved CB Protective Glove which will have better tactility and protection. The other Services have an interest in the protective boot and glove items. The program schedules are parallel to the JSLIST schedule.

The Army is also developing an auxiliary cooling system to enable ground troops to perform heavy work for at least 6 hours in MOPP gear with a backpack that weighs no more than 15 pounds. Armor crews currently use the M1A1 cooling vest but will consider an improved design. An aircrew vest is being developed in conjunction with an aircraft micro climate conditioning system.

Army Explosive Ordnance Disposal (EOD) soldiers and civilians working in Army chemical depots currently use the Toxicological Agent Protective (TAP) ensemble for chemical ordnance operations. For sustained EOD and depot operations in contamination concentrations which are of Immediate Danger to Life and Health (IDLH), the Self-Contained Toxic Environment Protective Outfit (STEPO) is being developed for fielding in FY96. An interim STEPO has been approved and fielded for 2-hour depot operations, to be used for IDLH operations until STEPO is fielded. A draft requirement is being staffed for an Improved TAP (I-TAP) ensemble which will bridge the gap between Level B operations and IDLH operations requiring the STEPO. The I-TAP will incorporate improvements in material and design and includes a one-hour supplied air bottle system which can be switched to a filtered air respirator when operators exit the area of high contamination. A Personal Ice Cooling System (PICS) is being developed for use with the I-TAP. The I-TAP and PICS will be joint service programs. In addition, the Army is working with the Air Force on a chemical protective fire fighter's suit.

Table 10 Provides a summary of the Army's individual protection programs.

**TABLE 10**

**ARMY  
INDIVIDUAL PROTECTION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Respiratory and eye protection with communications, drinking capability and internally-mounted corrective lenses; not compatible with night vision devices/target sighting systems <b>(M17 Field, M24 Aviator, M25 Tanker Masks)</b>	Improved fit and comfort; easy to change external filter canisters; enhanced optical compatibility; NATO standard filter canister <b>(M40 Field, M42 Tanker Masks)</b>  Compatible with integrated helmet and display system for all Apache helicopter; aviator (helicopter) crew mask <b>(M43/M43A1)</b>	Better comfort, improved decontaminability <b>(M40A1/M42A1)</b>  Improved compatibility with aviation sighting/night vision systems <b>(Aircrew Protective Mask)</b>	No change	Integrated eye/respiratory protection with soldiers system <b>(RESPO 21)</b>  No change
Bulky charcoal impregnated foam suit, adequate protection <b>(Chemical Protective Overgarment (CPO))</b>	Improved Protection/durability <b>(Battle Dress Overgarment (BDO))</b>  Undergarment capability <b>(Chemical Protective Undergarment)</b>	Advanced protective suit technology: lighter, improved agent protection/flame protection <b>(JSLIST)</b>  Improved protection w/self-contained breathing capability for special purposes <b>(STEPO)</b>	Improved protection/less burdensome protective suits <b>(JSLIST II)</b>	Improved protection/less burdensome protective suits <b>(JSLIST III)</b>
Hard-to-don, awkward foot protection <b>(Chemical Protective Footwear Covers)</b>	Less awkward, easier donning <b>(Green Vinyl Overboot/Black Vinyl Overboot)</b>	Improved foot protection <b>(Multipurpose Overboot)</b>	Improved protection/less burdensome foot protection <b>(JSLIST II)</b>	Improved protection/less burdensome foot protection <b>(JSLIST III)</b>
Bulky hand protection <b>(Chemical Protective Gloves – 25 ml)</b>	Improved tactile materials <b>(Chemical Protective Gloves – 7,14,&amp; 25 ml)</b>	Improved hand protection <b>(Improved CB Glove)</b>	Improved protection/less burdensome hand protection <b>(JSLIST II)</b>	Improved protection/less burdensome hand protection <b>(JSLIST III)</b>

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

***Collective Protection***

The NBC Collective Protection Modernization Program concentrates on the following technology and development areas: (1) improved air filtration methodologies, (2) advanced technologies integrated into power and ventilation for Army systems, that offer a significant improvement in logistics, and (3) applications on essential Army vehicles, vans and shelters. CP programs are in place to support the Comanche and Armored Systems Modernization by providing advanced filtration systems and environmental conditioning systems. Complete descriptions of these programs are in Annex G.

Presently, CP is used to increase combat capabilities of the M1A1 tank. The system incorporates overpressure and micro climate cooling that improves both fighting efficiency and soldier morale as demonstrated during ODS. Improved Modular Collective Protection Equipment (MCPE) is also being applied to numerous combat support systems such as PATRIOT and TACFIRE.

The portable M20 Simplified Collective Protection Equipment (SCPE) is adaptable to existing structures as a command post/rest and relief facility. Near-term programs will address maintainability for all CP equipment, system set-up and transportability for SCPE. The ability to provide more rudimentary medical care in an NBC environment depends on collective protection. The Chemical/Biological Protective Shelter (CBPS) and the hardened NBC Protective Shelter for Tactical Medical Unit (DEPMEDS) (fielding FY95/96) will significantly improve our medical readiness.

The MCPE is being extended and improved to support tactical needs, and SCPE for use in tents and deployable medical facilities.

Table 11 provides a summary of the Army's collective protection programs.

**TABLE 11  
ARMY  
COLLECTIVE PROTECTION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
No collective protection capability for soldiers; no protection for supplies	Transportable, fixed site collective protection ( <b>SCPE-Shelter, M20A1</b> )	NBC protection for supplies ( <b>NBC Protective Cover</b> )	NBC protection for Integrated Command Post	Integrated regenerable filtration
Ventilated/filtered systems in combat vehicles ( <b>GPFU</b> )	Integrated protection in some combat vehicles/shelters	No change	Modular, reduced size, weight, power for vehicle/shelter collective protection equipment ( <b>AICPS</b> )	Integrated regenerable filtration
Bulky, power intensive collective protection for medical operations ( <b>M51</b> )	No change	Collective protection for tactical medical hospitals ( <b>DEPMEDS, M28</b> )	Collective protection for Forward tactical medical units ( <b>Chem/Bio Protective Shelter</b> )	Integrated regenerable filtration

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

## **2.4.2 Air Force Protection**

Currently, Air Force protection programs focus on individual protection. The detailed descriptions of the Air Force protective programs are at Annex H. Table 12 provides a summary of the Air Force's protection systems that are fielded and proposed.

## ***Individual Protection***

Current plans for improving individual protection include evaluating material technologies which offer enhanced liquid and aerosol barriers, breathability, durability, decontaminability, tactility and reduced thermal burden. USAF inventory aircraft are being modified with Aircrew Eye-Respiratory Protection (AERP) systems to protect aircrews from CB hazards. This system compliments the recently fielded lighter-weight aircrew overgarment. Ground crews are receiving a new mask which offers improved protection. New protective ensembles are being developed for ground crews and specialized fire fighting and EOD activities. The Air Force is presently conducting a limited test of a protective mask fit validation system to determine how well its newly fielded protective masks fit its troops.

After the Army performed the initial developmental work on the XM-30 mask and it did not meet Army requirements, the Air Force and Navy pursued continued development and procurement. Redesignated the MCU-2/P, it has a single, flexible eye piece that promotes better vision and better interface with optic devices (i.e. range finders, night vision goggles, binoculars, etc.). The NATO standard screw-on canister filter allows for easier replacement without disassembling the mask. Also, the canisters can be attached to either side of the mask. However, the mask has a low resistance to penetration by liquid chemical agents. The butyl rubber impermeable hood is necessary to protect wearers against liquid agents. Further, the separate hood provides improved head mobility over other NATO designs and makes the mask easier to decontaminate.

The Air Force fielded the MCU-2A/P ground crew protective mask to replace the M17, the Aircrew Eye/Respiratory Protection (AERP) mask to replace the CRU-13/P, and the CWU-66/P Aircrew Ensemble to replace the old three piece ensemble. The Air Force also completed development of the Multi-man Intermittent Cooling System and provided it to the Desert Storm forces to extend work times during work-rest cycles while in protective clothing.

The Air Force is also developing CB protection for firefighters and Explosive Ordnance Disposal personnel and an inexpensive, compact disposable mask to be carried by air and ground personnel where the threat is not great but exists, without burdening personnel with the full head/respiratory protection of the AERP or the MCU-2A/P. The Air Force has a requirement for individual body cooling for personnel in full protective clothing, and is monitoring Army development of such a device. The Air Force is also cooperating in the JSLIST program with the other Services.

## ***Collective Protection***

The Air Force is currently re-evaluating the concept of collective protection. Revised policy will address the future requirements for collective protection and use of open air toxic free areas or shelters for rest and relief of personnel.

**TABLE 12  
AIR FORCE  
PROTECTION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Air respiratory protection for ground personnel (M17) and aircrew personnel (MBU-13/P)	Improved air eye/respiratory chemical protective mask for ground personnel (MCU-2A/P); provides easier filter changes, better seal, more ease in carrying/maintaining (Aircrew Eye Respiratory Protective Mask (AERP))	Disposable Eye/respiratory system	No change	No change
Bulky charcoal impregnated foam suit, adequate protection (Chemical Protective Overgarment (CPO))	Chem protective suit with enhanced protection, longer wear life (Battle Dress Overgarment (BDO))	Improved lightweight overgarment to reduce overall physiological stress (JSLIST)	No change	No change
Aircrew ensemble with no chemical protection capability (CWU-27P)	Improved ensemble reducing thermal burden while providing chemical protection (CWU-66/P)	No change	No change	No change
Black rubber overboots with ties	Improved Green Vinyl Overboot, easier to put on, more durable	No change	No change	No change
Black vinyl glove with cotton inserts	No change	No change	No change	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

### **2.4.3 Navy Protection**

Detailed descriptions of the Navy protection programs are in Annex I. Table 13 provides a summary of the Navy's individual and collective protection programs.

#### ***Individual Protection***

The Navy ensemble of individual protective equipment (IPE) consists of the Chemical Protective Overgarment (CPO), Chemical Protective Glove Set, Chemical Protective Overboots (Fishtails) and the MCU-2/P Protective Mask.

The CPO is an adaptation of the British Mark III protective suit. It consists of a parka and trousers. Both have two layers: inner (anti-gas), and outer (modacric/nylon). Each piece of the CPO is issued in a mylothene envelope that is pressure packed, air evacuated and heat sealed. The CPO has a shelf life of 10 years when unopened. The CPO protects against all known chemical agents and is permeable to water vapor. The suit was designed to meet the requirement for a six hour protection time, protection against 2gms/m<sup>2</sup> of liquid HD and an

allowable breakthrough of vapor of 4 microgram/cm<sup>2</sup>. Once removed from its protective envelope it has a service life of 100 hours in a non-chemical environment.

Procurement of the Navy's Advanced Chemical Protective Garment (ACPG) as a replacement for the CPO now in the fleet, will begin in FY97. The Navy is participating in the Joint Service Lightweight Integrated Suit Technology (JSLIST) program governed by a Memorandum of Agreement, with Marine Corps as the lead service.

### ***Collective Protection***

The Navy has incorporated Collective Protection Systems (CPS) into selected new construction combatants, logistics support and amphibious ships. Ship classes with installed CPS include: DDG-51, LHD-1, AOE-6 and LSD-41. It provides a contamination-free environment to selected areas (zones) which allows personnel to safely work, rest and eat without the need for protective clothing or a protective mask. An integral part of the ship's ventilation system, CPS utilizes special filters to remove NBC contaminants from the atmosphere. The air inside the zone is maintained at a higher pressure than the outside air which prevents leakage of contaminants into the protected zone. CPS achieved Milestone III on 9 Aug 93. For ships without installed CPS there is Selected Area Collective Protection System (SACS) available. By modifying existing ventilation systems, SACPS will create safe zones in selected areas on the ship. Like CPS, these zones will provide a contamination free environment where it is not necessary to wear individual protective equipment.

**TABLE 13  
NAVY  
PROTECTION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
<b>INDIVIDUAL</b>  Protective mask with adequate fit and protection, filter good for multiple attacks ( <b>MK V</b> )	Mask with improved fit and comfort; easy to change filters; enhanced optical compatibility; NATO standardized filter kit ( <b>MCU-2/P</b> )	No change	No change	No change
Suit with some liquid and vapor protection	Charcoal impregnated foam suit, adequate protection ( <b>Chemical Protective Overgarment (CPO)</b> )	Lightweight overgarment to reduce heat stress ( <b>JSLIST</b> )	No change	No change
<b>COLLECTIVE</b>  Ventilation intakes on ship secured ( <b>CIRCLE W</b> )	Protective zones designed into ship's ventilation system, utilizing filters and over pressurization ( <b>CPS</b> )	Capability to backfit ships without SPS with contamination free protected zones ( <b>SACPS</b> )  Improved filters to reduce maintainability and logistics burden	Advanced, regenerable non-carbon filtration systems ( <b>CATOX, CORONA Discharge</b> )	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

## **2.4.4 Marine Corps Protection**

### ***Individual Protection***

As already discussed, the Marine Corps is the lead for the JSLIST program in which all Services are participating. This program is a pure Joint venture and will serve as a model of cooperative development for future programs.

### ***Collective Protection***

The Marine Corps presently has approximately 240 prototype systems in war reserve. The Portable Collective Protection System (PCPS) program was discontinued based on the conclusion of the Cold War. The use of PCPS to support command and control functions was deemed inappropriate. The Marine Corps position on the need for collective protection is currently being re-evaluated.

Table 14 provides a summary of the Marine Corps' individual and collective protection programs. Annex J contains detailed description of Marine Corps protection programs.

**TABLE 14  
MARINE CORPS  
PROTECTION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
<b>INDIVIDUAL</b>				
Protective mask with adequate fit and protection, filter good for multiple attacks	Mask with improved fit and comfort; easy to change external, filter canisters; enhanced optical compatibility; NATO standardized filter kit ( <b>M40/M42 Field Protective Mask</b> )  Aircrew mask compatible with integrated helmet and display system for all helicopter and C-130 aircrews	No change	Light forces protective mask	No change
Suit with some liquid and vapor protection	Bulky suit, adequate protection ( <b>OG-84, Saratoga</b> )	JSLIST: -Lightweight CB Overgarment	JSLIST II – Technology - Insertion for Garments, Boots and Gloves	No change
	Green Vinyl Overboot	- Multipurpose Overboot		
	Black rubber Gloves, 20 mil	- Improved CB Glove		
<b>COLLECTIVE</b>				
Hybrid type systems in combat assault vehicles (AAVs, LAVs, and tanks)	Hybrid type filtration systems in combat assault vehicles (AAVs and LAVs)  Over pressure systems in main battle tank and NBC recon system	Collective protection for all combat assault vehicles and unit shelter systems	Advanced, regenerable filtration systems for collective protection systems for all vehicles	No change
No unit collective protection capability	Unit protection (PCPS)		No change	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

## 2.5 DECONTAMINATION

Decontamination is necessary to remove any contamination incurred by personnel or equipment. The ultimate goal is to reduce the MOPP level. DoD has fielded a number of items and systems for skin and equipment decontamination which, as shown in Table 15, have greatly improved its capability in this functional area.

**TABLE 15**

**JOINT REQUIREMENTS  
(MULTI SERVICE INTEREST)  
DECONTAMINATION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Capability to remove and neutralize agent (slow, laborious, caustic decontaminants)	Less caustic to skin, easier to use and store	Less caustic and damaging to equipment	Non-caustic, non corrosive decontaminate for personnel and equipment	No Change
Multiagent decontaminants (highly caustic, corrosive, difficult to store, require water rinse)	No Change	Non-caustic, non corrosive, easy to store multipurpose decontaminate	Auto-releasing coatings; reduces skin contact hazard & labor requirements	Self-decontaminating auto-releasing coatings; reduces manpower and logistic requirements, eliminates skin contact hazard
Manual decon spray capability for small critical areas of vehicles and equipment	Large capacity, pump dispensing system with scrubbing capability	No Change	No Change	No Change
Powered decon wash capability (significant manpower & logistics burden)	Lightweight decon wash capability (easier to transport & maintain)	High pressure water wash; mechanical scrubber; improved decontaminate dispenser (increased vehicle throughput)	Non-aqueous capability for electronics, avionics and other sensitive equipment	Rapid, large scale automated decon capability; reduced manpower and logistic burden  Vehicle interior decon capability

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

**2.5.1 Army Decontamination**

Decontamination modernization consists of multipurpose decontaminants and lightweight modular dispensing systems. Emphasis is on non-corrosive, all-agent decontaminants for personal equipment and sensitive electronics. Self-decon coatings on vehicles and weapons systems ultimately eliminate contact hazards, reducing or eliminating the need for decontamination, and allowing continuation of combat operations. Detailed descriptions of Army decontamination programs are provided in Annex K.

Recently, the Army fielded the new M291 skin decontamination kit. It is more effective, has more capability to decontaminate skin and individual equipment, and is easier to use than the M258A1 kit it replaces.

Vehicle and crew-served weapons decontamination has also been enhanced by fielding of two new decontamination systems. The M17 Lightweight Decontamination System (LDS) has also been introduced to provide a viable decontamination system to battalions and subordinate units to conduct operational decontamination and then resume combat operations. The system provides a rapid rinse of vehicle and equipment, and replaces division level decontamination which is currently served by the M12A1 Power-Driven

Decontaminating Apparatus. Both the older M13, Decon Apparatus, Portable and M17 decontaminating systems were available in South West Asia (SWA).

Near, mid, and far-term decontamination research and development programs are being pursued for new individual and equipment decontaminants, equipment and coatings. The larger capacity kit has been type classified as the M295. It is issued to decontaminate personal equipment. Additionally, a multi-purpose decontaminant is being sought to replace bulk caustic Decontaminating Solution-2 (DS2) and corrosive Super Tropical Bleach (STB) at decontamination stations. It is intended to ensure operational, logistic, cost, safety, and environmental advantages over current materials. A modular decontamination system will be introduced to enhance vehicle and crew-served weapon decontamination. It will completely equip a decontamination site, and will reduce logistics burden and workload requirements on the soldier. It will also offer size and weight reductions, mechanical scrubbing, and improved decontaminant dispensing capability. The Army is currently researching ways to increase decontamination effectiveness and reduce or eliminate the necessity of manual decontamination.

Table 16 provides a summary of the Army's decontamination programs.

**TABLE 16  
ARMY  
DECONTAMINATION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Powered decon wash capability (significant manpower & logistics burden) ( <b>M12A1, 5 ton</b> )	Lightweight decon wash capability (easier to transport & maintain) ( <b>M17 Lt Wt Decon Systems (LDS)</b> )	No change	High pressure hot water washing & decontaminant scrubber capability ; reduced water, labor & logistics burden ( <b>Modular Decon System (MDS)</b> )	Waterless decon capability for electronics/avionics
Capability to remove and neutralize agent (slow, laborious, caustic decontaminants)	Personal decon kits; more efficient, less caustic to skin; resin absorbent ( <b>M258A1/M291 Kit</b> )	Larger capacity kits	Higher efficiency decon methods ( <b>Sorbent Decon</b> )	No change
Multiagent decontaminants (highly caustic, corrosive, difficult to store, require water rinse)	Effective, standard decontaminants for all known agents ( <b>Decon Agent DS-2</b> ) ( <b>Corrosive, Haz Mat</b> )	No change	Environmentally acceptable replacement for DS-2	No change
Manual decon spray capability for small critical areas of vehicles and equipment ( <b>M13 Decon Apparatus, Portable (DAP)</b> )	No change	No change	No change	Advanced non-aqueous self-strip decon coatings to reduce water and labor requirements

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

### 2.5.2 Air Force Decontamination

The Air Force cannot use the corrosive standard decontaminants on sensitive aircraft materials. Several years ago the Air Force procured the Lightweight Decontamination System (LDS), for use with water or steam only, from the off-shore source. The Army later improved the LDS and standardized it as the M17.

The Air Force has a requirement for aircraft interior decontamination and is working on several approaches to solving this very complex problem, including participation in a joint NATO working group, which the Air Force heads.

Table 17 provides a summary of the Air Force’s decontamination programs. Detailed descriptions of Air Force decontamination programs are in Annex L.

**TABLE 17**  
**AIR FORCE**  
**DECONTAMINATION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Personal, expedient decontamination of self and personal equipment (M13,M258, M258A1)	Improved less caustic (to skin) personal decontamination capability (M290/291)	No change	No change	No change
Large capacity decontamination (M12A1) and small, portable capability (ABC-M11)	Improved safety features, ease of mix and portability for large scale decontamination capability (M17,A/3 32U-8 remake)	No change	Safe decontamination for personnel without degrading aerospace materials (Aircraft Interior Decontamination System)	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

### 2.5.3 Navy Decontamination

The goal of the Navy’s Chemical, Biological, Radiological Defense (CBR-D) program is to ensure that the potential or actual employment of these weapons against a naval force will be a non-decisive factor in any operation. Details of Navy decontamination programs are provided in Annex M. Table 18 provides a summary of the Navy’s decontamination programs.

Navy decontamination efforts can be divided into four levels:

- Emergency Personnel Decontamination is that which is necessary to save

life. The goal is to safeguard the individual. It is vital to destroy, neutralize or remove contamination from exposed skin areas.

- Limited Operational Decontamination is that which is necessary to allow individuals to perform their tasks with a minimum risk of contact, pick-up and transfer of contamination. The objective is to destroy, neutralize or remove persistent contamination located on structures and/or equipment in places where they constitute a contact hazard.
- Operationally Complete Decontamination is that which is in such detail and completeness that contamination of personnel, structures and equipment is reduced to a level which results in a significant operational benefit. It entails reducing contamination to the lowest level possible at sea by ship's company.
- Complete Decontamination is a degree of decontamination such that appropriate tests fail to give positive response for residual agents. Decontamination at shipyards, advanced bases or by shore based personnel will normally be required to achieve this level of decontamination.

**TABLE 18**  
**NAVY**  
**DECONTAMINATION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY97-02)</b>	<b>FAR (FY03-08)</b>
Personal, expedient decontamination capability to remove and neutralize chemical agents (M258, M258A1)	Improved less caustic personal decontamination capability to remove and neutralize chemical agents (M291)	Less caustic capability	No change	No change
Saltwater spray for topside	Chloride solution for multi-agent decontamination (HTH)	No change	Enzymes for chemical agent decontamination	Contamination resistant shipboard materials

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

#### **2.5.4 Marine Corps Decontamination**

Marine Corps decontamination challenges are similar to those of the Army. Since the Marines must “travel light” it is necessary that decontamination equipment by this force is light and transportable. Marine Corps decontamination programs are summarized in Table 19. Detailed description of Marine Corps decontamination programs are in Annex N.

**TABLE 19**  
**MARINE CORPS**  
**DECONTAMINATION**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
Personal decontamination capability to remove and neutralize chemical agents; slow, laborious, caustic decontaminates	Improved less caustic personal decontamination capability to remove and neutralize chemical agents; easier to use and store ( <b>M291 Kit/M258A1</b> )	Less caustic and damaging to equipment ( <b>M291/M295</b> )	Non-caustic, non corrosive decontaminate for personnel and equipment	No change
Multi-agent decontaminates; highly caustic, corrosive, difficult to store, requires water rinse ( <b>DS2 and STB</b> )	No change	Non-caustic, non corrosive, easy to store multipurpose decontaminate	Auto-releasing coatings; reduces skin contact hazard & labor requirements	Self-decontaminating auto-releasing coatings; reduces manpower and logistic requirements, eliminates skin contact hazard
Manual decon spray capability for small critical areas of vehicles and equipment  Powered decon wash capability; significant manpower & logistics burden	Lightweight decon wash capability; easier to transport & maintain ( <b>M12A1/M17A3 LDS</b> )  Portable systems, used for operator spraydown ( <b>ABC-M11, M13 DAP</b> )	No change	Non-aqueous capability for electronics, avionics and other sensitive equipment	No change

Notes:

1. A no change entry indicates no new capability is being fielded in that time frame. Where there are improvements to an existing capability, only the improvement is listed.
2. Where applicable, systems which meet requirements are listed following the entry.
3. Systems are funded unless otherwise noted.

**NON MEDICAL R&D REQUIREMENTS ASSESSMENT**

**\* DoD perspective is that CB detection programs require focusing and prioritization. Priority must be given to those shortcomings identified in the Title V Report to Congress. DoD must field expeditiously a biological detection and identification capability and to expedite the fielding of stand-off technology for both chemical and biological detectors.**

**SOLUTION:** Conduct a Joint Service program review and Joint Mission Area Analysis to baseline the requirement for detection.

**\* Each Service defines NBC defense requirements independently as a consequence of their interpretation of their Title 10 responsibilities. This impacts the logistical supportability of their requirements because of the number of different versions or types of an item that must be supported on the battlefield, i.e., six**

**overgarments.**

**SOLUTION:** The Services have begun to review their requirements and consolidate their efforts in developing and procuring NBC equipment, i.e., JSLIST program.

**\* Requirements process lacks joint focus and senior leadership review. CINC involvement in the process is lacking. Army, as Executive Agent, lacks sufficient authority to make programmatic decisions and cannot adequately integrate the NBC defense program.**

**SOLUTION:** Develop and implement an improved management concept to review, coordinate, and integrate Service NBC defense programs. Ensure that the Joint Staff and joint approval process includes feedback and input from each CINC.

**\* OSD view is that collective protection was identified by the Services as a significant shortcoming in Title V, Persian Gulf Report. The Services are not adequately pursuing the necessary programs to correct the identified deficiencies particularly mobile, tactical shelters to support tactical forces. Medical collective protection is programmed to provide for force package one FY95/96. Is critical this be accomplished.**

**SOLUTION:** Conduct a Joint Service program review and Joint Mission Area Analysis to baseline the requirement for collective protection.

**\* Decontamination continues to be a labor-resource intensive process and relies on a water-based system. More resources are needed to develop and field improved systems based on non-water approaches and systems. Ecologically sound decontaminants must also be developed and fielded.**

**SOLUTION:** Conduct a Joint Service program review and Joint Mission Area Analysis to baseline the requirement for decontamination.

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## **CHAPTER 3**

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

### 3.1 REQUIREMENTS

DoD has maintained a robust medical research and development program for NBC defense for many years. This research 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 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**

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 constraint that preclude such efficacy studies for CW and BW countermeasures. Field studies of efficacy can not be performed, since exposure to CBW agents does not occur naturally. The high lethality and/or toxicity of CBW 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 CBW 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 20 provides a summary of the medical NBC defense programs.

### **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 O.

#### **3.2.1 Goals**

**Maintain technologic 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

**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 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

### 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 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.
- 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 counter-measures 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 P contains detailed description of the MBDRP.

#### **3.3.1 Goals**

- Protecting the US forces' war fighting capability during a biological attack, providing medical management of biological warfare casualties
- Preventing a threat surprise by maintaining a strong technology base. The program is directed against agents of biological origin that are validated military threats.

#### **3.3.2 Objectives (See Figure 3.1)**

- Prevent casualties with medical countermeasures:
  - Vaccine and toxoids
  - Drugs
- Diagnose disease:
  - Forward Deployable Kits
  - Confirmation Assays
- Treat casualties to prevent lethality and maximizes return to duty:
  - Antitoxins
  - Drugs

## **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 which 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 provides 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 the time release of the vaccine and delivery of the vaccine to target organs within the body.

### **TREATMENT**

- Human monoclonal antibodies. Use molecular genetics to produce large quantities of human monoclonal antibodies (bodies 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 doctors 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.

**Figure 3.1**

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

### **3.3.3 Threats, Countermeasures, and Technical Barriers**

The principal threat includes classical biological agents (such as anthrax), protein toxins, neuroactive compounds, and viral agents. The ease and low cost of producing an 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. The threat also includes use of biological warfare agents in combination with chemical and nuclear weapons.

The current MBDRP includes the following research subjects to develop medical countermeasures:

- Biochemical, physiological and morphological characterization 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.

## **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.

The detailed descriptions of the MNDRP are at Annex Q.

### **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 critically 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 20**

**MEDICAL NBC DEFENSE**

<b>PAST</b>	<b>PRESENT</b>	<b>NEAR (FY94-97)</b>	<b>MID (FY98-02)</b>	<b>FAR (FY03-08)</b>
<p><b>Medical – Biological Defense</b></p> <p>Antibiotic Therapy</p> <p>Traditional Diagnostic Cultures</p>	<p>Conventional killed vaccines and toxoids</p> <p>ELISA Diagnostic Assays</p>	<p>Monoclonal antibody therapy</p> <p>Genetically engineered vaccines</p>	<p>Mouse-Human monoclonal antibody therapy</p> <p>Proteosome deliver</p>	<p>Nucleic acid therapy</p> <p>Multivalent vaccines</p>
<p><b>Medical – Chemical Defense</b></p> <p>Agent Antidote Kit</p>	<p>Convulsive Antidote for Nerve Agent</p> <p>Mark I – Nerve Agent Antidote Kit</p> <p>M291 Resin-Based Skin Decontamination</p> <p>Nerve Agent Pretreatment (Pyridostigmine)</p>	<p>Multi-chambered Autoinjector</p> <p>Topical Skin Protection</p> <p>Establish feasibility of Catalytic Pretreatments for Nerve Agents</p>	<p>Advanced Anticonvulsant</p> <p>Nerve Agent Antidote System (NAAS; HI-6) agents</p> <p>Cyanide pretreatment</p>	<p>Catalytic Scavengers for Broad Range of CW Agents</p> <p>Reactive Topical Skin Protectant</p>
<p><b>Medical – Nuclear Defense</b></p> <p>Antibiotics</p> <p>Fluids</p>	<p>First generation immunomodulator therapy</p> <p>Anti-emetic compounds</p>	<p>Identification of cytokine for platelets</p> <p>Improved anti-emetic strategies</p> <p>Pharmacological approach to synapse deficits</p>	<p>Combination immunomodulator therapies</p> <p>New generation immunomodulators for multi-organ injuries</p> <p>Cognitive performance enhancing pharmaceuticals</p>	<p>Molecular strategies to reduce radiation-induced cancer/mutation</p>

## MEDICAL R&D REQUIREMENTS ASSESSMENT

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

***SOLUTION:*** Procure and stockpile sufficient stocks to inoculate US forces in accordance with recently issued DoD Directive. Complete the review on the best procurement option, e.g., government-owned and government-operated facility (GOGO), government-owned and contractor-operated facility (GOCO); contractor-owned and contractor-operated facility (COCO). DoD will need congressional support and additional funding to procure required vaccines.

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## **CHAPTER 4**

# **NUCLEAR, BIOLOGICAL AND CHEMICAL WARFARE DEFENSE LOGISTICAL STATUS**

## **4.1 INTRODUCTION**

Logistical support in the area of NBC defense is of considerable interest to the Services. As a result of Desert Shield/Storm, the Joint Services Coordination Committee (JSCC) was formed to address NBC defense logistics problems of the Services and key industrial base issues. In the light of recent changes in requirements, the Joint Logistics Commanders (JSC) and the JSCC have been reviewing the health of the NBC Industrial Base.

During the collection of data for this report, several problems were highlighted regarding the accountability and management of NBC defense item inventories. First, the Services have very limited asset visibility of most chemical and biological items below the wholesale level. Second, Services procure NBC items through multiple separate and distinct funding authorizations. For example, most individual protection items are procured using Operations and Maintenance (O&M) account monies 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 are aware of these problems and are working jointly to resolve them.

## **4.2 NBC DEFENSE LOGISTICS MANAGEMENT**

Defense Logistics Agency (DLA) and Army Materiel Command (AMC) are the inventory managers or National Inventory Control Points (NICP) for most NBC defense items. They are responsible for industrial base development, acquisition and storage of wholesale peacetime and sustainment wartime stocks. They are also responsible for maintaining dedicated Service wholesale war reserve sustainment stockpiles. Stocks in wholesale accounts would back-up unit-held Service stocks.

Service inventories of NBC defense items are maintained at unit level using unit-level manual records or using 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 an 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 inter-installation connectivity to link logistics data bases. 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) are entered and routinely tracked on SBSS. Other NBC defense items, because of reduced logistics coding requirement, are maintained only on non-automated unit records. Recognizing this deficiency, the Air Force is establishing Mobility Automated Inventory Tracking System (MAITS) to provide a semi-automated tracking system for Chemical 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 the other Services sub-automated data bases have different names the problem is 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 the TAV, a long term initiative, which will link existing DoD logistics automated systems.

Three DoD studies conducted during the last three years confirm that the NBC industrial base sector is composed of primarily small to medium size companies. These companies are heavily dependent on military requirements and sales for their survival. Recent changes in the CB threat as well as reductions in overall DoD CBD requirements have had a severe impact on this sector. Hence, this sector is extremely fragile. One measure the DoD is using to sustain this base is the “War Stopper” program. Selected CBD items have been included in the “War Stopper” program for which Congress provides specialized funding to sustain designated industrial base capabilities. Currently, the three CBD items in the “War Stopper” program are assessed in this report. DoD is reviewing its industrial base strategy for all items in this sector.

#### **4.3 QUANTITIES, CHARACTERISTICS, AND CAPABILITIES**

The results of the data collection efforts are compiled in Table 21, Logistic Readiness NBC Report Data. The items listed under *Nomenclature* are the currently fielded NBC defense items in each of the Services. The characteristics and capabilities of these items are detailed in Chapter 2 of this report. There are different versions of some similar items listed in Table 21.

Under the provisions of Title 10, 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 *Wartime Requirement* quantities reflected in Table 21 are those computed by the Services based on DOD’s strategy for responding to two nearly simultaneous major regional conflicts.

The *Wartime On-hand* quantities, on Pages 4-10 thru 4-13 of Table 21, are wartime stocks being held by the Services. On Pages 4-14 & 4-15, the quantities depicted are the stocks held by Army Materiel Command and Defense Logistics Agency at the wholesale level for both peacetime and wartime use. Quantities *On Contract* are those quantities for which a Service or an agency has submitted a requisition or purchase order and has not yet received the requisitioned items. Finally, the quantities depicted as *Estimated Procurements* are quantities the Services have forecasted 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 both wartime and peacetime consumptions of NBC assets, to include training use and shelf-life expiration.**

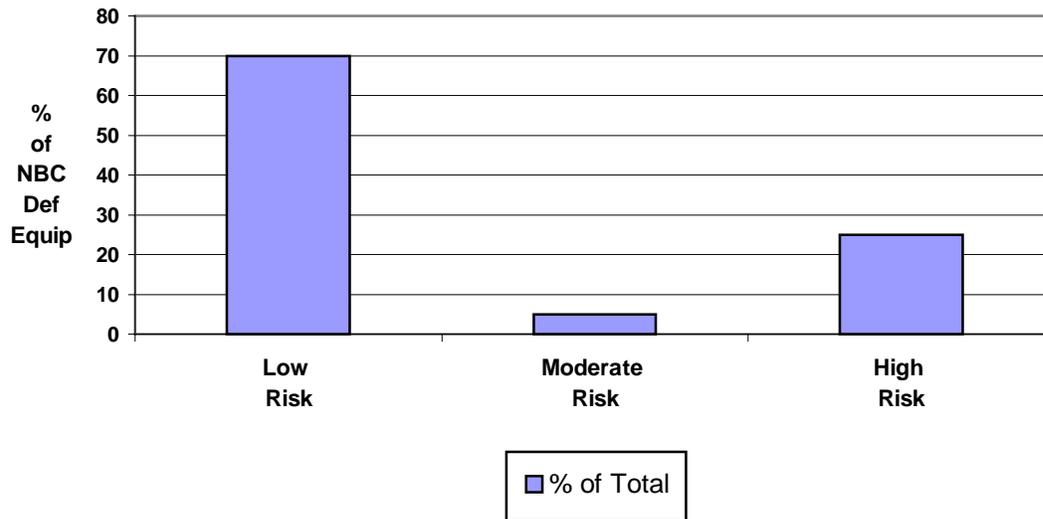
It must be emphasized that these are based on major command estimates of requirements. Actual procurements will be based on funding available during the appropriate time frame.

#### 4.4 LOGISTICS STATUS

Sixty-seven primary items of NBC defense equipment which are currently fielded were reviewed. NBC support items such as batteries, detector paper, decontaminates, mask hoods and filters, and so forth, were considered as a subset of the primary item. The quantity required for wartime needs was then compared to the quantity currently on-hand. The wartime requirement was based on the strategy for responding to two nearly simultaneous major regional conflicts. The items were assessed as low, moderate, or high risk based on Service data as of September 15, 1993. Table 22 contains exhibits which provide the complete results of the assessment. Risk was defined as the probability that a 15% shortage or more in the wartime requirement would exist which would severely impact a Service's capability to respond to a contingency.

Low risk was assessed if less than a 15% shortage existed or at least eighty-five percent (85%) of the wartime requirement was currently on-hand in service inventories. Moderate risk was assessed if a 15-30% shortage in the wartime requirement existed or the percentage of the wartime requirement was between seventy and eighty-four percent (70-84%). If the quantity on-hand was less than seventy percent (70%) of the wartime requirement, this item was assessed at high risk.

Figure 4.1 depicts the status by percentages of NBC defense equipment.



**Figure 4.1 Fielded Chemical and Biological Defense Items Data Assessment**

It is significant to note that forty-seven of the sixty-seven items, or seventy percent (70%), on which information was collected are in the low risk category. Equally significant is

that most of the individual protection items used in NBC defense are assessed in the low risk category.

NBC 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 four functional areas.

- Contamination Avoidance
- Protection (Individual and Collective)
- Decontamination
- Medical

An explanation of item requirements and descriptions for item supporting each functional area are found in Chapters 2 and 3.

#### **4.4.1 Contamination Avoidance**

Table 22, page 4-16 is the compilation of the assessment of the items used in contamination avoidance. The M256A1 Detection Kit and M8A1 Chemical Agent Alarm are the primary items used in contamination avoidance by the Army, Marine Corps, and Air Force. In addition to the M256A1, the Navy utilizes the Chemical Warfare Directional Detector (CWDD) for stand-off detection.

Both the M256A1 and the CWDD are assessed as low risk. The M8A1 is assessed as moderate. However, the Automatic Chemical Agent Detector Alarm (ACADA) is being developed as the replacement item for the M8A1.

The Chemical Agent Monitor (CAM) inventory will improve to moderate risk by FY 96 with the addition of projected quantities on contract and for procurement.

According to the data collected, there are three items used in contamination avoidance assessed as high risk. They are the M93 NBC Reconnaissance System (FOX); M272 Water Test Kit; and M274 NBC Marking Set. Of particular concern is the Fox which is being fielded to Army and Marine Corps. Currently, procurement and fielding are being limited to the active forces due to funding constraints. The high risk assessment is primarily due to the restricted fielding plan.

#### **4.4.2 Protection**

##### *Individual Protection*

Currently fielded CBD 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 such as six different chemical protective suits

and six different masks. In Table 22, page 4-17 is the compilation of the items used in the individual protection of the soldier, airman, sailor, and marine.

To provide individual protection, personnel will don various items of equipment to form a chemical protection ensemble: The BDO is used by the Army, Air Force, and Marine Corps. However, the Marine Corps also uses the British Mark IV and Saratoga chemical protective (CP) suits. The MK3 suit is primarily used by the Navy. The BDO is available in both woodland and desert patterns, but only the Army is currently procuring or stocking the desert pattern. Of the selected items noted above, the Saratoga suit is assessed at high risk. The Saratoga suit is assessed high because only a limited number are currently on-hand. However, a significant number are on contract and, when received, will improve the assessment to moderate. In addition, the Marine Corps plans to use either the Saratoga or the BDO to satisfy their overgarment requirement so the impact of not having the Saratoga is less severe.

The Services are 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...). Newer versions of masks are being procured to replace the existing masks. For example, the M40 and M42 masks are replacing the M17 and M25 masks. The newer M40, M42 and MCU-2/P masks provide increased protection and improved fit and comfort. The M40 and M42 masks provide compatibility with most Army and Marine Corps 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 high risk, but will improve to low risk upon receipt of quantities on contract.

The Services have joined efforts to develop, test and field the next generation of chemical suits. The JSLIST program was discussed in detail in Chapter 2.

### *Collective Protection*

The primary collective protection item is the M51 shelter, which is assessed as high risk (Table 22, page 4-18). Although the quantities of M51 shelters on-hand would normally result in a low risk assessment, the maintenance posture of the M51 renders this as a high risk item. Very few (40) are mission capable because of age and, therefore, can not be used for chemical collective protection. The M51 is being replaced by the new chemical and biological protective shelter (CBPS). However, the M20A1 shelter will be used as an interim replacement item until the new protective shelter is fielded. The M20 shelter is also assessed as high risk, but this is a new system that is being procured from production. Collective protection equipment is also being introduced to provide NBC protection through the use of filtered air under positive pressure to a variety of vans, vehicles, shelters, and ships.

### **4.4.3 Decontamination**

Current decontaminants used with our decontamination systems are highly effective in decontaminating all CB agents (Table 22, page 4-18). Most decontaminants, while effective,

provide environmental hazards. The Services are attempting to find environmentally safe decontaminants.

The primary item used in personnel decontamination is the M258A1 Personal Decontamination Kit. The M291 is a new item which is being introduced to replace the M258A1. Both are effective against nerve and blister agents. Although the M291 is assessed as high risk because it is a new item, the M258A1 is assessed as low risk.

Chemical decontamination personnel use the Power-Driven Decontamination Apparatus (PDDA), M12A1 in operational equipment decontamination operations to mix and apply various decontamination solutions. The M12A1 is assessed as moderate risk. Although the M12 on-hand stocks would result in an assessment as low risk, the maintenance requirements due to the age of this item limit full utilization as a decontamination device. The Services are planning to replace this item with the modular decontamination system, XM21/XM22. The Lightweight Decontamination System (LDS), M17A2 is used to provide operational equipment decontamination. The M17A2 is assessed as moderate risk. Basic soldier skills for decontamination of vehicle and crew-served weapons is accomplished using the Portable Decontamination Apparatus, M11 and Decontamination Apparatus, Portable, M13. The M11 is assessed as low risk, while the M13 is assessed as high risk.

#### **4.4.4 Medical**

Medical items are used to counteract the effects of exposure to a chemical or biological agent. The medical items listed in Table 22, page 4-18 are assessed as low risk, except for biological defense products. However, medical research continues to develop medical countermeasures to deter, constrain, and defeat the use of biological agents against US Forces. The medical biological research program is directed against agents of biological origin that are validated medical threats.

### **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.

As mentioned previously, 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.

## **4.6 FUNDING**

Currently, each of the Services is funded separately to procure NBC defense equipment. The Services use different funding lines and strategies to provide NBC equipment to their forces. For example, Army procures NBC defense items for initial issue with Procurement and Operations and Maintenance funds. In addition, Army procures NBC defense items for war reserves using Congressionally appropriated war reserve funding to provide sustainment and operational contingency stockpiles. In the Marine Corps, funding of all initial issue NBC defense items comes from both Procurement and Operations and Maintenance funds. In each of the Services, follow-on buys are funded through the use of Operations and Maintenance accounts. That is, replacement costs become the responsibility of the owning unit. The unit commander must decide if chemical defense items will be procured. The commander has to decide between procuring chemical defense items which may sit on a shelf or using the funds to procure repair parts, conduct training exercises, or buy fuel to keep aircraft flying. As a consequence, even though there may be a requirement for chemical defense equipment, the commander may decide that there is sufficient chemical defense equipment on-hand to meet urgent protective needs. Therefore, the commander may decide not to procure the chemical defense item to meet the requirement.

Limited Congressional war reserve funding and the designation of medical material as secondary versus primary items (OPA/OMA funded), severely limit the Army Medical Department's ability to fund war reserve material.

Under the current acquisition procedures and DoD guidance to minimize wholesale stockpiles, procurements are based on funded Service requisitions. 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**

The DoD recently completed three industrial base assessments:

- Chemical-Biological Sector Study: A Joint Service Industrial Base Assessment for Chemical and Biological Defense Programs (Draft);
- The 1993 National Defense Industrial Base Capability Assessment Report to Congress (Draft);
- The Department of Defense Report on War Stopper Items (1992).

These assessments indicate that the NBC defense industrial base sector is primarily supported by small to medium highly specialized companies dedicated to produce military unique products with little or no commercial utility. These companies have become dependent on Service demands and sales for their financial survival. Selected CBD items (battledress overgarment, 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 CB threat and reduced DoD requirements are severely impacting 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. Items which are of particular concern are:

#### **4.7.1 Battledress Overgarment (BDO)**

There are currently six firms manufacturing the BDO. The annual peacetime requirement is projected to be 150,000 BDOs; a quantity sufficient to maintain only one supplier. DLA, via the “War Stopper” program, will maintain at least one supplier through 1994 until new suit technologies have been developed. Fielding of the new chemical defensive suit is expected in late 1997. 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 has awarded an Industrial Base Maintenance Contract (IBMC) to Duro to maintain this capability. By maintaining Duro’s critical process capability, DLA will be able to establish BDO production within six months if the suit assembly capability is shut down. There are sufficient war reserve stocks to meet any near term requirements.

#### **4.7.2 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 Brunswick Corp., Willard, Ohio. The current strategy provides for an IBMC at Brunswick and at Siebe North. The Services have adequate stock 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 Defense Logistics Agency to pursue an IBMC with both current manufacturers to sustain the industrial base with “War Stopper” funding.

#### **4.7.3 Medical Chemical and Biological Defense Material**

The nerve agent autoinjectors are an integral part of the medical items used in chemical defense. In 1992, Kali-Duphar stopped US production. Since then, the only US producer of nerve agent autoinjectors is Survival Technology, Inc. (STI) of St. Louis, Missouri. The Services have confirmed that they have minimal peacetime requirements for new procurement of nerve agent autoinjectors. As a consequence, STI is being maintained with an Industrial Base Maintenance Contract (IBMC).

Although the single source, STI, for nerve agent autoinjectors is a US company, 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.

Diazepam, an anti-convulsant nerve agent antidote is being added to the inventory. The Defense Personnel Support Center (DPSC) is currently qualifying a domestic source for this item.

Additionally, pyridostigmine bromide tablets (PBT) a nerve agent pretreatment, and plague vaccine are also discussed because they can be considered “War Stopper” items which must be available to support worldwide troop deployment. These vaccines have a limited commercial application and require a dedicated production base.

## LOGISTICS SUPPORT ASSESSMENT

**\* DoD lacks a joint, integrated system to maintain asset visibility of CDE below wholesale level and also lacks a standardized war reserve program for CDE.**

***SOLUTION:*** DoD establish the requirement for asset visibility; review existing systems and procedures, both for peacetime reporting and war time reporting. Services need to address NBC defense asset visibility deficiency under the auspices of the Total Asset Visibility initiative. Review war reserve process. Congressional support may be required if a major automated system is determined as needed.

## LOGISTIC READINESS NBC REPORT DATA

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATED PROCUREMENTS			REMARKS
					FY 94	FY 95	FY 96	
<b>OVERGARMENTS</b>							326,380	
SUIT, CP CAMO (BDO)	8415-01-137-1700-07	2,688,186	3,559,863	492,490	385,325	330,541		
SUIT, CP CAMO-DESERT		1,220,002	1,350,536				4,672	
CP, UNDERCOVERALL	8415-01-040-3141	12,760	12,760	0	4,672	4,672		
SUIT, BRIT, MK IV	NOT AVAIL		3,573					
SUIT, CP, SARATOGA	8415-01-333-7573-76	654,000	84,392	352,000				
SUIT, CP, OG (CPO)	8415-00-177-5008(M)		124,766	654				
SUIT, CP, OG MK3	8415-01-214-8290(M)	353,920	367,720					
<b>CHEMICAL OVERBOOTS</b>								
BLACK/GREEN VINYL	8430-01-317-3374-85	4,598,173	5,967,300	250,320	379,335	341,075	343,046	
CP SOCKS	8415-01-040-3169	12,760	13,012		8,415			
CP FOOTWEAR COVERS	8430-01-021-5978(L)	282,434	1,170,197	8,415				
DISP FOOTWEAR COVER	8430-00-580-1205-03	12,760	13,000	0				
<b>CP GLOVES</b>								
CP GLOVES 25 MIL	8415-01-033-3517-20	6,499,309	7,836,412	32,522	7,936	7,936	7,936	
CP GLOVES INSERTS	8415-00-782-2809	12,760	12,932	0				
CP GLOVES 14 MIL	8415-01-138-2497-00	453,000	1,395,544	58,107	91,184	91,184	91,184	
CP GLOVES 7 MIL	8415-01-138-2501-04	200,000	251,308	3,541	25,984	25,984	25,984	
<b>CB MASK</b>								
MASK, CB, M17A2	4240-01-143-2017-20	817,724	1,737,703	275				
MASK, M24, AVIATOR	4240-00-776-4384(M)	22,686	227,410					
MASK, M25A1, TANK	4240-00-994-8751-52	68,711	217,493					
MASK, CB, M40	4240-01-258-0061-63	1,612,732	331,642	212,618	222,400	142,300	139,500	
MASK, M42, TANK	4240-01-258-0064-66	192,320	39,465	77,447	31,300	28,265	0	
MASK, M43, APACHE	4240-01-208-6966-69	0	0	0				
MASK, MCU-2/P	4240-01-175-3443	249,103	352,627	22,134				
MASK, COMM, ADAPTOR	NOT AVAIL	50,000	3,923	15,007		10,000	15,000	
MASK, MCU-2/AP	4240-01-284-3615		155,405	24,641				
MASK, MCU-2/AP(WR)	4240-01-327-3299		98,367	23,545				
MASK, MARK V	4240-00-268-9732	0	0	0				
MASK, AR-5, A/P22P-2	PT\$1505217	12,746	13,037	0				
MASK, SECOND SKIN	NOT AVAIL	277,333		233,333		44,000		

TABLE 21-1

## LOGISTIC READINESS NBC REPORT DATA

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATEED PROCUREMENTS			REMARKS
					FY 94	FY 95	FY 96	
<b>MISC PROTECTION</b>								
CANTEEN W/M1 CAP	8465-01-115-0026	373,641	469,778	10,466	10,000	10,000	10,000	
CANTEEN COVER	8435-00-860-0256	367,606	453,569	4,449	4,000	4,000	4,000	
CP HELMET COVER	8415-01-111-9028	3,447,821	3,363,228	204,997	16,684	7,682	8,000	
NBC HH CALCULATOR	NOT AVAIL		30					
AIRCREWMAN CAPE	8415-01-040-9018				9,088	9,088	9,088	
HOOD, M6A2 (FOR M17)	4240-00-999-0420	1,418,896	2,387,488	51,149	40,532	28,013	22,359	
HOOD, M7 (AIR)	4240-00-021-8699	155,656	122,394	0				
HOOD, M5 (TANK)	4240-00-860-8987	134,915	66,889	0	216	136	142	
HOOD, FOR MCU-2A/P	4240-01-189-9423		1,518,936	203,327	150,000	150,000	150,000	
FILTER SET, M13A2	4240-00-165-5026	2,394,273	3,422,496	36,956	178,393	170,217	163,917	
FILTER CAN, M10A1	4240-00-127-7186	303,372	285,750	0	129	109	99	
FILTER CAN, C2	4240-01-119-2315	2,476,002	3,349,501	516,007	1,703,666	103,666	103,666	
FILTER CAN, C1	4240-00-218-0779	0	0	0				
FILTER, GP	4240-01-161-3110	0	0	0				
FILTER, GP, M18	4240-00-828-3952	0	8	0				
CARRIER, M15A1 (M17)	4240-00-933-2533		159,692					
CARRIER, M13A1 (M25)	4240-00-910-3657		5,288					
CARRIER, M17 (M24)	4240-00-476-2541	3,509	17,239					
MICS (COOL SYSTEM)	4240-01-298-4140YR	0	0					
MICS VEST	8415-01-217-5634	0	0					
CARRIER, M40/M42		269,000	107,426					
<b>CHEMICAL DETECTION</b>								
DET KIT, M256A1	6665-01-133-4964	237,426	211,711	294	3,336	2,218	2,520	
M256A1 TRAINER	6665-01-112-1644		295	1	10	10	10	
DET PAPER, M9	6665-01-049-8982	43,620	758,422	78,504	70,000	70,000	60,000	
DET PAPER, M9	6665-01-226-5589	5,190	167,526	0				
DET PAPER, M8	6665-00-050-8529	71,794	1,061,956	42,398	40,000	40,000	40,000	
TUBE PHOSGENE	6665-01-010-7965	0	0					
ALARM, CAA, M8A1	6665-01-105-5623	49,165	36,272	133	100			
BATTERY, BA3517/U	6135-00-450-3528		221	16	15	15		
POWER SUPPLY, M10	6130-00-859-2225		25					
POWER SUPPLY, M10A1	6130-01-093-2739		154	13	10	10		

TABLE 21-2

## LOGISTIC READINESS NBC REPORT DATA

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATEED PROCUREMENTS			REMARKS
					FY 94	FY 95	FY 96	
MAINT KIT, M273	5180-01-108-1729		302	8	5	5		
CWDD, AN/KAS-1	5855-01-147-4362	817	817					
CHEM AGENT MONITOR	6665-01-199-4153	3,041	2,001	301	50	50	50	
CAM BATTERY	6665-99-760-9742	108,000	92,004	40	50	50	50	
CAPDS	6665-01-294-2556	331	331	0				
NBC RECON SYSTEM	NOT AVAIL	215	113					
NBC MARK SET, M274	9905-12-124-5955	2,286	639	5	10	10	10	
WATER TEST KIT, M272	6665-01-134-0885	3,023	165	5	10	10	10	
IND CHEM AGENT DET	NOT AVAIL	13,000	9,993	1,000		11,000		
XM21 RSCAL	NOT AVAIL	197	125					
<b>DECONTAMINATION EQUIPMENT</b>								
DECON KIT, M258A1	4230-01-101-3984	1,278,246	1,688,189	35,188	41,730	33,527	33,785	
M58A1 TRAINER	6910-01-101-1768	0	27,056	1,348	1,000	1,000	1,000	
DECON KIT, M291	4230-01-276-1905	1,031,151	589,791	440	300	300	300	
DECON APPAR, M11	4230-00-720-1618	89,755	83,878	0	40	0	20	
DECON APPAR, M13	4230-01-133-4124	101,817	63,027	0	571	44	44	
DS2, 1 1/3 QT	6850-00-753-4827	159,886	213,053		292	267	287	
DS2, 5 GAL	6850-00-753-4870	193,793	187,814	6	66	54	54	
SUPER TROP BLEACH	6850-00-297-	4,249	4,592	0				
SODIUM HYPOCHLORITE	6810-00-598-7316	0	769	163	50	50		
CALCIUM	6810-00-255-0471	512	308					
DRY SORBENT POWDER	4230-01-262-0484	0	43	1				
L/WT DEC SYS, M17	4230-01-303-5225	3,744	2,932		149	379		
A/E32U-8 DECON SYS	4230-01-153-8660	0	588	98	25	25		
PDDA, M12A1	4230-00-926-9488	1,694	1,651	1				
NITROGEN CYLINDERS	4200-00-775-7541	45,000	44,527	0				
<b>COLLECTIVE PROTECTION/MEDICAL EQUIPMENT</b>								
SHELTER, CO/P, M51	4240-00-854-4144	1,178	1,165					
PORTABLE CO/P SYS	NOT AVAIL	200	200					
SURVIVAL CO/P SYS-2	4230-01-184-7913	400	375					
SURVIVAL CO/P SYS-2A	4230-01-315-7465	0	0					
KMU-450 SHEL MOD KIT	4240-01-044-7659	0	0					

TABLE 21-3

## LOGISTIC READINESS NBC REPORT DATA

NOMENCLATURE	NSN	WAR REQ	WAR O/H	ON CONTRACT	ESTIMATEED PROCUREMENTS			REMARKS
					FY 94	FY 95	FY 96	
SHELTER, CO/P, M20	4240-01-166-2254	2,821	850	275	386			
NAAK, MKI	6705-01-174-9919	1,889,000	4,212,116		321,000	321,000	321,000	
ATROPINE AUTOINJ	6505-00-926-9083	3,412,000	3,402,490					
ATROPINE TRAINER	6910-01-194-0378	0	15,000					
2-PAM CHLORIDE,AUT	6505-01-125-3248	1,856,000	1,606,444					
2-PAM TRAINER	6910-01-194-2227	0	15,000					
PYRIDOSTIGIMINE TAB	6505-01-178-7903	398,000	430,619		214,000	214,000	214,000	
CANA	6505-00-137-5891	810,000	858,000			267,000	267,000	

## LOGISTIC READINESS NBC REPORT DATA

NOMENCLATURE	NSN	DEFENSE LOGISTICS AGENCY		ARMY MATERIEL COMMAND		
		Inventory O/H	ON CONTRACT	Inventory O/H		
<b>OVERGARMENTS</b>						
SUIT, CP CAMO (BDO)	8415-01-137-1700	46,209	614,045			
SUIT, DESERT	8415-01-327-5346	27,612				
SUIT, DESERT	8415-01-324-3084	664				
UNDERCOVERALL	8415-01-040-3136	49,881				
SUIT, CP, SARATOGA	8415-01-333-7573		100,132			
SUIT, CP,OG,(CPO)	8415-00-407-1060	0				
SUIT, CP, OG MK3	8415-01-214-8289	57,279	31,664			
<b>CHEMICAL OVERBOOTS</b>						
BLACK/GREEN VINYL	8430-01-317-3374	319,516				
CP SOCKS	8415-01-040-3169	1,499,815				
CP FOOTWEAR COVERS	8430-01-021-5978	3,193				
DISP FOOTWEAR COVER	8430-00-580-1205	199,997				
<b>CP GLOVES</b>						
CP GLOVES 25 MIL	8415-01-033-3517	1,597,103	74,808			
CP GLOVE INSERTS	8415-00-782-2809	703,686				
CP GLOVES 14 MIL	8415-01-138-2497	1,051,690	315,975			
CP GLVOES 7 MIL	8415-01-138-2501	241,286	158,574			
GLOVES LINER	8415-01-138-2494	227,814	188,890			
CP HELMET COVER	8415-01-111-9028	114,285	287,040			
<b>MISC PROTECTION</b>						
AIRCREWMAN CAPE	8415-01-040-9018	26,755		1,000,000		
HOOD, M6A2 FOR M17	4242-00-999-0420			300,000		
HOOD,M7 (AIR)	4240-00-021-8699			100,000		
HOOD, M5 (TANK)	4240-00-860-8987			1,096,000		
FILTER SET, M13A2	4240-00-165-5026					

4-15

TABLE 21-6

## LOGISTIC READINESS NBC REPORT DATA

FILTER SET, M10A1	4240-00-127-7186			120,000		
FILTER CAN, C2	4240-01-119-2315			1,786,000		
CANTEEN W/M1 CAP	8465-01-115-0026	458,158				
CANTEEN COVER	8465-00-860-0256	167,268				
MICS VEST	8415-01021705634	16,655				
<b>CHEMICAL DETECTION</b>						
DET KIT, M256A1	6665-01-133-4964			13,200		
<b>DECONTAMINATION EQUIPMENT</b>						
DECON KIT, M258A1	4230-01-101-3984			510,000		
DECON, M291	4230-01-276-1905			31,000		
<b>COLLECTIVE PROTECTION/MEDICAL EQUIPMENT</b>						
SHELTER, CO/P, M20	4240-01-166-2254			46		
<b>ATROPINE AUTOINJ</b>	6505-00-926-9083	65,602				
ATROPINE TRAINER	6910-01-194-0378	337	425			
2-PAM CHLORIDE, AUT	6505-01-125-3248		274,334			
2-PAM TRAINER	6910-01-194-2227	509				
PYRIDOSTIGIMINE TAB	6506-01-178-7903	161,568				
CANA	6505-00-137-5891	418	33,840			



# LOGISTIC ASSESSMENTS

## MAJOR NBC DEFENSE ITEMS

### INDIVIDUAL PROTECTION ITEMS

ITEMS	ASSESSMENTS	REMARKS
Masks		
M17 Series, General Purpose	Low	Being Replaced by M40 (Army/Marines)
M25A1, Tank	Low	Replaced by MVU-2P Series (AF/Navy)
M24, Aviator	Low	Being Replaced by M42 (Army/Marines)
M40, General Purpose	High	Modernization Item
M42, Tank	High	Modernization Item
MCU-2P Series, General Purposes	Low	
Suits		All Suits will be Replace/Augment by JSLIST Output
Battledress Overgarment (BDO)	Low	
Chemical Protective Overgarment	Low	Phase-Out Item
Chemical Protective Undercoverall	Low	
British Mark III	Low	
British Mark IV	Low	
Saratoga	High	Modernization Item
Gloves		
Chemical Protective Gloves	Low	Three Operational Thickness (7,14,25, Mil)
Chemical Protective Glove Inserts	Low	
Over-Boots		
Green/Black Vinyl Overshoes (GVO/BVO)	Low	Being Replaced by GVO/BVO
Chemical Protective Footwear Covers	Low	
Disposable CP Footwear Covers	Low	

TABLE 22-2

# LOGISTIC ASSESSMENTS

## MAJOR NBC DEFENSE ITEMS

### COLLECTIVE PROTECTION ITEMS

	ASSESSMENTS	REMARKS
Shelter, Collective, Protective, M51	High	Risk Increased Due to Maintenance  Modernization Item
Portable Collective, Protective System	Low	
Survival Collective, Protective Sys-2	Low	
Shelter, Collective, Protective, M20	High	

### DECONTAMINATION EQUIPMENT ITEMS

	ASSESSMENTS	REMARKS
Decon Kit, M258A1	Low	Being Replaced by M291 Modernization Item Augmented by M11 Modernization Item  Risk Increased Due to Maintenance
Decon Kit, M291	High	
Decon Appar, M11	Low	
Decon Appr, M13	High	
L/Wt Dec Sys, M17	Moderate	
A/E32U-8 Decon Sys	Low	
PDDA, M12A1	Moderate	

### MEDICAL DEFENSE ITEMS

	ASSESSMENTS	REMARKS
Nerve Agent Antidote Kit (NAAK)	Low	Vaccine Production Facility is planned to fix
Atrophine Autoinjector	Low	
2-PAM Chloride, Autoinjector	Low	
Pyridostigimine Tab	Low	
CANA	Low	
Biological Warfare Vaccines	High	

4-19

TABLE 22-3

## **CHAPTER 5**

# **NUCLEAR, BIOLOGICAL AND CHEMICAL DEFENSE READINESS AND TRAINING**

## **5.1 INTRODUCTION**

Training and readiness are key to the success of the Force in an NBC environment. It has been demonstrated that the utility of WMD decrease significantly when used against a trained and ready force. The Services have taken significant steps to ensure that the military is sufficiently trained and ready to fight in an NBC contaminated environment.

## **5.2 NBC DEFENSE DOCTRINE**

Joint doctrine for NBC defense was approved for publication on 15 April 1994. This new publication identifies the principles of NBC defense as avoidance, protection, and decontamination. These principles form a hierarchy by which all NBC programs are categorized and prioritized.

Currently, Joint doctrine and individual Service doctrines may be inadequate to meet the possibility of facing an enemy who might resort to the use of NBC warfare because it does not provide sufficient guidance for integrated “battlespace” NBC defensive operations. Initiatives are being planned in the context of the new NBC defense management structure to fill this gap but funding constraints may cause delay in new doctrine development and publication.

## **5.3 STANDARDS/PROFICIENCY AND CURRENCY**

Each of the Services is responsible for establishing standards of proficiency and currency for NBC training programs.

### **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. At the initial training level, NBC defense tasks while wearing Mission Oriented Protective Posture (MOPP) gear are taught 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 a NBC NCO specialist and at the battalion or higher level each unit has an NBC Officer/Senior NCO. NBC training is integrated into unit mission training as well as individual and leader training. The NBC protective mask is worn during weapons qualification training up to twice a year depending on a units 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 warfare is a battlefield condition and therefore the Army incorporates it’s NBC training into mission tasks. Units accomplish mission tasks under NBC conditions during internal and external evaluations.

### 5.3.2 AIR FORCE

Air Force policy is to train and equip only personnel in or deployable to NBC threat areas.

#### *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 additional classroom training and exercise participation. Task qualification training occurs through on-the-job-training and exercise participation.

#### *Unit NBC Defense 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 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 Regulation 355-1, Disaster Preparedness Planning and Operations. The Air Force ensures proficiency and currency of NBC warfare defense training (CBWDT) through classroom training, unit level training, and exercises. All military and civilians designated as emergency essential receive the training annually. 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 completed by unit level training on wartime mission critical tasks. Personnel are trained in job tasks by supervisors while wearing full chemical protective equipment. Exercises are used for training and evaluation purposes.

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 62.1D            Surface Ship Survivability
- 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

The Navy provides initial entry level NBC defense training to all officers and enlisted personnel. 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. Aviation personnel receive training in a classroom annually. In addition to classroom and shipboard training, exercises are conducted quarterly. These exercises are graded.

### 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

The Marine Corps has four levels of training; individual training, unit training, major exercises/operations, and command level NBC defense courses. Individual training requires each individual Marine be capable of performing specific tasks as required by MCO 1510.71; Individual Training Standards (ITS) for Occupational Field 57 NBC Defense Specialists and NBC Defense Officers, and Non occupational Field 57 Common Tasks Handbook for all Marines. Marines are tested annually in their ability to accomplish these tasks. 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 specialists conduct unit level training and are graduates of the Army's Chemical Defense Training Facility at Ft. McClellan, Alabama. Exercises and operations at all levels include some degree of NBC defense training. The level is determined by mission, threat, and task organization. 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. At the command level the Marine Corps has various NBC defense schools. These schools conduct refresher training for unit NBC defense specialists and to unit NBC defense teams.

## **5.4 INTEGRATION OF REALISM/WARGAMES/EXERCISES**

### **5.4.1 WARGAMES**

Currently, several models which accurately portray the fluid dynamics of NBC contamination are available, but have been implemented in only a few wargaming and planning models used by DoD. The Corps models such as Vector In Command (VIC) and Division models such as Combined Arms and Support Task Force Evaluation Model (CASTFORM) have been improved. The combat development and training model, JANUS, is currently going through major NBC improvements. Force Evaluation Model (FORCEM) and Tactical Warfare (TACWAR) have been modified for theater level play. Existing NBC play in TACWAR is currently being revised. Incorporation of WMD features in relevant models, including faithful portrayal of CB aerosolization and electromagnetic pulse (EMP) effects is essential. 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 in their respective senior level service schools which incorporate weapons of mass destruction in the scenarios. 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, will for the first time this school year, incorporate electronic simulation of the NBC environment. Additionally, the Chief of Staff of the Air Force's Aerospace Powers Symposium at Maxwell AFB, Alabama used off-line electronic simulations integrated with expert opinions from the Defense Nuclear Agency in November 1993. Finally, the Navy has plans to include realistic NBC situations into all future wargames including the Joint Littoral Wargame, developed by Johns Hopkins University Applied Physics Laboratory, and Total Force 93 sponsored by the Navy Staff at the Navy War College.

### **5.4.2 JOINT NBC TRAINING/JOINT AND COMBINED EXERCISES**

In an effort to improve NBC training and add realism to the training, the Joint Staff in proposed Joint Pub 3-11 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 Services' initiatives to ensure the integration of NBC defense in Joint training and exercises.

### *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.

Programs of Instruction at branch schools are incorporating more realistic NBC scenarios within situational or field training exercises. This type of instruction is being taught to all soldiers. NBC collective training conducted at the CTCs are increasing the number of NBC events and operations in and around simulated contaminated areas. Rotations at the NTC and JRTC which integrate NBC situations have validated that units do plan for and react to NBC threats and that they can survive and continue to operate in a chemically contaminated environment. Approximately twelve two week rotations of brigade headquarters with accompanying battalions train at the NTC each year and twelve light infantry battalions train at the JRTC annually. At the JRTC, the number of battalions trained will be increased this year to twenty. In the past, when units trained at the JRTC, they did not include chemical threat in low-intensity conflict scenarios. A chemical threat was only played in mid-intensity scenarios. Now, the majority of scenarios include a chemical threat.

### *Air Force*

Chemical warfare defense preparedness is an integral part of the ability to survive and operate portions of annual Operational Readiness Inspections conducted by Major Command Inspector Generals. 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. Examples of some of these exercises are:

- 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 in the same manner 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. All platforms are equipped with a nozzle to spray wintergreen and oil into the local environment to simulate a chemical environment. Even if NBC defense were an integral part of a specific exercise, it would not alter the way the Navy conducts NBC defense training.

### *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 Twentynine Palms, California. Battalion level unit exercises are also conducted during Korea and Thailand Incremental Training Programs where units deploy and exercise various tasks including realistic NBC training. Like the Air Force and Army, the Marine Corps also participates in major joint/combined exercises such as TEAM SPIRIT, ULCHI FOCUS LENS, GALLANT EAGLE, GALLANT KNIGHT, and VALIANT BLITZ. They incorporate realistic NBC defense training into the exercise scenario to enhance the value of the exercise.

## **5.5 TRAINING IN A TOXIC CHEMICAL ENVIRONMENT**

Each of the Services use chemical agent simulators in unit and classroom training. The simulators used attempt to mimic actual chemical warfare agents and create physical transfer problems similar to real chemical warfare agents.

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 27,000 US and Allied members from all Services. Over 4,000 were trained in FY93 alone. 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.

Demand for enrollment at the Joint Senior Leaders Course and the Toxic Agent Leader Training Course at Fort McClellan is increasing. Almost 2,400 active and reserve commanders and service leaders from each of the services have attended. In FY93, 347 commanders and leaders attended these two courses. The Services trained almost 3300 experts at the CDTF in FY93. These experts become instructors for the Services for unit training. In addition to the opportunity, toxic chemical environment training provides senior officers, commanders and future experts confidence in the techniques and the doctrine which they execute, the equipment they fight with, and the challenges presented by NBC contamination.

## **5.6 INITIATIVES**

### **5.6.1 ARMY**

In an effort to refine doctrine and training, the Army is quantifying the impact of NBC environments on combat operations. Two programs are being 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<sup>2</sup>NBC<sup>2</sup>). These Force Development Testing and Experimentation (FDTE) evaluations have provided a better understanding of individual and unit operations and performance degradation while in Mission Oriented Protective Posture (MOPP); and quantified for the first time, field data that commanders can now 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, and 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.

### 5.6.2 AIR FORCE

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

- The Disaster Preparedness Technical School is moving to Fort McClellan, Alabama and plans to be operational again by October 1994. This move will consolidate chemical warfare training for all the Services at one location. It will be advantageous for the Air Force because it will allow access to training sources that were not previously available. This includes the benefit of toxic agent training, an extensive reference library, and excellent training sites.
- The Air Force is developing an advanced training course for experienced personnel that will expand their knowledge of program management, planning of operations, and response procedures for various scenarios. All Disaster Preparedness NCOs in the grade of E-6 and above are the target audience for the advanced training course.
- Finally, the Air Force is developing a computer-based training program for certification testing of chemical warfare specialists. The 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 the testing results, and serve as a record for the supervisor. This system will also allow individuals to continue their training while under field conditions using laptop computers.

### 5.6.3 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.

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.

Finally, the Navy is researching how to fight fires in a chemical environment on the Damage Control research and development platform, the Ex-Shadwell.

#### 5.6.4 MARINE CORPS

The Marine Corps' training initiatives center on two areas; casualty decontamination and staff planning. Operation Desert Storm highlighted the fact that the Marine Corps was deficient in the way it conducted casualty decontamination and how it implemented NBC into the staff planning process. Since the conclusion of Operation Desert Storm, the Marine Corps has focused much attention on these two areas. Marine Corps command level NBC schools have implemented additional instruction and exercises in casualty decontamination. Unit Standard Operating Procedures now include sections on how NBC casualties will be treated/handled on the battlefield. Casualty decontamination exercises are now an integral part of command level NBC operational evaluations. Staff planning, particularly rapid staff planning, is undergoing development within the Marine Expeditionary Units. As the program matures, rapid staff planning will be implemented in command level schools and be part of the evaluation process during FY94.

#### 5.7 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 should provide more visibility to NBC defense 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 will determine the type of equipment and training levels to be monitored. The Services are developing procedures for measured units to report this status through SORTS. Once the Service procedures are in place, SORTS will be a useful tool to flag those units who have equipment shortages and training shortfalls. Data is now being collected on NBC defense training and equipment and will be reported to ATSD(AE)(CM) on a semi-annual basis beginning October 1994.

Additionally, under CJCS MOP 53 and Joint Pub 1-03.31, "Preparedness Evaluation System", the Commanders in Chief (CINCs) of the unified commands are required to report on NBC defense concerns and deficiencies in their biennial CINCs Preparedness Assessment Reports (CSPARs). This information is contained in the data base maintained by the Joint Staff, and used by the Joint Staff, Services and DoD planners.

#### **NBC DEFENSE TRAINING AND READINESS ASSESSMENT**

**\* DoD lacks a feedback mechanism on the status of training, equipment, and readiness. Need a mechanism for assessing operational force capabilities from both the Department perspective and the operational/CINC perspective.**

**SOLUTION:** Develop and implement adequate NBC defense reporting information in the Joint Status of Resources and Training System (SORTS) currently in-use by the Joint Staff and the CINCs.

**\* DoD lacks Integrated Joint NBC defense doctrine.**

**SOLUTION:** Explore new concepts during the development of the new NBC defense program management strategy that will improve the integration of Services NBC defense doctrine to facilitate joint operations. Make development of Joint battlespace tactics, techniques, and procedure for NBC defensive operations the first priority of the Joint Integration Group of the new management structure once it is fully operational.

**\* DoD will de-emphasize NBC defense readiness with the ratification and implementation of chemical weapons arms control agreements.**

**SOLUTION:** Use the OSD Executive Steering Committee and the DAB-process to ensure that NBC threat and NBC defense readiness is balanced and in-place. Continue emphasis on Joint NBC Training Center, joint doctrine, joint exercises, and high-level DoD policy reviews to focus on CB defense readiness improvement policies and programs. Baseline the planning, programming, and budget process to ensure that CB defense funding is maintained at a adequate level to support CB defense readiness. Form a strong “national center for NBC defense” by consolidating and reorganizing all NBC defense assets for the Armed Services.

**\* Limited WMD feature in wargaming and planning models.**

**SOLUTION:** DoD develop an initiative under the new NBC defense management structure Joint Integration Group that will integrate WMD features into simulations and models.

## **CHAPTER 6**

# **PREPARATIONS FOR THE CHEMICAL WEAPONS CONVENTION**

## **6.1 TRAINING FOR INSPECTORS**

The On-Site Inspection Agency (OSIA) has fully trained and qualified 368 US inspectors and escorts to conduct activities in support of the Chemical Weapons Convention (CWC) and related activities. The training consists of one week of classroom instruction in Washington and a week of field safety training (including a day in the toxic-agent training facility) at Fort McClellan, Alabama. During the past year, a total of six courses were conducted. The major portion of the OSIA effort in support of chemical weapons (CW) agreements has been specifically for bilateral agreements between the US and the Russian Federation. These bilateral agreements, however, are directly focused upon facilitation of the CWC.

On the multilateral front, OSIA has been designated as Executive Agent for the Department of Defense (DoD) in the training of international inspectors who will form teams to verify compliance with the CWC. A 12-week pilot course was conducted over the summer of 1993 by the US Army Chemical School to develop a curriculum for this international inspector training (OSIA provided both instructor and student personnel). A second pilot course (with international students) was initiated in March 1994 and an actual inspector course is programmed to be conducted in the fall of 1994.

Relatedly, as DoD Executive Agent for Inspector Training, OSIA continues to evaluate a number of requests for assistance from other nations (i.e., Argentina) to provide training support in their preparation for implementation of the CWC. In late-1993, OSIA personnel also participated in a CWC inspector training course in the United Kingdom, serving as both students and instructors.

## **6.2 PREPARATION OF DEFENSE INSTALLATIONS**

OSIA has coordinated actively with the Military Services during the past year in preparing DoD installations for inspections under the CWC. All Defense installations which will be subject to declaration under the requirements of the CWC (and many of which, although not declared, could be subject to challenge inspections) were visited by OSIA technical experts through a series of staff assistance visits, joint training exercises, and mock inspections. No fewer than twelve mock inspections were conducted and five man-years of effort were expended in related support during the period.

The Defense Treaty Inspection Readiness Program (DTIRP), for which OSIA is DoD Executive Agent, uses a sophisticated database network designed to address risks to national security and proprietary information and to provide cost effective security countermeasures to the US Government (USG) and government contract industry during the conduct of inspections under the CWC. The 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 DTIRP for various industry forum and the USG through seminars, mobile training teams, mock inspections, and tabletop exercises.

DTIRP is an integral support element to Quick Reaction Teams of the Military Services, Department of Energy, and others for CW challenge inspections at their undeclared facilities. Through DTIRP, OSIA maintains an operational capability to deploy personnel and equipment to support challenged facilities on short notice. This capability will be available to support DoD and other government contractors for implementation of the CWC.

### **6.3 PROVISION OF TECHNICAL EXPERTISE**

OSIA provided technical experts to render recurring support (consultations, research, working papers, etc.) to the CWC Preparatory Commission (PREPCOM) in The Hague, The Netherlands. The PREPCOM is charged with developing procedures and implementing the international mechanism, the Organization for the Prohibition of Chemical Weapons (OPCW), which will oversee worldwide compliance with the CWC.

OSIA also provided operational advice to the US negotiating delegation in Moscow which completed implementation Protocols, (signed in January 1994), with the Russian Federation to enable the detailed CW data exchange and intrusive inspection regime of the historic Wyoming Memorandum of Understanding (MOU). The MOU was originally signed in September 1989, with Phase I being completed in February 1991. Phase II, which was to have been initiated 120 days before the signing of the worldwide CWC, had been suspended as a result of the turbulent political situation in the former Soviet Union.

In late 1993, OSIA provided instructors and linguists to support a 3-day demonstration of US Nondestructive Evaluation (NDE) equipment in Moscow. Nearly 100 Russian technical experts observed the demonstration, which did much to quell apprehensions about US CW inspection methods and equipment.

### **6.4 COOPERATIVE THREAT REDUCTION**

OSIA provided escort, linguistic, and related logistic support services for the extended training of six Russian interns in techniques of CW destruction at three US facilities during the period September 1993 through March 1994.

To facilitate continuing coordination with Russian technical experts on the destruction of the former Soviet CW stockpile, OSIA provided linguistic services for the establishment and operation of a Support Office in Moscow in June 1993. Formal Plans Of Work for CW destruction activity during 1993 and 1994 were completed to provide focus for the joint effort. The office continues to function actively and to provide a forum for ongoing dialogue between CW destruction experts of the two nations.

## **6.5 CHEMICAL TREATY COMPLIANCE (ARMY)**

Army site activities during the last reporting period focused on preparations in anticipation of on-site inspections at CW storage, former production, and development and test sites conducted under Phase II of the Wyoming Memorandum of Understanding (MOU). Since the MOU is intended as a “confidence building” regime between the US and the Russian Federation, inspections under the MOU are expected to closely parallel those under the CWC. Specific activities conducted were:

- \* Updated the Army’s Chemical Treaty Compliance Implementation Plan. The plan provides standard procedures for all activities to be performed as declared Army CW sites during inspections.

- \* Compiled all data required to be included in the US-Russia Wyoming Phase II Data Exchange. Part I of the Data Exchange was completed in 14 April 1994. The second, and final, part of the package was delivered 14 May 1994.

- \* Conducted a complete round of site preparation exercises with the OSIA at declared CW sites. These exercises included mock inspection, joint training exercises, and site assistance visits.

- \* Developed operational plans for all Army CW sites to accept and support challenge inspection under the CWC. Points of contact (POCs) were identified at all major commands (MACOMs) for short notice response to inspection notifications. The Army has conducted training exercises for MACOM and site personnel involved with challenge inspections. An Installation Assistance Team was designated that will provide expert advice and assistance to Army installations receiving challenge inspections.

- \* Established data management systems to develop and maintain all chemical treaty reporting requirements, including those under the CWC. These systems include a toxic chemical munitions database to store data on CW storage sites, and a geographic information system to depict site perimeter data.

- \* Provided Army escort and inspection team volunteers with training courses conducted by OSIA.

## **6.6 CWC NEGOTIATIONS AND PREPARATORY COMMISSION SUPPORT (ARMY)**

As part of the CWC Technology Verification Research and Development program administered by the Defense Nuclear Agency (DNA), the US Army Chemical and Biological Defense Command (CBDCOM) supported US delegations by providing technical support to the Preparatory Commission (PREPCOM). The Army is providing hardware, procedures, training, and technical experts to assist the commission in developing implementation

procedures for the CWC.

## **6.7 DESTRUCTION TECHNOLOGY ASSISTANCE (ARMY)**

During this period, the Army continued support to the Russian Federation CW destruction program. This support was provided pursuant to the Agreement Between the United States of America and the Russian Federation Concerning Safe and Secure Transportation, Storage and Destruction of Weapons and the Prevention of Weapons Proliferation, signed June 1992, and the Agreement Between the Department of Defense of the United States of America and President's Committee on Conventional Problems of Chemical and Biological Weapons of the Russian Federation Concerning the Safe, Secure and Ecologically Sound Destruction of Chemical Weapons, signed July 1992. The main focus of the Army's efforts are to provide program management support and technical support for destruction of Russian nerve agent filled chemical weapons. This work will serve to facilitate implementation of the 1990 US-Russian Bilateral Destruction Agreement once negotiations on this accord are finalized. Specific activities include:

- \* Development of a comprehensive concept plan for destruction of the Russian CW stockpile. Detailed Plans of Work were developed and agreed to between the US and Russian Federation in October 1993 and January 1994. Award of a contract for development of the concept plan is expected in May 1994.

- \* Since September 1993, the Army hosted six Russian technical interns as part of the destruction technology Intern Training (Familiarization) program. Additional interns are expected later in FY 94.

- \* In June 1993, a Chemical Weapons Destruction Support Office was established in Moscow. This office will serve as the primary technical and management interface between the US and Russian governments for US Government assistance to the Russian destruction program.

- \* Conducted a Facility Assessment in November 1993 for the purpose of locating a Central Analytical Laboratory in the Russian Federation. This laboratory is required in the Russian destruction program to develop and maintain chemical agent analytical methods and procedures; train destruction facility personnel; provide quality assurance functions for the destruction program, and conduct analysis of environmental samples.

- \* Continued exchange visits by Russian personnel to the US chemical weapons destruction facilities in August 1993.

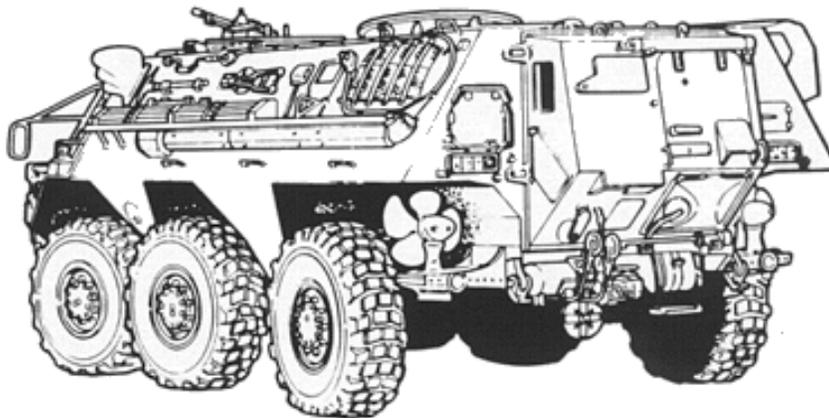
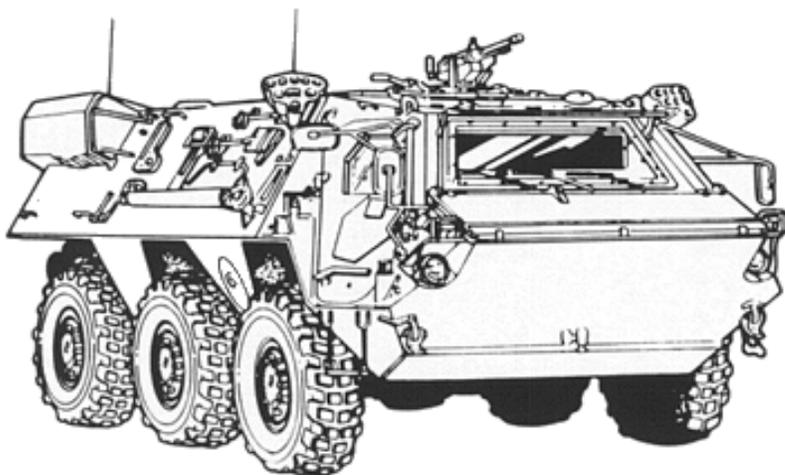
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**ANNEXES**

**SERVICE NBC DEFENSE  
PROGRAM SPECIFICS**

**ANNEX A**

**SPECIFICS OF ARMY  
AVOIDANCE PROGRAMS**



**Chemical Agent Monitor (CAM or Company CW Monitor)  
(First Unit Equipped (FUE) FY88)**

Key Requirements:

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

Description:

- The Chemical Agent Monitor (CAM) is a hand-held device for monitoring chemical agent contamination on personnel and equipment. The CAM monitors vapors of chemical agents by sensing molecular ions of specific mobility (time of flight) and uses timing and microprocessor 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 expendable such as batteries, confidence tester, and dust filters.
- An improved CAM (ICAM) was been type classified in 4QFY93. It significantly reduces the level and frequency of maintenance without effecting the CAM's performance.

**XM22 Automatic Chemical Agent Detector Alarm (ACADA)  
(Platoon CW Alarm) (FUE FY97).**

Key Requirements:

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

Description:

- The ACADA is a man-portable, point sampling alarm system that provides significant improvements 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.
- ACADA replaces the M8A1 Alarm as an automatic point detector and augments the M1 Chemical Agent Monitor (CAM) as a survey instrument. ACADA is currently undergoing a program restructure that arose from technical difficulties and is being replaced by an NDI approach.

**Multipurpose Integrated Chemical Agent Detector (MICAD) (FUE FY00)  
(R&D Efforts to Complete Program Unfunded)**

Key Requirements:

- Interface with existing and developmental NBC sensors, detectors, alarms and communications systems at Battalion level and below; and provide automatic transmission of NBC alarms and data in NBC message format;
- Provide chemical monitoring of internal and external air samples within vehicles, vans and shelters;
- Initiate audible and visual alarms to warn personnel when NBC contaminants are detected; and,
- Provide NBC-1 or NBC-4 reports to the Maneuver Control System (MCS) - Automated Nuclear, Biological, and Chemical Information System (ANBACIS) at the lowest MCS node.

Description:

- The MICAD system consists of the following developmental components: a display/control, a sample transfer system and telemetry link. MICAD interfaces with the M8A1 Chemical Agent Alarm, XM22 (ACADA), AN/VDR-2 Radiac Set, other existing and developmental NBC detectors, existing and future command and control (C2) radios, and vehicle navigation systems. The display/control monitors and displays data received from the NBC detector or via the C2 radio net and automatically formats and transmits an NBC-1 or NBC-4 report upon NBC hazard detection. For vehicles, vans, and shelters, the internally mounted CB detector uses the sample transfer system to sample internal and external air. For battlefield ground units, the MICAD telemetry link allows the transmission of NBC alarms and information from remote chemical detectors to the display/control for processing into a NBC-1 Report.

**Biological Integrated Detection System (BIDS).  
(Interim BIDS FUE FY96/97).**

Key Requirements:

- Detect/identify 5 to 25 agent-containing particles per liter of air (alpha) in the 2-10 micron range in 15-30 minutes.;
- Provide collective protection;
- Include environmental controls;
- Use both FM/HF radios to communicate;
- Equipped with a knowledge-based system to process detector information; and,
- Vehicle-mounted shelter.

Description:

- The BIDS is a vehicle-mounted, collectively-protected detection system, housed in a HMMWV shelter. It uses a multiple technology approach to detect biological agents with both developmental and off-the-shelf materiel in order to maximize the ability to accurately detect a BW attack. We are integrating the BW Detector with the CB Mass Spectrometer (CBMS) as a component to the PSI BIDS with a more robust system to follow. The BIDS is modular to allow component replacement and exploitation of

“leap ahead” technologies.

**Biological Detector (BIDS Component)  
(FUE FY02).**

Key Requirements:

- Provide identification capability for the BIDS;
- Provide agent class and concentration to BIDS operator;
- Capable of detecting liquid samples of specified materials (CAT A of ITF-6 Report);
- Capable of rejecting common battlefield interferents; and
- Capable of being modified to detect new threat agents.

Description:

- The Biological Detector (BD) is an antibody based, automatic aerosol sampling device capable of detecting specific biological agents on demand. The BD consists of electronics processing equipment, fluid processing modules (FPMs), reservoirs for antibody reagents, and the light addressable potentiometric sensor (LAPS) the provide biological detection and identification. The total processing time, from insertion of sample, is 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 allow operator identification of malfunctions.

**CB Mass Spectrometer (CBMS) (BIDS Component)  
(Replaces MM1 in NBCRS)**

Key Requirements:

- Detect, identify, and semi-quantitate CB agents;
- Characterize new agents;
- Respond to agent vapors, aerosols or liquid droplets;
- Have detection thresholds at or below human response levels; and,
- Accommodate future advances in hardware technology and changes in CB threat through modules.

Description:

- 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 a sample identification device. The mass analyzer chassis houses the mass analyzer, pumps, control electronics, and computers. With the aerosol sampling 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/aerosols or as liquid droplets on surfaces. The CBMS is mounted within the NBC Recon System and searches for areas of CB agent contamination.

**XM93 NBC Reconnaissance System (NBCRS) (Fox NBC Recon Vehicle)  
Interim System Production (ISP) (FUE FY92).**

Key Requirements:

- Armored vehicle;
- Chemical agent point detectors and monitors;
- Radiation detector and monitor;
- Navigation system;
- Secure communications system; and,
- Collective protection system.

Description:

- The XM93 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 on primary, secondary, or cross country routes throughout the battlefield. The XM93 can find and mark chemical and nuclear contamination. Through secure communications system, it provides warnings to follow-on forces. The crew is protected by an on-board overpressure system.

**XM93E1 System Improvement Phase (SIP)  
(FY97 RDE Unfunded)**

Key Requirements:

- Armored vehicle;
- Chemical agent stand-off and point detectors and monitors;
- Radiation detector and monitor;
- Navigation system;
- Jam resistant communications system;
- Central data processor integrated with all detectors and monitors, navigation and communications systems;
- Meteorological sensing system; and,
- Collective protection with over-pressure and macro cooling.

Description:

- The XM93E1 Fox NBCRS is a dedicated system of NBC detection, warning, and sampling equipment integrated into a high speed, high mobility armored carrier capable of performing NBC reconnaissance on primary, secondary, or cross country routes throughout the battlefield. The XM93E1 is a system improvement phase to upgrade the XM93, to meet all the requirements of the approved Required Operational Capability (ROC). The XM93E1 FOX NBCRS can detect chemical contamination in its immediate environment through the use of a stand off detector (XM21 RSCAAL). It automatically integrates contamination information from sensors with input from on-board navigation and meteorological systems. It rapidly transmits hazard warnings via a central data processor, a commander's display, a keyboard, and integrated digital jam-resistant communications. The XM93E1 permits reducing the crew from four to

three individuals. For the first time this program also develops and fields organic maintenance for the FOX NBCRS.

**XM21 Remote Sensing Chemical Agent Alarm (RSCAAL)  
(Standoff CW Detector) (FUE FY97).**

**Key Requirements:**

- Stand-off detection of nerve and blister agent vapor clouds at line-of-sight distances up to 5 km; and,
- Operate in reconnaissance (on an NBC reconnaissance vehicle) and surveillance roles.

**Description:**

- The 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 tripod-mounted modes. The detector can scan horizontally 60 degrees.

**Laser Stand-Off Chemical Detector (FUE FY03) (Unfunded)**

**Key Requirements:**

- 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; and,
- Provide rapid agent concentration mapping.

**Description:**

- The Laser Stand-off Detector is a lightweight, vehicle-mountable, contamination monitoring system which detects and quantifies all types of chemical agent contamination, (including agent rain, vapors, aerosols, and ground contamination), in a stand-off mode. It operates from fixed sites and ground vehicles. The system has distance-ranging and contamination-mapping capabilities and transmits this information to a battlefield information network. Laser detection from a distance of 3 Km is possible. Pre-Planned Product Improvements are planned to detect biological contamination.

**Pocket RADIAC (Platoon Radiac) (FUE FY98).**

**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);
- Settable alarm capability for dose and dose-rate;
- Mission dose capability;
- Digital readout; and,
- Night visibility (secure lighting).

Description:

- The 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. Presettable alarms 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.

**Advanced Airborne RADIAC System (AARS)  
(FUE FY99) (Unfunded)**

Key Requirements:

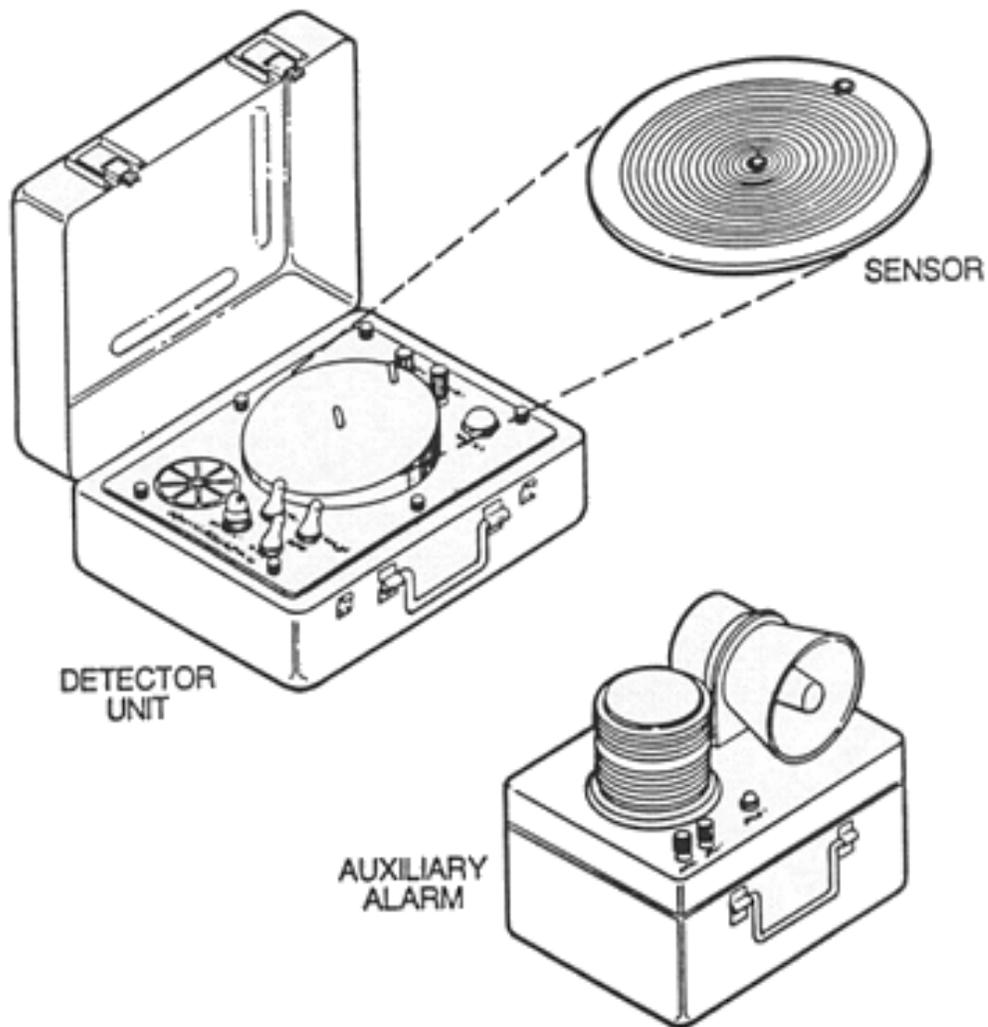
- Mission Specific Kit (integration option for Comanche RAH-66);
- Quick installation in rotary wing aircraft (45 minutes maximum);
- Capable of detecting and measuring gamma radiation from nuclear fallout on ground (1-1000cGy/hr);
- Able to function at airspeeds up to 100 knots;
- Altimetry System (0-1000 ft);
- Navigation System (+/- 100 meters); and,
- Data processing and storage.

Description:

- The AARS provides rapid, accurate and safe measurement of aerial radiation readings and calculations of residual ground radiation. The compact, lightweight AARS is mounted on a helicopter and automatically correlates airborne readings to ground radiation readings and position. The AARS also measures total dose and dose rate of the pilot and warns him when he has reached an unsafe level. Collected data is stored on a removable-media memory module for post flight processing. A P3I allows transmission of data via the aircraft's secure radio. The field commander uses AARS data to plan operations and unit movements to minimize the exposure of soldiers to radiation hazards. The AARS is compatible with the maneuver control system (MCS) and the automated nuclear, biological, and chemical information system (ANBACIS).

## ANNEX B

# SPECIFICS OF AIR FORCE AVOIDANCE PROGRAMS



## **Biological Agent Detector (BIODET) (FUE FY97/98)**

### Key Requirements:

- Detect, identify, and automatically warn of the presence of biological pathogens and toxins;
- Detect/identify biological materials listed in “An Assessment of Global Confirmed and Suspected Chemical and Biological Warfare Programs (WSSIC 91-10004 CX)” regardless of physical characteristics, and discriminate between them at a 95 percent confidence level;
- Identify agent and its concentration level;
- Equipment comprising BIODET must be lightweight, man portable and capable of being set up within 30 minutes or less from storage configuration to fully operational configuration;
- Equipment must operate in field conditions while in motion, either hand-carried or vehicle mounted up to speeds to be determined;
- Be programmable for new agents.

### Description:

- Investigates/develops the capability to detect and warn personnel of potentially harmful pathogens and toxins. Operation DESERT STORM highlighted the urgent need for a biological detector/alarm. This effort looks at the effects of biological agents on sortie generation and recommends a strategy to deal with the threat. A development program will be initiated to provide detection and warning to airbase personnel. The system produced will detect those biological agents specified in the Operational Requirement Document (ORD). The BIODET ORD is currently in coordination.

## **Automatic Vapor Agent Detector (Limited Fielded Units - FY94) (Follow-on Procurement FY95/96)**

### Key Requirements:

- Detect and identify chemical agents in vapor form;
- 95 % probability of detecting vapor agents present;
- No more than 1 false alarm in 24 hours, desired: 1 in 100 hours;
- Lightweight, transportable by one person in full individual protective equipment.

### Description:

- Adds automatic vapor agent detection capability with minimal development to current capability. Operation Desert Storm highlighted the urgent need to add automatic mustard agent detection capability to current detection capabilities. Current detection capability, using M256 kits, is time-consuming and manual. Mustard agents have been used by various nations since WWI and it is being added to an ever-increasing number of weapons arsenals. Current procurement efforts have selected the M-90 manufactured in Finland as the “best available”. A limited number of M-90s have

been procured and field testing is underway. Results of the operational field test will provide the benchmark for follow-on procurement efforts.

### **Multi-Function Radiation Detector (FUE FY96)**

#### 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.

#### Description:

- 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. Nuclear materials are present in research and medical labs, hazardous materials shipments and weapon arsenals.

### **Aircraft Interior Detector (FUE FY97/98)**

#### Key Requirements.

- Detect, identify, quantify and warn of presence of even low levels of nerve or blister agents in vapor form in aircraft interiors.

#### Description.

- Program will develop and procure a system that will detect, identify, quantify and warn of the presence of nerve agents and blister agents in vapor form in aircraft interiors. Aircrews flying missions during Operation Desert Storm had an urgent need to know if chemical agents were present due to the fact that the agents will cause miosis or more severe effects, thus subverting the mission. This procurement effort will begin with a study to determine the most promising technologies to meet the requirements and will be followed with a hardware development program.

## **Individual Vapor Detector (FUE FY98)**

### Key Requirements.

- Small, lightweight detector capable of detecting presence of chemical agents in vapor form;
- Capable of dewarning, allowing for rapid reduction of burdensome protective postures.

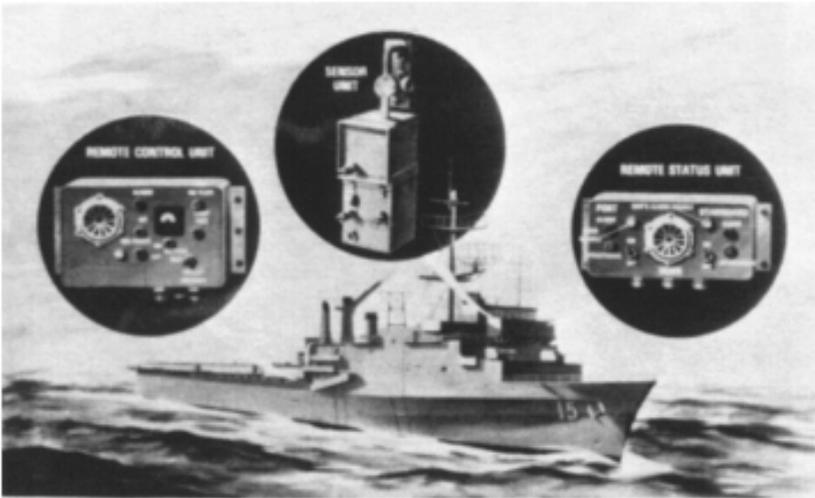
### Description.

- Program will develop and procure a small lightweight device to be worn by individual personnel to warn them of a chemical agent attack. During Operation Desert Storm personnel needed an individual vapor detector to monitor for the presence of chemical agents because general point detectors were too few and costly. There are several candidate technologies for this effort. A study will be conducted to identify the most promising technologies. This will be followed by an equipment development effort.

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**ANNEX C**

**SPECIFICS OF NAVY AVOIDANCE PROGRAMS**



### **AN/KAS-1 Chemical Warfare Directional Detector (Fielded)**

#### Key Requirements:

- Stand-off detection of nerve agent clouds;
- Operated/maintained by ship's force;
- Operate in a shipboard environment;
- Detect while the ship is underway.

#### Description:

- Initially fielded in 1985, this device detects vapor clouds of nerve agents by identifying their infrared signatures at ranges out to 10km. The system requires a trained operator to both interpret the data generated and, if necessary, to sound the alarm.

### **Chemical Agent Point Detection System (CAPDS) (Fielded)**

#### Key Requirements:

- Provide automatic nerve agent detection (vapor);
- Operated/maintained by ship's force;
- Operate in a shipboard environment;
- Detect while ship is underway.

#### Description:

- CAPDS, initially fielded in 1989, provides fully automatic point detection of nerve agents in vapor form using baffle tube ionization technology. CAPDS will be replaced in the near future by the Improved Chemical Agent Point Detection System.

### **Improved (Chemical Agent) Point Detection System (IPDS)**

#### Key Requirements:

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

#### Description:

- Utilizing dual-cell ionization mobility spectroscopy technology, IPDS is being developed to replace CAPDS. The system 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 the 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 the various compounds observed by IPDS with those in the library, the system is able to avoid false alarms. Initial procurement is scheduled for FY 96.

### **Shipboard Automatic Liquid Agent Detector (SALAD)**

#### Key Requirements:

- Automatic detection of liquid chemical agents;
- Operated/maintained by ship's force;
- Operate in a shipboard environment;
- 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. Procurement is scheduled for FY 97.

### **Interim Biological Agent Detector (IBAD)**

#### Key Requirements:

- Rapidly develop and field the capability to detect and identify biological warfare agents;
- Operated/maintained by ship's force;
- Operate in a shipboard environment;
- Detect while the ship is underway.

#### Description:

- IBAD will provide a near term solution to a deficiency in shipboard detection and classification of biological warfare agents. IBAD consists of a particle sizer/counter, particle wet cyclone sampler and a detection unit which uses improved membrane colorimetric tickets (flow-thru assay). A total of 40 IBADs will be purchased, beginning in FY 93.

### **Biological Agent Detection System (BADS)**

#### Key Requirements:

- Automatically detect and classify biological warfare agents;
- Have both stand-off, point and portable detection capability;
- Operated/maintained by ship's force;
- Operate in a shipboard environment;
- Detect while the ship is underway.

#### Description:

- BADS, presently in development, will be capable of automatic point, remote and portable detection and identification of biological and toxicological warfare agents. It will detect in real time at concentrations below incapacitating doses and alarm locally

and remote. Procurement is scheduled for FY 00.

### **Shipboard Chemical Agent Monitor Portable (SCAMP)**

#### Key Requirements:

- Post-attack, portable chemical agent monitoring device;
- Operated/maintained by ship's force;
- Operate in a shipboard environment.

#### Description:

- In an attempt to field a post-attack, portable monitoring device the Navy evaluated the Army's Chemical Agent Monitor (CAM) for use aboard ships. Due to the high false alarm rate caused by interferents, CAM was determined to be unsuitable for shipboard use. SCAMP will be a miniaturized IPDS that will detect and alarm in the presence of nerve and blister agents. It is designed to be used in processing personnel and detecting compartment contamination. Procurement is scheduled for FY 97.

### **Vapor, Liquid, Solid Tracking (VLSTRACK) Model**

#### Key Requirements:

- Predict the movement of chemical/biological agent clouds;
- Predict chemical/biological hazards to personnel on ship;
- PC compatible;
- Operated by ship's force.

#### Description:

- To predict the movement of chemical and biological agent clouds and to assist in contamination avoidance, the Naval Surface Warfare Center (NSWC), Dahlgren developed the Vapor, Liquid, Solid Tracking (VLSTRACK) model. Designed for shipboard PC's, VLSTRACK is also being used by the Army, Marine Corps, Institute for Defense Analysis, Assistant to the Secretary of Defense for Atomic Energy, and organizations in Canada and the United Kingdom. NSWC Dahlgren has also developed the Chemical Warfare Naval Simulation (CWNAVSIM) model. The system's three dimensional graphics capability allows easy visualization of an attack and the resulting shipboard contamination. CWNAVSIM is also being used to assess the interior compartment contamination resulting from an exterior attack. This data will be used to determine the level of protective equipment required inside the skin of the ship.

### **Radiological Detection/Monitoring**

#### Key Requirements:

- Detect various types/amounts of radiation onboard ship.
- Monitor exposure doses to shipboard personnel.

Description:

- AN/PDR-27 Series RADIAC: Is a battery operated, portable radiation detector used to detect and measure 500 milliroentgens per hour (mR/hr) of gamma radiation and can detect the presence of beta radiation. The RADIAC set indicates the presence of radiation by clicks in the unit's headset and by upscale reading shown on the radiacmeter panel meter. The meter reading and the frequency of the clicks are proportional to the radiation intensity.
- AN/PDR-43 Series RADIAC: Is a battery operated, portable radiation detector used to measure gamma radiation up to an intensity of 500 Roentgens (rads) per hour (R/h) and to detect beta radiation. The radiacmeter consists primarily of a regulated power supply, a mica-end window, Geiger Mueller (G-M) tube, a circuit for pulsing the G-M on for a pre-set period of time, and a computer-indicator circuit which provides a meter reading that is proportional to the radiation field intensity.
- AN/PDR-56 Series: Is a battery operated, portable scintillation counter for detection and measurement of alpha radiation up to an intensity of 10 to the sixth counts per minute. The emitter output is proportional to the intensity of the alpha contamination.
- AN/PDR-65 Series: Is designed for shipboard use to detect and measure gamma radiation hazards. Two types of displays are on the radiacmeter equipment: dose rate and accumulated dose. The main meter displays a constant dose rate and the small counter registers accumulated dose in rads per hour by counting the rad pulses from the detector. The detector itself can also be detached to probe otherwise inaccessible areas and still provide remote readout from associated meters. In many cases the radiacmeter is mounted on a bulkhead on the bridge and the detector is placed in the ship's superstructure.
- DT-60D/PD (Personal Dosimeter): Is a non-self indicating personal dosimeter with a sensitive element that emits luminescent light after exposure to X-ray or gamma ray radiation. The portable CP-95/PD is required to compute and indicate the amount of radiation exposure. The CP95/PD indicates the TOTAL amount of radiation to which the DT60D/PD has been exposed to up to the time of the reading. It does not indicate the radiation level at any one time. The range of the DT-60D/PD is 10-600 rads.
- IM-143/PD (Self Indicating Dosimeter): Is a pocket dosimeter used to measure and indicate the accumulated dose of X-ray or gamma-ray radiation the wearer has been exposed to since the charging of the unit's electrometer. A scale, calibrated in rads, is mounted inside and can be read directly by holding the radiacmeter up to a source of light and looking into the eyepiece. The range is 10-600 rads.

The Navy Multifunction RADIAC System (MFR) will replace the AN/PDR-27 and the AN/PDR-43 for Chemical, Biological and Radiological Defense (CBR-D). It is a microprocessor-based portable radiation detection system which can be calibrated quickly using a standard serial interface to an IBM compatible personal computer. It will provide greater detection capability and lower life cycle costs than existing instruments. The MFR will provide a capability during watch standing, maintenance, damage control or mission execution to monitor radiation dose through the use of a single, lightweight, multi-level sensing device developed for field use under inclement conditions. The Automated RADIAC Calibration and Diagnostic Equipment (ARCADE) System will provide an automated capability to perform calibration and diagnostic troubleshooting of the MFR Master Unit and

associated probes. Current Acquisition Objective (AO) is 2590 for the CBR-D mission area. Milestone III is scheduled for AUG 94.

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## ANNEX D

# SPECIFICS OF MARINE CORPS AVOIDANCE PROGRAMS



## **Chemical Agent Monitor (CAM)**

Key Requirements. Similar to that of the Army.

### Description:

- The CAM is a hand-held device intended to be employed as a means to detect and identify chemical agents on personnel and equipment. Method of internal operation and components are similar to that of the Army CAM.
- In addition to detecting blister and nerve agents, a Marine Corps improved CAM will provide a capability of detecting three additional agents.
- Two hundred and forty systems were deployed in support of operations in Southwest Asia. The Acquisition Objective (AO) for the CAM is 2751 and will be fielded during FY94. Milestone III was achieved 18 May 1993.

## **Nuclear, Biological, and Chemical Reconnaissance System (NBCRS)**

### Key Requirements:

- Integration of advanced NBC detection and analysis equipment suited for Marine Air-Ground Task Force (MAGTF) operations.
- Marine Corps standard host vehicle.
- Transportable by C-130, CH-53E, and LCAV-30.

### Description:

- The Marine Corps' current system is the German "FUCHS" vehicle, affectionately known as the FOX. However, the FOX cannot perform stand-off chemical detection, to provide early warning of windborne hazards, its gross weight of 19.2 tons makes it extremely heavy, and because of its unique chassis, it is quite difficult to support logistically.
- The NBCRS is intended to be used as the Marine Corps premiere vehicle for accurate, rapid NBC combat hazard information by verifying the absence of, finding, mapping, and marking radiological, biological, and chemical hazards in support of land operations ashore. The NBCRS will be an integration of advanced NBC detection and analysis equipment suited for Marine Air-Ground Team Force expeditionary operations.
- Currently, the Concept of Employment (COE) and Operational Requirement Document (ORD) are in staffing. The AO for NBCRS is for 44 vehicles: 22 Light Armored Vehicle (LAV) and 22 HMMWV variants. The LAV variants would be assigned to reconnaissance elements within the Marine Divisions.

## **M21 Remote Sensing Chemical Agent Alarm (RSCAAL)**

### Key Requirements:

- Be capable of operation while-on-the-move.

Description:

- The M21 RSCAAL is a two-man portable, automatic scanning passive infrared sensor which detects nerve and blister agent vapor clouds based on changes in the infrared energy emitted from remote objects, or from a cloud formed by the agent. The RSCAAL is a stand-alone tripod-mounted, chemical agent overwatch system. It consists of a detector, tripod, transit case, power cable assembly, and standard military power source, capable of scanning horizontally 60 degrees. It will be used 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 force for chemical agent vapors, and to provide advanced detection and warning of chemical hazards.
- Currently, the RSCAAL only operates from a stationary position. A product improvement program (PIP) is planned to PIP the RSCAAL so it can be employed while on-the-move.
- The AO for the RSCAAL is 197. Currently, the Marine Corps has 125 RSCAALs. Milestone III was achieved 23 September 1992.

**Nuclear, Biological, and Chemical Hazard Information and Warning System (NBC HAZWARN)**

Key Requirements:

- Must accept NBC 1, 2, and 4 reports.
- Must be capable of producing NBC 3 and 5 reports in accordance with ATP-45.
- Must be capable of printing NBC weapon effects overlays.
- Must be capable of interacting with MAGTF command and control systems.

Description:

- The NBC HAZWARN system is intended to be used as an early warning system capable of providing Marines and their units with early indications that an NBC attack is taking place. NBC HAZWARN will consist of NBC detectors with transmitter interface, a personal computer with receiver interface, and software. The NBC HAZWARN system will automate what used to be a slow and unreliable means of spreading the word that an NBC attack had taken place.
- Currently, the ORD is in staffing. The AO for NBC HAZWARN is 200. Fielding of an initial system will commence during FY94. A Milestone III is tentatively scheduled during March 1994. Product improvements will allow further development of the NBC HAZWARN system.

**Lightweight Stand-off Chemical Agent Detector (LSCAD)**

Key Requirements:

- Be capable of employment from manned and unmanned systems.
- Be capable of being data-linked with a centralized hazard information data collection center.
- Be capable of remote operation.

Description:

- The LSCAD is a sensor that will detect the presence or absence of nerve or blister agents at a distance up to 5 kilometers. The LSCAD interferometer employs a passive infrared system that detects the presence or absence of chemical agents by completing a spectral analysis of target chemicals. The LSCAD can operate while-on-the-move or from a stationary position.
- The LSCAD has been in the development stages for the past several years. During several tests, the Marine Corps has employed the LSCAD on a UH-1 helicopter to test its capability in detecting chemical simulants. Future tests include the LSCAD being employed on an unmanned aerial vehicle.

**Individual Chemical Agent Detector (ICAD)**

Key Requirements:

- Must meet the NATO 5% Incapacitating Concentration/Total (ICT5) for early warning sensitivity and response time specifications for nerve agents (GD must meet NATO ICT10 specification).
- Be capable of being placed into service by one individual.
- Be capable of operation after submersion in salt/fresh water.
- Be capable of providing both an audible and visual alarm.
- Weigh no more than 12 ounces.

Description:

- The ICAD consists of two major components, a sensor cell module and an electronics/alarm module. The sensor cell module mounts inside the electronics/alarm module and consists of a plastic box which contains two electrochemical detector cells and one 3.6 volt lithium battery. One cell is sensitive to nerve agents (G and V agents), choking agents (CG), and blood agents (AC, CK); the other cell detects blister agents (HD, L). Chemical agent vapors in the air diffuse through membranes on the faces of the ICAD detector cells and are collected by an electrolyte gel behind the membranes. The agent concentration in the electrolyte is measured by multiple-electrode electrochemical-cell systems. When the concentration reaches a preset threshold level, the sensor module outputs a signal to the electronics module. The electronics/alarm module consists of a plastic box which contains the following: the electronic circuitry, and audio alarm, two visual alarm indicators, a sliding plastic cover, and two wire bails. The electronic circuitry inside the electronic/alarm module interprets the signal from the sensor cell module and causes the audio alarm to sound and the appropriate visual alarm indicator to flash. Three top-mounted female connectors link the sensor module detector cells and battery to the electronics/alarm module circuitry. The sliding plastic cover can be placed the lowered position, thereby covering the two detector cells and reducing diffusion into the detector cells. The wire bails are attached to the top and bottom of the electronics/alarm module. The operator can use these bails to attach the ICAD to his outer clothing. All repairs necessary to restore the ICAD to readiness can be accomplished by organizational maintenance (first and second echelon).
- As a result of operations in Southwest Asia, the ICAD was fielded to provide

- individual MAGTF Marines with the means to detect and identify chemical agents.
- The AO for ICAD is 215,000.

### **M272 Water Testing Kit**

#### Key Requirements:

- Be capable of providing the operator with an agent present or absence indication.

#### Description:

- The M272 enable tactical units to reconnoiter potential water sources and then monitor water supplies to verify that processed water does not exceed minimum permissible level of contaminants. The M272 provides the Marine Corps with a reliable method to support water point operations for water production, water distribution/storage, water reconnaissance, and preventive medicine in tactical environment for all climate design types. The M272 is a maintenance free, expendable chemical agent detector kit consisting of a jar, type I and type II detector tubes, standard waterproof matches, test reagents, training simulants, and a laminated plastic instruction card. All components are packaged in a molded plastic carrying case. The M272 is designed to test the following: Lewisite-L, Cyanide-AC, Blister-HD, and Nerve-GB. Test results will provide an agent present or absent indications within 30 minutes from test initialization. Chemical agents are detected when they produce specific color change in M272 test tubes or strips.
- The Marine Corps procured 3,045 kits.

### **Biological Detection and Warning System (BDWS)**

#### Key Requirements:

- Be designed for employment by any foot mobile unit.
- Be capable of providing an initial warning alarm (visual and audible) when challenged by any agent concentration.
- Be capable of being data-linked with a centralized hazard information data collection center.

#### Description:

- The biological detection and warning system will be the Marine Corps premier detector capable of detecting and identifying agents of biological origin. The BDWS will consist of two systems; a individual detector (capable of detecting a class of agents), and a unit detector (capable of identifying particular agents).
- To date, technology has not yet been able to provide the Marine Corps with what it requires.

## **AN/VDR-2 Radiacmeter**

### Key Requirements:

- Lightweight, and man-portable.

### 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 radiacmeter, probe (which contains gamma sensing devices and Geiger-Mueller tube), pouch with strap and the converter cable receptacle. The AN/VDR-2 measures gamma radiation from 0.01 microGrays/hour to 9,999 centiGrays/hour and beta radiation from .001 centiGrays/hour to 5 centigrays/hour. The dose rate is displayed on a three-digit liquid crystal display. The radiacmeter has the capability of time-integrating the dose-rate counts displaying the cumulative dose on command. With the probe, the AN/VDR-2 detects beta radiation and measures gamma contamination (at lose-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 radiacmeter capable of detecting and measuring both gamma and beta radiation.
- The AO for the AN/VDR-2 is 2,345 systems. A Milestone III was achieved 25 January 1988.

## **AN/PDR-75 Dosimeter**

### Key Requirements:

- Lightweight, and man-portable.

### Description:

- The AN/PDR-75 consists of the Detector, Radiac DT-236/PDR-75, and the Computer Indicator (CP-696/PDR-75). The Radiac Computer Indicator is designed to measure accumulated neutron and gamma radiation dose. The Radiac Detector is worn by personnel who may be exposed to radiation from tactical nuclear weapons. These devices, together, provide a means of detecting and measuring individual exposure of accumulated neutron induced and gamma radiation. 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.
- The inventory objective for the DT-236/PDR-75 is 187,086, and the inventory objective for the AN/PDR-75 is 1,205 systems.

### **IM-143/PD Dosimeter**

#### Key Requirements:

- Lightweight, and man-portable.

#### Description:

- Individual dose rates can be monitored by the currently fielded IM-143/PD. This is a pencil type dosimeter and is supported by the PP-4276/PD, radiac charger. Eventually, the IM-143/PD will be replaced as the AN/VDR-2 and AN/PDR-75 are completely fielded.

## ANNEX E

# SPECIFICS OF ARMY PROTECTION PROGRAMS (Protective Masks)



### **M40 Protective Mask (Individual Soldier Mask) (FUE FY92).**

#### Description:

- The M40 provides respiratory, eye, and face protection against chemical and biological agents. The mask consists of a silicone rubber face-piece with an in-turned peripheral face seal and binocular rigid lens system. A face-mounted canister (gas and aerosol filter) can be worn on either the left or the right cheek. Microphones and air adapters are provided for combat vehicle applications. The mask comes in small, medium and large sizes.
- The M40 P3I Mask program enhances the operational performance of the M40 mask by incorporating these options: improved communication system; canister interoperability; quick-doff/second skin hood; and improved vision correction. The communication system and canister interoperability concept will enable conversion of the M40 Mask to a combat vehicle compatible M42 Mask. The communication system includes speech amplification and microphone inter-changeability.

### **M43/M43A2 Protective Mask (Aircrewman Mask) (FUE FY93).**

#### Key Requirements:

- CB protection compatible with all Army rotary wing aircraft; and,
- Weapon system interface.

#### Description:

- The M43 Protective Mask was developed for the AH-64 helicopter and consists of a form-fitting facepiece with lenses mounted close to the eyes; an integrally attached CB hood and skull-type suspension system; an inhalation air distribution assembly for regulating the flow of air to the oronasal cavity, 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 mask provides the required CB protection and is compatible with the AH-64 Integrated Helmet and Display Sighting System (IHADSS) and the Optical Relay Tube (ORT). The M43A2 is a preplanned product-improved M43. The M43A2 replaces the M24 protective mask. Key features include: an auxiliary motor blower to maintain minimum level of production, replaceable prescription lenses, use of standard batteries, and improved NBC survivability.

### **XM45 Aircrew Protective Mask (ACPM) (FUE FY98).**

#### Key Requirements:

- Unpowered protection;
- Optical compatibility; and,
- Reduced weight, cost and logistic burden and improved RAM versus M43A1.

Description:

- The ACPM is the follow-on to the M43A1 mask and addresses the limitations (blower dependency and high unit cost) of that mask. It has 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 provides the required CB protection with or without the aid of forced ventilation air and is compatible with aircraft sighting systems and night vision devices.

**Respiratory Protection System 21 (RESPO 21)  
(Integrated Respiratory Protection) (FUE FY02).**

Key Requirements:

- Protection against future threats;
- Reduced mission degradation; and,
- Improved system integration over M40 series protective masks.

Description:

- RESPO 21 is a replacement for the M40 series protective mask. RESPO 21 provides quantum improvements in CB protection by minimizing soldier degradation through reduction of the physiological burden and maximizing compatibility with future weapon systems. RESPO 21 provides improved protection required against future CB threat agents.
- Exploratory development (6.2) concepts address the above key requirements. Concepts include multi-layer and lightweight facepiece designs with modular facepiece component substitution according to mission needs. Both general purpose and light forces applications are being considered. Initial functional prototypes for both concepts were completed in 3QFY92. The 6.3a technical demonstration is planned for late FY94.

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**ANNEX F**

**SPECIFICS OF ARMY PROTECTION  
PROGRAMS  
(Clothing and Equipment)**



## **PROTECTIVE SUITS**

### ***Past item:***

#### **Chemical Protective Overgarment (CPOG)**

(No longer used, but some used for training. Shelf life has expired).

#### **Description:**

- Two piece, two layer garment. The outer fabric is a plain green colored nylon/cotton blend. Liner is a polyurethane foam impregnated with activated carbon, laminated to a nylon knit fabric. CPOG met requirement for protection against 5 grams/meter squared ( $\text{g/m}^2$ ) liquid agent for 6 hours after 14 days of non-NBC wear.

### ***Current adopted items:***

#### **Battledress Overgarment (BDO) (FUE FY84)**

#### **Description:**

- The BDO is a two-piece, two-layer garment. The outer fabric is a camouflage printed (woodland or desert) nylon/cotton blend with a water repellent finish. The liner is a polyurethane foam impregnated with activated carbon, laminated to a nylon knit fabric. The carbon/foam formulation is improved compared to the CPOG and provides added protection. The BDO retains its protective qualities for a minimum of 30 days of non-NBC wear and affords 24 hours protection after  $10 \text{ g/m}^2$  agent contamination. It is not launderable. Shelf life is 12 years.

#### **Saratoga**

**(Army FUE-approved as alternative to the BDO;  
will not be procured for Army use unless surge required)**

#### **Aircrew Uniform, Integrated Battlefield (AUIB) (FUE FY95)**

#### **Description:**

- The AUIB is a two-piece duty uniform which provides Army aircrew with flame and chemical agent protection in a single uniform. It will replace the BDO for aircrews and is worn over the Nomex flight suit. The outer shell is a laminate of 95/5 Nomex/Kevlar and polytetrafluoroethylene (PTFE) film. The inner layer is a laminate of carbon impregnated, flame resistant polyurethane foam and nylon knit. The AUIB is compatible with aircrew life support equipment used in rotor-winged aircraft and with developmental cooling vests. The AUIB provides protection from flame threats and 24 hours protection against  $10 \text{ g/m}^2$  agent after 15 days non-NBC field wear; 6 hours protection after 30 days wear.

**Chemical Protective Undergarment (CPU)**  
**(FUE SOF, FY93; FUE, CVC, FY94)**

Description:

- The CPU is a two-piece undergarment made of a nonwoven fabric with activated charcoal. The undergarment weighs 2 pounds, 11 ounces. When worn under the CVC coverall, battledress uniform (BDU), the CPU provides 12 hours protection against 10 g/m<sup>2</sup> agent contamination after 15 days of non-NBC field wear and 1 field laundering. The CPU is not a stand-alone garment; it must be worn under an outer garment (BDU, CVCU).

**Toxicological Agent Protective (TAP) Ensemble**  
**(FUE unknown)**

Description:

- Used by Army Explosive Ordnance Disposal personnel (MOS 55D) and civilian operators in Army chemical depots for hazardous operations involving chemical munitions. The primary ensemble consists of hood, boots, gloves and coveralls made of an impermeable butyl rubber-coated nylon fabric. Footwear covers, an apron and an impregnated suit (worn under the coveralls) are used in some operations. Hoods are compatible with the M9A1 and M40 masks.

**Interim Self-Contained Toxic Environment Protective Outfit (STEPO-I) (FUE to depots, FY92; fielding completed FY93)**

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.

***Near Term Items:***

The JSLIST program includes four requirements for Army suits: The Advanced BDO, the Lightweight C/B Garment, the Enhanced AUIB and the VPFRU.

**Advanced Battledress Overgarment (ABDO)**  
**(FUE, FY97)**

Key Requirements:

- Provide 24 hours protection against 10 g/m<sup>2</sup> liquid agent and 5000 CT for vapor/aerosols.
- Provide 30 days field wear (minimum) in all geographical areas.
- Retain chemical protection after 4 launderings.
- Weigh less than 4lbs for a size medium-regular, packed garment.

- Reduce physiological heat burden currently imposed by BDO.

Description:

- New outer shell materials and new liner fabrics for the ABDO are being evaluated in JSLIST program. Liners currently are based upon various activated carbon technologies (carbon beads, thin carbon foam and others). The ABDO will be a two-piece suit design with an integrated hood compatible with the M40 mask with second skin. The ABDO will be worn as an overgarment over the duty uniform or as a primary garment over underwear depending upon the environment and mission.

**Lightweight Chemical/Biological Protective Garment (LCBPG)**  
**(FUE, FY97)**

Key Requirements:

- Provide 6 hours protection against 10 g/m<sup>2</sup> liquid and 5000 CT for 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<sup>3</sup> (300 desired).
- Reduce by at least 20% (30% desired), the physiological heat burden currently imposed by BDO.

Description:

- 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. New outer shell materials and new liner fabrics for the LCBPG are being evaluated in JSLIST program. 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 over the duty uniform or as a primary garment over underwear depending upon the environment and mission.

**Enhanced Aircrew Uniform Integrated Battlefield (EAUIB)**  
**(FUE, FY97)**

Key Requirements:

- Provide 12 hours protection (24 desired) against 10 g/m<sup>2</sup> liquid and 10,000 CT for vapor/aerosols.
- Provide 30 days field wear (minimum) in all geographical areas.
- Retain chemical protection after 4 launderings.
- Provide flash fire protection (10 watts/cm<sup>2</sup> for 6 seconds).
- Weigh 25% less than the AUIB.
- Reduce physiological heat burden currently imposed by the AUIB; be compatible with micro climate cooling vest.

Description:

- The EAUIB will be worn by aircrew and by aviation ground personnel. The EAUIB will combine flame protection and chemical protection in a single garment. New

outer shell materials and new liner fabrics for the EAUIB are being evaluated in JSLIST program. It will be a two-piece suit design with an integrated hood compatible with the M43 and XM45 mask series with second skin. In order to allow MOPP flexibility, the EAUIB will be worn as an overgarment over the duty uniform or as a primary garment over underwear depending upon the environment and mission.

### **Vapor Protective Flame Resistant Undergarment (VPFRU) (FUE, FY97)**

Key Requirements: (When worn under the Nomex coveralls)

- Provide 12 hours protection (24 desired) against 10 g/m<sup>2</sup> liquid and 10,000 CT for 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<sup>2</sup> for 6 seconds).
- Weigh less than 3 pounds (without coveralls).
- Reduce by 20% the physiological heat burden currently imposed by the CPU worn with coveralls.

Description:

- The current CPU was tested and approved for 15 days wear, 12 hours protection, 1 laundering. The VPFRU will be developed and tested for 30 days wear time, 4 launderings and a reduction of the heat stress burden of 20% compared to the CPU. Materials for the VPFRU are being evaluated in the JSLIST program. The VPFRU will be a one or two-piece undergarment with an integral hood compatible with the M42 series protective mask.

### **Fire-Fighters Suit-Combat (FIS-C) (Draft requirement; FUE projected for FY95)**

Key Requirements:

- Provide 12 hours of CB agent protection against 10 g/m<sup>2</sup> liquid agent.
- Usable by firefighters engaged in both structural and crash fire fighting/rescue operations.
- Will allow firefighters to use mission essential tools and equipment.
- Provide resistance to water and all standard fire fighting chemicals (foam, CO<sub>2</sub>, aircraft POL).
- Capable of being donned in 3 minutes or less.

Description:

- Monitoring on-going USAF program for similar ensemble, with intent of adopting for the Army/or modifying for unique Army missions. Ensemble will consist of a CB undergarment worn under the standard firefighting outergarment and used with a switchable filtered/supplied air respiratory system (same as for the Improved TAP

ensemble below). Four types of CB undergarments are being evaluated, including the CPU.

### **Self-Contained Toxic Environment Protective Outfit (STEPO) (FUE, FY96)**

#### Key Requirements:

- Provide 4 hours of percutaneous protection against chemical agents, toxic industrial chemicals, unknown chemicals, rocket fuels and petroleum, oils and lubricants (POL).
- Be capable of being decontaminated for reuse after 5 vapor exposures for 4 hours each.
- Provide 4 hours of self-contained respiratory protection and cooling.
- Provide self-extinguishing flame resistance.
- Be compatible with radios in depot and EOD supply system.

#### Description:

- The STEPO will be worn by EOD and depot chemical munitions personnel engaged in special operations in Immediately Dangerous to Life and Health (IDLH) environments. STEPO will be used in extremely hazardous areas where contact with chemical agents, missile fuels, POL and/or toxic industrial chemicals can occur. The ensemble will have an encapsulating suit with visor; a NIOSH approved self-contained breathing apparatus (with a tether/ emergency breathing apparatus option); a battery powered micro climate cooling system; and a communication system compatible with EOD and depot radios in the supply system. Modified Non-Developmental Items (NDI) have had full consideration in system design. Mini-user evaluations have been used to the fullest extent to reduce design risks. The design has been frozen; test prototypes are being procured for technical and user testing starting in 3QFY94.

### **Improved Toxicological Agent Protective (I-TAP) Ensemble (FUE, FY97)**

#### Key Requirements:

- Provide 4 hours liquid chemical agent protection.
- 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.
- Provide a universal cooling system pass through which is compatible with cooling systems in development (Personal Ice Cooling System (PICS)).

#### Description:

- The I-TAP will be a joint service program with an Army lead. The I-TAP will provide an ensemble which can be used for routine operations requiring filtered air.

With a capability to switch to a 1-hour air bottle, the I-TAP also can be used for short term entry and life saving operations requiring supplied air, thereby reserving the STEPO for sustained operations in IDLH environments. The I-TAP will have an improved material to replace the current butyl coated fabric which has experienced production quality problems. The design will reduce the bellows effect and will have a pass through for cooling systems. The primary candidate for the switchable respiratory system is the one being evaluated by the USAF for the combat fire-fighting ensemble discussed above.

## PROTECTIVE FOOTWEAR

### *Past item:*

#### **Chemical Protective Footwear Cover (CPFC) (No longer used)**

##### Description:

- Butyl rubber sole and upper with laces. Worn over the combat boot. Two versions were fielded, one with single heel flap and the other with a fishtail double heel flap.

### *Current Adopted Item:*

#### **Green/Black Vinyl Overboot (GVO/BVO) (FUE: GVO has been in supply system to provide environmental protection; it was approved for use as chemical protective boot in FY89. FUE for chemical use, FY90)**

##### Description:

- The GVO is olive drab vinyl overboot with elastic fasteners. It is worn over the combat boot for environmental protection. Worn over the combat boot, it provides 24 hours protection against 10 g/m<sup>2</sup> liquid agent after 14 days non-NBC wear. The BVO is similar to the GVO except for color and enlarged tabs on the elastic fasteners. The BVO is replacing the GVO as the GVO stocks are depleted.

### *New Item:*

#### **Multipurpose Overboot (MULO) (FUE FY97)**

##### Key Requirements:

- Provide 24 hours protection against 10 g/m<sup>2</sup> liquid agent as well as environmental protection from water, snow and mud.
- Provide 60 days wear in all geographical environment 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 field decontaminants.

**Description:**

- The MULO will be a joint service program under the auspices of the JSLIST program. The MULO will be made of an elastomer blend and will be produced by injection molding. It will be designed to be worn 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 MULO sole will be designed to provide traction on various surfaces including dirt and metal.

**PROTECTIVE GLOVES**

***Current Adopted Item:***

**Glove Set, Chemical Protective  
(FUE (25 mil) unknown, FUE 7 and 14 mil, FY87)**

**Description:**

- Set consists of an outerglove made of impermeable, black butyl rubber. An inner glove of thin cotton is used to absorb perspiration. A 25 mil glove is for soldiers who perform close combat tasks and other types of heavy labor. The 14 mil glove set is used by aviators, vehicle mechanics and weapon crews whose tasks require dexterity and sensitivity. The 7 mil glove is used by medical personnel, keyboard operators and electronic repair personnel whose tasks require extreme dexterity and sensitivity. The glove set is donned new as the protection level is raised to MOPP 4. The 14 and 25 gloves provide 24 hours protection after exposure to agent; the 7 mil provides 6 hours protection.

***New Item:***

**Improved CB Protective Glove (FUE FY97)**

**Key Requirements:**

- Provide 24 hours protection against 10 g/m<sup>2</sup> liquid agent.
- Provide protection against POL and standard decontaminants.
- Provide self-extinguishing flame resistance .
- Provide 15 days wear durability in all geographical environment without degradation of protection.
- Provide dexterity necessary for soldiers to employ their weapons and perform required tasks equal to or better than the standard 14 and 25 mil butyl gloves.

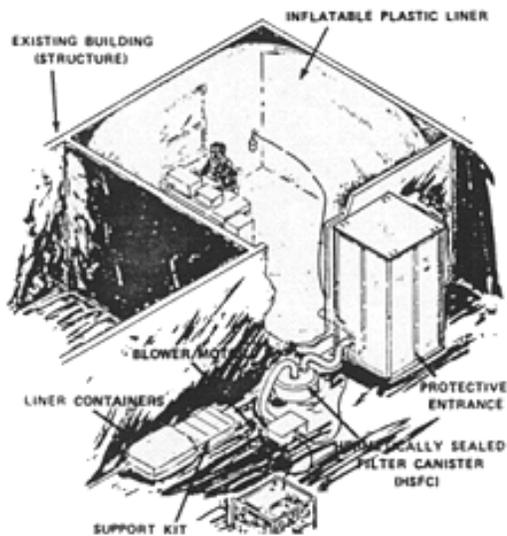
**Description:**

- 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.

# ANNEX G

## SPECIFICS OF ARMY COLLECTIVE PROTECTION PROGRAMS



**M20E1/M28 Simplified Collective Protection Equipment (SCPE)  
(Battalion CB Shelter) (FUE FY92).**

Key Requirements:

- Provide a medical airlock for litter patients (XM28 only);
- Increase entry-exit rate;
- Provide liquid agent resistance;
- Interface with tent, extendible, modular, personnel;
- Allow expansion of the protected area;
- Interface with existing Army environmental control units; and,
- Reduce generated electromagnetic interference.

Description:

- The simplified collective protection equipment (SCPE) currently in production is a low cost method of transforming a room of an existing structure into an NBC collective protection shelter for C3 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 preplanned product improvement (P3I) program to the SCPE (M20E1/XM28) 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.

**Advanced Integrated Collective Protection System (AICPS)  
for Vehicles, Vans and Shelters (VVS) (FUE TBD)**

Key Requirements:

- Provide an advanced NBC filtration system integrated with Auxiliary Power Unit (APU) and an Environmental Control Unit (ECU) for integration into vehicles, vans and shelters.
- Provide advanced NBC filtration system to reduce logistics burden of filter change and meet future threats; and,
- Provide an NBC filtration system integrated with APU/ECU units which offer overall size, weight and energy reductions and additional electric power.

Description:

- The AICP is an NBC filtration system integrated with environmental control and power source components for combat systems. The combined components provide overall size, weight and energy reduction, as well as the needed 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 and Biological Protective Shelter (CBPS)**

### 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 their mission 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.

## **DEPLOYABLE MEDICAL SYSTEM (DEPMEDS)**

### Key Requirements:

- Chemical hardened;
- Provides CB collective protection; and
- Corps level hospital use.

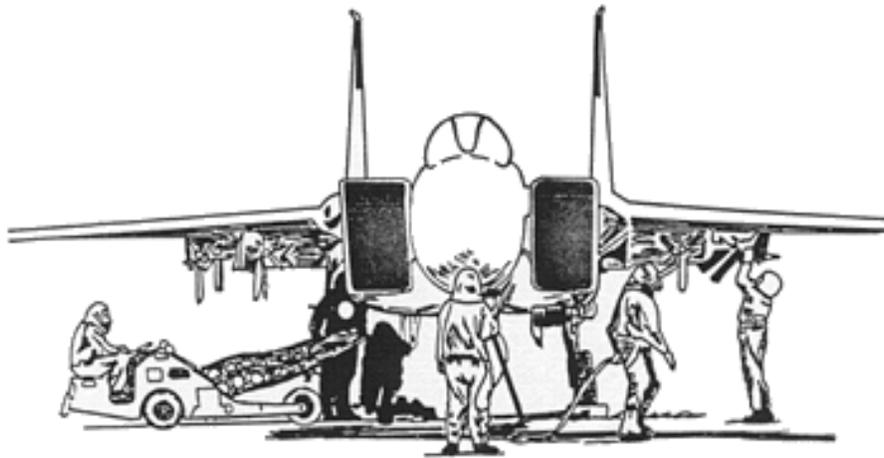
### Description:

- The chemical 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, entryways and filter/blower units. Also part of this effort is the Environmental Control Unit (C-100) and the heater which will be chemically hardened.

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## ANNEX H

# SPECIFICS OF AIR FORCE PROTECTION PROGRAMS



**Aircrew Eye/Respiratory Protection System (AERP)**  
**(In Production, First Units Fielded FY93)**

Key Requirements:

- Enhance existing capability by providing improved visibility, fit, chemical protection and comfort.

Description:

- Replaces the MBU-13/P chemical and biological oxygen mask with an improved system. The final objective is to equip all aircrew members in all aircraft MDS with a chemical defense capability. This system is a second generation chemical defense system that is designed to improve visibility, fit, protection, and comfort. The system includes a mask/hood, blower unit, intercom unit and passive anti-drown device.

**Aircrew Ensemble CWU-66/P**  
**(In Production, First Units Fielded FY93)**

Key Requirements.

- Enhance existing ensemble improving chemical protection and reducing ensemble weight and thermal burden.

Description.

- Program develops, tests and procures improved aircrew chemical defense ensembles to replace the current ensembles. Technical objectives are to reduce thermal load burden with a lighter weight ensemble and improve chemical protection. Through USAF development contracts, off-the-shelf procurements, and contractor furnished material, four candidate fabrics were tested for use in a new aircrew ensemble. Following Developmental Test, and Evaluation (DT&E) and Individual Operational Test and Evaluation (IOT&E), a garment was selected and manufactured into ensembles through a sole source production contract to support Operation Desert Storm. Due to high ratings by users during ODS, the remaining USAF requirements will be procured to current specifications through a competitive production contract.

**Groundcrew Ensemble**  
**(User Evaluation/Source Selection FY 96)**

Key Requirements.

- Enhance existing capability with lighter, less thermal burdening ensemble.

Description.

- Program provides chemical protection, from the neck down, to personnel while in the Air Base environment. The garment will provide sufficient protection from liquid and vapor hazards at a specified level while greatly reducing the level of physiological stress encountered with the current battle dress overgarment (BDO). The material will be lighter and will provide a reduction in heat stress. The suit must

be launderable and decontaminable. In-house studies have resulted in the Air Force jointing the JSLIST effort with the other Services to meet USAF requirements. Additionally, a related effort is underway for an explosive ordnance disposal (EOD) ensemble.

The EOD program targets development of a replacement for the existing EOD butyl rubber ensemble which will incorporate available technologies to reduce thermal burden reduce weight, be decontaminable, provide protection from ordnance blast/effects, provide NBC protection and interface with ground support equipment. The current ensemble wear-time is insufficient due to thermal loading. Requirements will be baselined and a development program will be initiated starting with advanced development concept studies. The USAF Groundcrew Ensemble program will also be monitored, to share in the benefits and lessons learned from that development. An similar effort is underway to develop an ensemble for fire fighters.

### **Disposable Eye/Respiratory Protective Mask (FUE FY96/97)**

#### Key Requirements.

- Provide a minimum of two hours protection against vapor hazards;
- Capable of being donned within 15 seconds;
- One size fits all; costs less than \$40/unit, and is expendable.

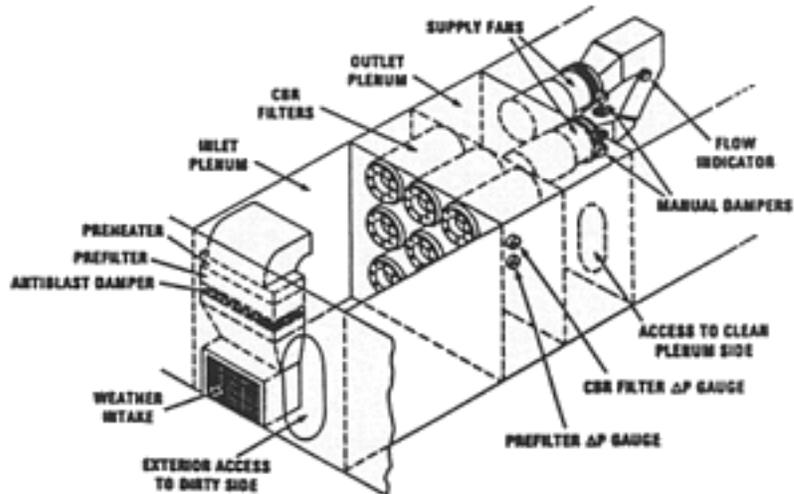
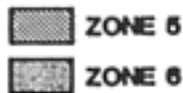
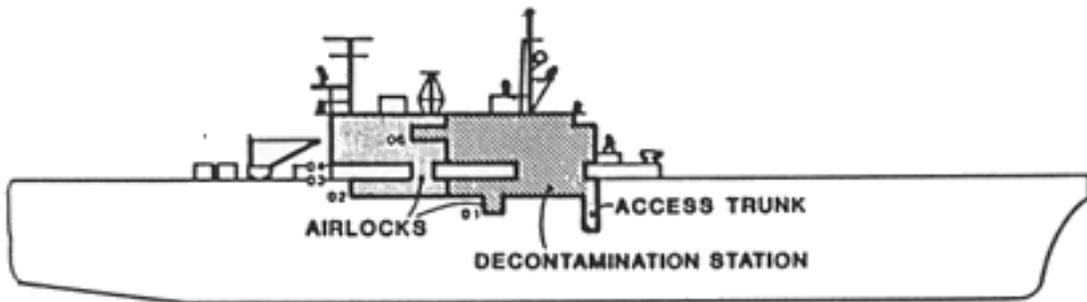
#### Description.

- Program will target development and procurement of an inexpensive, compact, disposable mask to be used for various emergency/short-term purposes. Commercial masks have been screened to determine their suitability for use. This industry review has revealed that several existing masks could be modified to satisfy user requirements. A competitive procurement is underway to provide a modified commercial item.

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**ANNEX I**

**SPECIFICS OF NAVY PROTECTION PROGRAMS**



## CHEMICAL PROTECTIVE CLOTHING (FIELDED)

### Key Requirements:

- Provide protection from all known chemical and biological warfare agents;
- Utilize a minimum of storage space onboard ship;
- Zero maintenance requirements beyond visual inspection.

### Description:

#### Chemical Protective Overgarment (CPO):

- The CPO is an adaptation of the British Mark III protective suit. It consists of a parka and trousers. Both have two layers: inner (anti-gas) and outer (modacrylic/nylon). The CPO is effective against all known chemical agents and is permeable to water vapor. The suit was designed to meet the requirements for a six hour protection time, protection against 2gms/m<sup>2</sup> of liquid HD and an allowable breakthrough of vapor of 4 micrograms/m<sup>2</sup>. Once removed from its protective package, the CPO has a service life of 100 hours in a non chemical environment.

#### MCU-2/P Gas Mask:

- Introduced in 1987 as a joint Navy/Air Force product after the Army discontinued the M30 program. The mask consists of a unimolded, silicone rubber face piece, a single polyurethane visor, a polycarbonate covering for the visor which provides additional abrasion protection, and a single replaceable C-2 filter cartridge which meets all NATO standards for interoperability and performance. It has two voice emitters: one for face-to-face speech and one at the side for use with communication equipment. The mask is equipped with a drinking tube, which enables the user to drink from a canteen fitted with a special drinking cap. The mask can be worn over approved compatible spectacles. The flexible lens permits the use of binoculars, a gun sight or other optical equipment. The filter can be used on either side of the mask as desired. The mask is designed to provide full chemical, biological and radiological (CBR) protection and has replaced the MK V mask. The MCU-2/P will protect the face, eyes and respiratory tract of the wearer from tactical concentrations of chemical and biological agents, toxins and radioactive fallout particles. It is designed to accommodate the use of tri-service/NATO canisters. Concern over possible susceptibility of the face piece to certain concentrations of select agents has resulted in an effort to develop a "second skin" covering which will provide enhanced resistance to chemical agent adsorption.

#### Chemical Protective Overboots (Fishtails):

- Worn over the standard work shoe and provide protection against exposure to all known concentrations of nerve and blister agents. The boots are loose fitting, impermeable, butyl sheet rubber with a premolded, non-slip, butyl rubber sole. The boots are approximately 16 inches high with a grommet lace closure including five eyelets to allow lacing around the foot. They are issued in a polyethylene bag with two pairs of laces and an instruction sheet. Unopened, the set has an indefinite shelf

life. Upon contamination, the Fishtail provides six hours protection from agent penetration.

#### Chemical Protective Glove Set:

- Worn to afford hand protection against nerve and blister agents in liquid and vapor form. The set consists of an outer glove to provide chemical protection and an inner glove to assist in the absorption of perspiration. The outer five-finger glove is made of impermeable, unsupported, black butyl rubber and is manufactured in a right and left hand configuration. The inner thin white cotton glove can be worn on either hand. The glove set is issued in a clear polyethylene bag with an instruction sheet. Unopened, the gloves have an indefinite shelf life. The black glove gives protection against chemical agent vapors, aerosols and small droplets. Upon contamination, the glove set provides at least six hours of protection from agent penetration. Gloves, in good condition, can be decontaminated using standard procedures.

### **CHEMICAL PROTECTION SYSTEMS (CPS) (FIELDED)**

#### Key Requirements:

- Provide a contamination free environment for a crew;
- Protect against both chemical and biological agents;
- Utilize existing ventilation systems and equipment;
- Minimize impact on crew ingress and egress;
- Minimize maintenance requirements.

#### Description:

#### Chemical Protection System (CPS):

- CPS provides a contamination free environment to selected areas (zones) which allows personnel to safely work, rest, and eat without the need for protective clothing or a protective mask. An integral part of the ship's ventilation system, CPS utilize a special filters to remove NBC contaminants from the atmosphere. The air inside the zone is maintained at a higher pressure than the outside air which prevents leakage of contaminants into the protected zone. CPS is being installed on the following new construction ships :DDG-51, LHD-1, and LSD-41.

#### Selected Area Collective Protection System (SACPS):

- For backfit applications, SACPS is capable of being installed. By modifying existing ventilation systems, SACPS will create safe zones in selected areas on the ship. Like CPS, these zones will provide a contamination free environment where it is not necessary to wear individual protective equipment.

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## ANNEX J

# SPECIFICS OF MARINE CORPS PROTECTION PROGRAMS



## **M40/M42 Field Protective Mask**

### Key Requirements:

- Improved voice enhancement.
- External filter/canister.
- Drinking capability.

### Description:

- The M40/M42 provides chemical-biological protection to the face, eyes, and respiratory tract from field concentrations of all chemical-biological agents, (vapor and aerosol form), toxins, radioactive particles, and battlefield or environmental contaminants. Each canister can withstand a minimum of 15 nerve, choking, and blister agent attacks and a minimum of 2 blood agent attacks. It provides unobstructed, undistorted forward vision and can accommodate corrective lenses. The mask can be worn continuously for 8 to 12 hours for functional purposes. Coupled with a voice communication adapter, it facilitates intelligible speech transmission and does not interfere with hearing. Accessories/components include:
  - Laser protection.
  - Second skin.
  - C2 canister.
  - Voice communications adapter.
  - Mask carrier, drinking system, hood, lens cover outserts, waterproof bag, and carrier.
  - Operations in Southwest Asia highlighted the fact the M17A2 field protective mask needed improvements. The new M40 series masks, with needed improvements, began Marine Corps fielding during CY93.

## **Protective Garment**

### Key Requirements:

- Be compatible with the current field protective mask.
- Weight for a complete, medium-sized ensemble (ensemble includes suit, gloves, and foot-wear covers), will be no more than 4.5 kilograms.
- Be flame retardant
- Provide protection from liquid, aerosol, and vapor chemical agents from a minimum of 24 hours after a minimum of 30 days of wear when challenged by 10 mg/m<sup>2</sup> of threat liquid agent(s), 5000 mg/m<sup>3</sup> of vapor agents, and 1000 mg/m<sup>3</sup> for aerosol agents (NATO standard).

### Description:

- The current protective suits within Marine Corps inventory are the OG-84 and the Saratoga. The protective suits are capable of providing protection against known chemical and biological agents. The protective gloves are the standard twenty mil black rubber gloves. The protective footwear is the Green Vinyl Overboot. OG-84 and the Saratoga will eventually be replaced by the new lightweight integrated ensemble.

- Initially a Marine Corps only program, the Joint Service Lightweight Integrated Suit Technology (JSLIST) program has become a multi-service program. The JSLIST program consists of the services in full cooperation jointly developing and fielding a new chemical protective suit/garment. Developments of JSLIST will eventually replace the OG-84 and possibly the Saratoga.
- Currently, the Concept of Employment (COE) and Operational Requirement Document (ORD) are in staffing. The AO for the Marine Corps for the future suits is 656,000.

### **Canteen Refilling System**

#### Key Requirements:

- Be compatible with a variety of common water distribution systems.
- Be capable of filling more than two canteens at once.
- Be lightweight, durable and man portable for short distances.
- Be capable of providing self-protection to ensure the refill fittings cannot become contaminated as a result of airborne NBC contamination.

#### Description:

- The CRS will consist of modifications to current water systems. Early capabilities will provide MAGTF Marines with an ability to refill their canteens from unit five-gallon water containers. The objective requirement for the CRS is that it be compatible with a variety of common water distribution systems.

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## ANNEX K

# SPECIFICS OF ARMY DECONTAMINATION PROGRAMS



### **Catalytic Sorbent Decontamination System (FUE FY07).**

- The follow-on 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 offgassing of agents from used sorbents.

### **Catalytic Self Decontaminating Coating (Self-decon coatings) (FUE TBD) (Unfunded)**

- 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.

### **Catalytic Emulsion Decontaminant (FUE TBD).**

- The catalytic emulsion decontaminant is an improvement to the DAM. This material uses hydrolytic and oxidative catalysts to destroy CB agents to a level equivalent to DAM with less corrosion to the cleaned surfaces. The replacement of reactive components reduces the consumption of reactants and thereby significantly decreases the logistical burden.

### **Modular Decontamination System (MDS) (FUE FY97) (Partially unfunded)**

#### Key Requirements:

- Provide high pressure water for the primary wash process;
- Mechanically dispense and scrub decontaminants;
- 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; and,
- Provide fire hydrant adapter kits.

#### Description:

- The MDS includes the XM21 pumper /scrubber module and the XM22 high pressure washer module. MDS is used for deliberate and hasty decontamination of vehicles and equipment. The system consists of a pumper/scrubber module for applying standard decontaminant DS2, and a high pressure washer module for primary wash and rinse steps. The MDS replaces the heavier, less mobile M12A1 power-driven decontaminating apparatus, and is transported in 3/4 or 1-1/2 ton trailers. The XM21 delivers DS2 or field expedient decontaminants (formalin, household bleach, and diesel fuel) at low pressure (100 psi) at a rate of 1-1/2 gpm, and mechanically agitates decontaminant solutions to improve decontamination efficacy. The XM22 draws

water from natural water sources, heats it, and delivers it at adjustable pressures and flow rates. These items are supported by two M17 lightweight decontamination systems for primary wash and rinse applications, and by 3000 gallon self-supporting collapsible water tanks, 65 gpm water pumps at each decontamination station, and fire hydrant adapters for water supply. The components of a single MDS completely equip a decontamination line at a deliberate equipment decontamination site, and are transported in a 3/4-ton trailer towed by a M1037 high mobility multipurpose wheeled vehicle or in a 1-1/2 ton trailer towed by a 5-ton cargo truck.

## ANNEX L

# SPECIFICS OF AIR FORCE DECONTAMINATION PROGRAMS



## **Aircraft Interior Decontamination (AIDECONS) (FUE FY01)**

### Key Requirements.

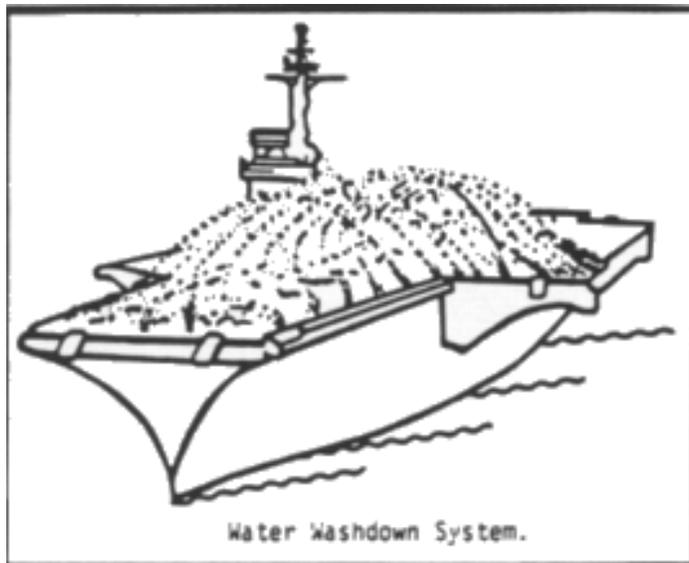
- Provide a capability to decontaminate the interior of an aircraft, without harming personnel or degrading aerospace materials.

### Description.

- Operation Desert Storm demonstrated the need for a capability to decontaminate aircraft interiors. The Air Force currently has no feasible means to decontaminate aircraft interiors. AIDECONS must be safe to personnel, offer protection from off-gassing and direct liquid exposure during decontamination. It must also not degrade aerospace materials or avionics equipment.

## ANNEX M

# SPECIFICS OF NAVY DECONTAMINATION PROGRAMS



### **Counter Measure Wash Down System (Fielded)**

Key requirement.

- Provide a method to prevent/remove NBC contamination of the ship's exterior;
- Able to operate for extended period of time;
- Utilize installed fire main system.

Description:

- All ships have a water wash down system consisting of a network of pipes which are connected to the fire main system. The pipes carry salt water to a series of nozzles permanently installed on the ship's exterior. When activated, the water wash down system will cover the ship's topside with a steady spray of salt water. Primarily designed as a preventive measure, the wash down system is also used for decontamination. It should be noted that the wash down system only removes the contaminants from the surface of the ship, it does not chemically neutralize or kill the agent. Fire hosing is a valuable addition to the washdown system which provides a more thorough removal of residues of contamination. The hose stream is most effective when projected well in advance of the nozzle so that there is little or no splash or rebound from the surface being contaminated.

### **M291 Skin Decontamination Kit (Fielded)**

Key requirement.

- Decontaminate personnel and equipment of nerve and blister agents.
- Can be used by crew members.

Description:

- To decontaminate the skin of nerve and blister agents there is the M291 Skin Decontaminating Kit. It consists of a wallet-like carrying pouch containing six individual decon packets. This is enough to do three complete skin decontaminations. Each packet contains an applicator filled with decontamination powder. The kit is expendable, so it can be thrown away after the packets are all used. The M291 is for external use only.

### **High Test Hypochlorite (HTH) (Fielded)**

Key requirement.

- Provide quick and effective ship decontamination;
- Utilize salt water;
- Effective against chemical and biological agents.

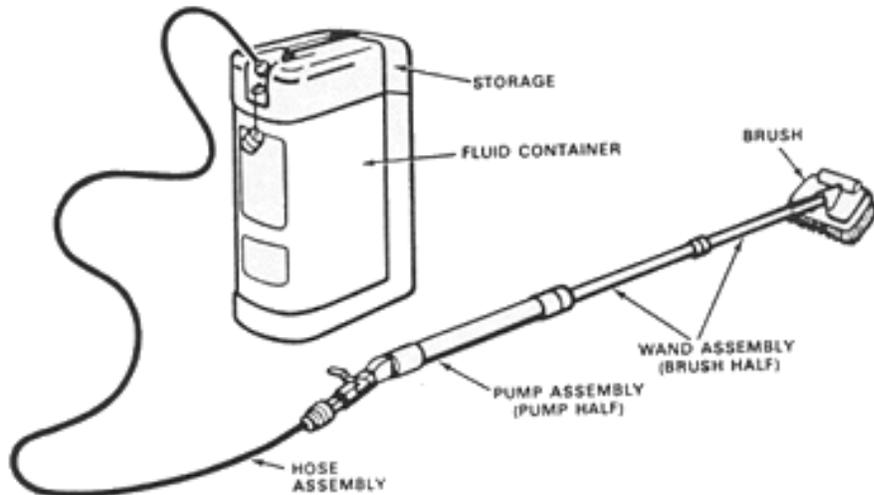
Description:

- High Test Hypochlorite (HTH) is a high test calcium hypochlorite product used for water purification and small area decontamination. HTH is the most powerful shipboard decontaminant for chemical and biological agents. The plastic containers used for HTH assures a shelf life of at least two years under normal circumstances.

The shelf life decreases by stowage at higher than average ambient temperatures. Minimum amount to be carried at all times is 192 six ounce bottles for amphibious ships and aircraft carriers and 144 six ounce bottles for all other surface ships. When using HTH for decontamination, it is mixed with water and a detergent wetting agent (the detergent assures complete wetting of the surface to be decontaminated). The standard mixture results in a one percent HTH/detergent solution, for more heavily contaminated areas a nine percent HTH/detergent solution is used.

**ANNEX N**

**SPECIFICS OF MARINE CORPS  
DECONTAMINATION PROGRAMS**



## **Lightweight Decontamination System (LDS, M17)**

### 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:

- Currently, the Marine Corps has the Lightweight Decontamination System (LDS) or generally known as the M17 Sanators. The LDS is sufficient. However, they depend upon gasoline for their operation. A plan is being developed to improve the LDS by replacing the existing gasoline engines with diesel engines.
- Milestone III for the LDS was achieved during September 1987. The acquisition objective for the M17s is 1,570.

## **ABC-M11 and M13 Decontamination Apparatus Portable (DAP)**

### Key Requirements:

- Be capable of being placed into operation is less than 10 minutes.
- Be capable of applying standard decontaminants.
- Have their own power source.
- Be transportable by a single Marine.

### Description:

- Both the ABC-M11 and M13 DAP are lightweight, man-portable systems. Both systems have their own unique power sources. The ABC-M11 is charged using nitrogen cylinders, and the M13 DAP works in the same fashion as a pump. Both systems are capable of applying Decontamination Solution 2 (DS-2). DS-2 is just one of the Marine Corps' standard decontaminants. Both systems are equipped with all the necessary components (i.e. brushes, mounts, etc.) required for operation.

## **M291 Individual Decontamination Kit**

### Key Requirements:

- Lightweight, and man-portable.
- Pose no hazard to the individual user.

### Description:

- The M291 will enable Marines to perform basic decontamination to remove, neutralize, or destroy chemical and biological warfare agents and toxins on contaminated skin. The kit consists of a wallet-like flexible carrying pouch containing six individually packaged, hermetically sealed foil 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 decontaminant enables the Marine

to perform a minimum of three skin decontamination procedures each to a minimum of 1,300 cm<sup>2</sup> against a 2.5 g/m<sup>2</sup> chemical and biological challenge for a single kit. The kit is small and rugged enough to be carried in a trouser pocket of the Battle Dress Overgarment/Uniform.

- The planned objective for the Marine Corps is 440,000 kits.

### **Decontaminants**

#### Key Requirements:

- Be capable of use with a variety of decontamination systems.
- Pose no threat to personnel or the environment.
- Be capable of use against biological and chemical agents.

#### Description:

- Currently, the standard decontaminants within the Marine Corps are Decontamination Solution 2 (DS-2) and Super Tropical Bleach (STB). Both are excellent for use in decontaminating chemical and some biological agents. However, both decontaminants are difficult to store and pose threats to the environment.

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## ANNEX O

# MEDICAL CHEMICAL DEFENSE RESEARCH PROGRAM



## Threat Category - Nerve Agents

### Countermeasures:

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

### Technical Barriers:

- Appropriate experimental model systems to predict drug or treatment efficacy and safety in humans (a FDA requirement)
- Pretreatment/antidotes with special characteristics, such as quick action, with a long-lasting effect, easy to carry and use
- Drugs that protect the brain, yet have minimal or acceptable side-effects (i.e., doesn't compromise soldier effectiveness)
- The nerve agents are small molecule compounds and cause only minimal immune response, thus it is very difficult to create antibodies against them

### Status:

- Monoclonal antibodies with catalytic activity have been produced against certain nerve agents. This system may possibly lead to a type of pretreatment for nerve agents.
- Pretreatment with exogenous enzyme (cholinesterase) administration (the enzyme affected by nerve agents) has shown efficacy against nerve agent challenge in several animal models.
- Four human-cholinesterase mutants have been expressed and are being tested for organophosphorus (OP) catalytic activity. These mutant human cholinesterases, or similar ones may possibly be suitable for development and used for pretreatment for nerve agents.
- A next generation anticonvulsant is being developed, the development is being based on the fact that neurotransmitter control of convulsions is time dependent; drugs with both anticholinergic and NMDA (NMDA is a type of brain receptor likely involved in nerve agent seizures) properties are showing the most promise. One particular nerve agent causes convulsions that are very difficult to treat with presently fielded drugs.

### Accomplishments:

- The mechanisms of nerve agent neurological brain injury have been extensively studied, to understand the mechanisms of nerve agent-induced seizures and associated neuropathology.
- Drugs showing efficacy at stopping nerve agent (GD) motor neuron seizure activity have been identified. These candidate drugs are potentially more advantageous than currently fielded drugs in the treatment for nerve agent intoxication.
- Potential candidate pretreatment/treatment compounds have been evaluated using the decision tree network evaluation method.
- Animal models have been used to demonstrate protection against GD with carboxylesterase, exogenous cholinesterase, and somanase. One or more of these three enzymes may form the basis for soldier pretreatment for nerve agents.

- A 3-dimensional crystal structure was used to model cholinesterase. This work was required to understand the interactive site of the cholinesterase enzyme with nerve agents, so that active analogs may be produced for nerve agent protection.
- Due to the above work, several candidate catalytic enzymes have been expressed. These enzymes may form the basis for enzyme pretreatment for the nerve agents.
- In order to have an enzyme pretreatment program the enzymes must be produced in sufficient quantities. Three expression vectors for increased enzyme production have been tested.

### **Threat Category - Vesicant Agents**

#### Countermeasures:

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

#### Technical Barriers:

- Appropriate experimental model systems to predict drug or treatment efficacy and safety in humans are unavailable
- Pretreatments/antidotes with special characteristics, such as quick onset of action, sustained effects, easy to carry and use
- Reactive/catalytic (a substance that rapidly detoxifies the blister agent) decontaminant that is active, yet safe for topical use.

#### Status:

- Results of studies are now being used to formulate hypotheses of sulfur mustard pathophysiological mechanisms (i.e. how mustard actually causes damage).
- Candidate countermeasures are being synthesized based on proposed mechanisms of mustard action
- Candidate reactive decontaminants are now being prepared for incorporation into candidate topical skin protectants

#### Accomplishments:

- Recent work has characterized the alterations of basement membrane zone proteins (area of the skin where the blister forms from sulfur mustard exposure) following sulfur mustard exposure of hairless guinea pig skin
- The time course of pathological change in the skin of guinea pigs following the cutaneous exposure of hairless guinea pig is being described; a necessary step required to understand the mechanisms of action of sulfur mustard and the damage it causes to skin
- The concepts of pretreatment with compounds that scavenge for sulfur mustard are currently being advanced. These efforts may lead to pretreatments or post exposure treatments for sulfur mustard.
- An *in vitro* human cellular model is being used to characterize the cell cycle (DNA replication and cell division) and metabolic disruptions of these processes caused by vesicating agents

- Developed multiparametric spectrophotometric assays to define a broad array of cellular structural and biochemical changes following sulfur mustard exposure. These assays will help to define the pathological changes occurring in various tissues from vesicant exposure, thus pointing to yet unknown areas where damage occurs from exposure to vesicants.
- New analytical methods for the detection of sulfur mustard and lewisite in biological samples have been developed. These assays are now available to analyze body fluids for possible exposure to vesicants (only recent agent exposures).
- Five (5) thiodiglycol dependent bacterial strains from soil have been identified. It has been confirmed that these bacteria can metabolize the organo-phosphorus (OP) agent VX (nerve agent) and have potential to metabolize HD, thus these bacteria may eventually form the basis for a catalytic/reactive type topical skin protectant.

### **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 effects, easy to carry and use
- Drugs that protect the brain, yet have minimal or acceptable side-effects (i.e., doesn't compromise soldier effectiveness)

#### Status:

- Protection through blood methemoglobin forming compounds has been verified as effective against cyanide

#### Accomplishments:

- Toxicity and safety assessment of two identified methemoglobin formers has been accomplished in the animal model. The model has:
  - Confirmed and quantified methemoglobin protection
  - Dose parameters have been determined
  - Assessment of physical performance in the animal model has been completed

### **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 are not available
- Pretreatment/antidotes with special characteristics, such as quick action, long-lasting effects, easy to carry and use

Status:

- Mechanism of action of several respiratory agents fully described
- An *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 (6.3.B) the goal is “Proof of Principle” (i.e., proof of the viability of system or concept), and to prepare a product to enter production and fielding (6.4). 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 at the US Army Medical Department Center and School (AMEDDC&S) and the Logistician [US Army Medical Materiel Agency (USAMMA)] in addressing the threat and DoD requirements. Medical chemical defense products now in the advanced development phase are:

#### **Topical Skin Protectant**

Concept:

- The new topical skin protectant uses perfluorinated formulations, that solve many of the difficulties encountered in earlier formulations
- The new topical skin protectant forms a nontoxic, non-irritating barrier film layer on skin
- Augments the MOPP
- Protection against vesicant and nerve agents

Status:

- Two candidates were transitioned to demonstration-validation phase, and were found effective against a broad spectrum of threat agents. These two candidates were well tolerated in the animal model.

#### **Multi-chambered Autoinjector**

Concept:

- Speeds administration of life-saving antidotes against nerve agents
- Replace 2 Pen MARK I Kit with single autoinjector

Status:

- Anticipate award of engineering contract in September 1993
- Fielding will require full FDA approval. Approval is expected in near time frame

### **Nerve Agent Antidote System (NAAS; HI-6)**

Concept:

- Replaces 2-PAM Chloride 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
- Technical testing continues
- Leveraging Canadian developmental effort through US-UK-CA MOU with the potential for significant savings in time and resources

### **Fielded Products**

Advances in Army medical R&D significantly impact the war fighting 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 solutions) provide the foundation that ensures the fielding of a flexible, sustainable, modernized force across the spectrum of conflict and in the full breadth and depth of the battlefield. Overcoming medical threats and extending human performance has provided a significant increase in military effectiveness in the past and presents the potential for future enhancement of military operational effectiveness. Some of the fully developed and 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). 1990
- Convulsant Antidote for Nerve Agent (CANAA), 1990
- Aerosolized Atropine (MANAA), 1993

### **Materiel**

- Resuscitation Device, Individual, Chemical, 1990
- Decontaminable Patient Litter, 1990, 1993
- CW Protective Patient Wrap, 1990

- Computer-Based Performance Assessment Battery, 1993

### **Information and Doctrine**

- Taxonomic 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”, 1992
- The Medical Management of Chemical and Biological Casualties Course

**ANNEX P**

**MEDICAL BIOLOGICAL DEFENSE  
RESEARCH PROGRAM**



## Threat Category - Classical Biological Agents

### Countermeasures:

- Vaccines against threat agents
- Produce immunogens against threat agents
- Forward deployed diagnostic systems

### Technical Barriers:

- Incomplete genetic information for all the threat agents
- Inability to test effectiveness of pharmaceuticals/ biologicals
- Difficulty in field testing rapid identification kits under natural conditions

### Status:

- Completed safety trials in man for Q-fever chloroform methanol residue vaccine.
- Demonstrated that a new live vaccine candidate, *B. anthracis* Delta Sterne containing plasmid PPA102, is highly efficacious in animal models against an intramuscular challenge of anthrax Ames spores
- Completed consistency lot trials and clinical testing in man of tularemia vaccine
- Developed rapid flow-through membrane, and biosensor diagnostic assays for anthrax
- Established polymerase chain reaction and biosensor assays for identification of *Yersinia pestis*, the causative agent of plague

## Threat Category - Protein Toxins

### Countermeasures:

- Vaccines
- Antibodies (antitoxins) directed against common antigens of protein toxin molecules
- Reagents to rapidly identify protein toxins either specifically or as members of their class

### Technical Barriers:

- Lack of appropriate model systems for the investigation of countermeasures to toxins that interfere with protein synthesis
- Lack of models for evaluating efficacy of candidate vaccines, antitoxins and drugs
- Required pharmacological characterization of pretreatment drugs and antidotes have not been performed
- Difficulty in generating an immune response against small molecules
- Difficult to produce polyvalent vaccines against toxin classes
- Unsuitable expression vectors for recombinant products (vaccines and antitoxins)
- Inability to detect physiologically significant levels of toxin in biomatrices

Status:

- Demonstrated efficacy of candidate ricin toxoid against lethal aerosol challenge of ricin toxin in non-human primate model
- Demonstrated efficacy of a microencapsulated toxoid vaccine against 22 times the lethal dose of aerosolized Staphylococcal enterotoxin B in animal models
- Initiated safety trials for Type F Botulinum Toxoid in man
- Completed safety trials of Botulism Immune Globulin (Human) in man
- Evaluated the therapeutic efficacy of Equine F(ab')<sub>2</sub> Antitoxin in non-human primates exposed to an aerosol challenge of type A botulinum neurotoxin
- Developed rapid flow-through membrane assay for ricin for identification in biological fluids

### **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
- 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
- Central Nervous System (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:

- Demonstrated reversal of saxitoxin-induced cardio-respiratory failure with IgG antitoxin in guinea pig model
- Reversed both saxitoxin- and tetrodotoxin-induced central cardio-respiratory depression with the trans-membrane potassium channel blocker, 4-aminopyridine in animal models
- Established that highly selective membrane receptor antagonists provide dose dependent protection against PAC-induced brain damage

### **Threat Category - Viral Agents**

Countermeasures:

- Vaccines conveying immunity against multiple agents
- Antibodies - for diagnosis and treatment of viral disease
- Devices to diagnose and identify viral threats

Technical Barriers:

- Appropriate model systems for investigation of viral countermeasures
- Inability to perform human clinical trials to prove efficacy of vaccines
- Production of polyvalent vaccines against viral classes
- Expression vectors for recombinant products (vaccines and antibodies)
- Immune system enhancement
- Rapid virus identification technology

Status:

- Completed preclinical testing in animal models of a cell cultured derived smallpox (vaccinia) vaccine
- Produced genetically engineered candidate Venezuelan Equine Encephalitis (VEE) vaccine
- Demonstrated proof of principle for a multiple agent (e.g., anthrax, ricin and VEE) dipstick for diagnostic immunoassay

**Predevelopment Products - Technical Demonstration (TD)**

In this TD phase (6.3A) of the medical materiel life cycle technology 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 0 in 2Q FY93

Staphylococcal Enterotoxin B Toxoid, Microencapsulated

- Status: MS 0 in 4Q FY93

Rapid Identification System (Diagnostic Assay) Fiber Optic Biosensor

- Status: MS 0 in 4Q FY 93

**Advanced Development Products**

These products are in the Demonstration/Validation or Engineering and Manufacturing Development phase of the medical materiel Life Cycle System Management Model. Medical biological defense candidate products that are now in the advanced development (6.3B - 6.4) stage are:

Botulinum Toxoid Type F

- Status: MS 1 in 1Q FY 94

Tularemia Live Vaccine

- Status: MS 1 in 3Q FY 93

Q Fever CMR Extract Vaccine

- Status: MS 1 in 3Q FY 93

Cell Culture Derived Smallpox

- Status: MS 1 in 1Q FY 94

Botulism Immune Globulin

- Status: MS 1 in 2Q FY 94

Botulism F(ab')<sub>2</sub> Antitoxin

- Status: MS 1 in 1Q FY 94

Botulinal Toxoid, Type G

- Status: MS 1 in 2Q FY 96

Botulinal Polyvalent Toxoid Type A-E

- Status: MS 1 in 1Q FY 95

**Fielded Products**

Products are considered fielded when a milestone III decision has been made.  
Biological defense products in this phase are:

- Venezuelan Equine Encephalitis Vaccine
- Eastern Equine Encephalitis Vaccine
- Western Equine Encephalitis Vaccine

**ANNEX Q**

**MEDICAL NUCLEAR DEFENSE  
RESEARCH PROGRAM**

## **Threat Category - Prompt Exposures From Nuclear Weapons**

### Countermeasures:

- Advanced medical treatment strategies for radiation injuries
- Drugs designed to increase resistance to radiation and harden the soldier against the early and late effects of ionizing radiation without compromising performance
- Drugs designed to prevent the onset of radiation induced performance decrements such as fatigue, nausea, vomiting
- Assessment of radiation injury by biological dosimetry techniques

### Technical Barriers:

- Availability of drugs to conduct animal studies for advanced treatment strategies
- Known drugs that provide some radiation protective effects have serious performance degrading side effects at drug doses required for operational requirements
- Mechanisms of action of several known treatment and radioprotective drug strategies are not well understood

### Status:

- Research in collaboration with pharmaceutical companies using large and small animal models is on-going
- Research using cellular systems and rodents has begun to investigate strategies to mitigate against late effects (e.g., cancer) of radiation
- Biological dosimetry techniques based on cytogenetic techniques are being developed
- Greater emphasis is being provided on molecular and cellular biology strategies to elucidate mechanisms of radiation damage and protection at the level of the DNA

### Accomplishments:

- Therapeutic protocols have been devised and tested to show efficacy in reducing the duration of neutropenia and thrombocytopenia.
- Lethal consequences of radiation can be averted with the therapeutic use of cytokines.
- Endotoxin shock can be reversed with the use of new generation blocking agents.
- Drug combinations have been devised that can provide a small margin of safety against ionizing radiation without compromising performance.
- Dose assessment techniques based on cytogenetic techniques have been demonstrated
- Molecular and cellular model systems have been developed to validate new approaches to resistance to ionizing radiation.

## **Threat Category - Chronic Exposures From Fallout And Other Exposures Scenarios**

### Countermeasures:

- Advanced medical treatment strategies for protracted radiation injuries from both external and internal sources of radioactivity
- Drugs designed to harden the soldier against the early and late effects of ionizing radiation without compromising performance

- Improved techniques to detect and remove internal sources of radioactivity

Technical Barriers:

- Availability of suitable radiation sources to study the effects of chronic exposure at relevant dose levels
- Difficulty in manipulating cellular repair and second messenger signaling mechanisms
- Toxicity of chelating agents used to remove sources of radioactivity
- Brief periods in which traditional radioprotective drugs are active
- Toxicity of radioprotective drugs used over protracted periods of time

Status:

- New radiation facility to permit protracted exposure experiments for neutrons and gamma rays is being planned
- New biological models for internal and external cellular and whole body chronic exposure studies are being developed
- New programs have been instituted for the study of molecular biology approaches to study gene radiation damage and repair mechanisms

Accomplishments:

- Contracts to study chronic human exposures have been established with scientists within the former Soviet Union
- Demonstrated that synaptic potentials in central nervous system neurons show anomalous dose rate dependence
- Confirmed that low dose rate neutrons have an increased rate of oncogenic transformation for certain specific cell lines

### **Threat Category - Combined Effects**

Countermeasures:

- Radiotherapeutic agents designed to decrease morbidity and mortality from multi-organ system failure due to the combined effects of radiation, trauma, burns, and infection
- Radioprotective drugs designed to harden the soldier against the effects of radiation, trauma, burns, and infection

Technical Barriers:

- Availability of reliable animal models to predict effects in man
- Antimicrobial resistance to current therapeutic agents
- Differences in sensitivity of biological systems at all levels to neutrons and gamma rays
- Mechanism of action of cell growth factors is not well understood

Status:

- Research in collaboration with pharmaceutical companies using small and large animal models continues
- Evaluations of radioprotective and radiotherapeutic agents on going in mixed-field irradiated animal models

- New antimicrobial products under evaluation for the treatment of gram positive bacterial sepsis
- Molecular biology techniques utilized to understand the effects of radiation, trauma, and combined effects
- Molecular biology techniques utilized to understand the beneficial effects of cell growth factors, immunomodulators, and antimicrobial agents

Accomplishments:

- Demonstrated that selected radioprotective drugs reduce mortality from combined effects in small animal models
- Demonstrated that selected antimicrobial agents promote survival from infection when given orally to mixed-field irradiated small animal models
- Demonstrated that combined modality therapy including topical/systemic antimicrobials, immunomodulators, and radioprotective drugs increase survival from combined effects

**Predevelopment Products - Technical Developments (TD)**

Pre-Transition Information Paper: Radioprotection by a Combination of Iloprost/Misoprostol/3D-MPL/WR-3689

The Armed Forces Radiobiology Research Institute has historically been a laboratory funded exclusively with 6.2 money. Beginning in 1994, several predevelopment products (e.g., biological dosimetry techniques) will be supported with 6.3a funds.

**Fielded Products**

Medical Effects of Nuclear Weapons Course-Training for approximately 1000 Medical Department personnel per year.

NATO Handbook AmedP-6, Medical Aspects of NBC Defensive Operations