ARMY FM 4-02.7
NAVY NTTP 4-02.7
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MARINE CORPS MCRP 4-11.1F

MULTISERVICE TACTICS, TECHNIQUES, AND PROCEDURES FOR HEALTH SERVICE SUPPORT IN A NUCLEAR, BIOLOGICAL, AND CHEMICAL ENVIRONMENT

FINAL DRAFT
FEBRUARY 2003

DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE, AND
COMMANDANT, MARINE CORPS

PREFACE

Purpose

This publication will establish doctrinal multiservice tactics, techniques, and procedures (MTTP) for integration of operational level of health service support (HSS) in a nuclear, biological, and chemical (NBC), radiological dispersal device (RDD), and toxic industrial material (TIM) environment. Doctrine reflects lessons learned. It is the intent of this document to inform commanders of the combatant commands, joint task force planners, joint task force medical commander and joint medical planners, on the tools available to provide the best quality of health service support in a NBC environment to enhance mission success. This publication will bridge gaps between Service and Joint HSS in joint operations publications.

Scope

This publication provides information for use by command surgeon, their subordinate commanders and staffs and component commanders, and their staffs, planners, and individuals responsible for HSS in an NBC environment at the operational level. Commanders have the direct responsibility for protecting their forces within an NBC environment. On future battlefields, failure to properly plan and execute NBC defense operations may result in significant casualties, disruption of operations, and even mission degradation. Further, the commander's mission and execution plans must address the implications of HSS in an NBC environment.

This publication contains tactics, techniques, and procedures relative to health service support in the following specific areas:

- Current policy on conduct of HSS
- The environment (NBC and TIM Threat)
- Spectrum of operations from major theater war to operation other than war
- Various operational conditions of air, land, maritime and civil-military affairs
- Procedures for obtaining medical intelligence information on NBC threats
- NBC aspects of HSS's command, control, communications, computers, and intelligence
- Health Service Logistic
- HSS planning and system for joint, coalition, and interagency operations
- HSS in weapons of mass destructions (WMD) consequence management planning
- Requirement for disease non battle injuries (DNBI) reporting and relations of potential chemical biological (CB) casualty to DNBI rates
- Procedures for performing medical surveillance activities
- Preventive medicine activities as they relate to NBC/TIM casualty prevention
- Types of potential NBC/TIM casualties that will require medical care
- Decontamination and Movement of patients in a NBC/TIM environment to a medical treatment faciliy (MTF)
- Discussion NBC Joint Mission Essential Task List

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The proponent of this publication is the United States (US) Army Medical Department Center and School (AMEDDC&S). Send comments and recommendations directly to Commander, US Army Medical Department Center and School, ATTN: MCCS-FCD, Fort Sam Houston, Texas 78234-5052.

The use of the term “level of care” in this publication is synonymous with “echelon of care” and “role of care.” The term “echelon of care” is the old North Atlantic Treaty Organization (NATO) term. The term “role of care” is the new NATO and American, British, Canadian, and Australian (ABCA) term.

The use of term "casualties" is synonymous with "patients".

The use of the term nuclear, biological, chemical in this publication is synonymous with chemical biological and radiological.

The term chemical biological, radiological, and nuclear (CBRN) used in this publication applies to Homeland Security weapons of mass destruction (WMD) discussions.

The use of TIM in this publication is inclusive of RDD.

The use of the term “health service support” in this publication is synonymous with combat health support as used in other US Army publications. Health Service Support is the term used in Joint Publications to describe medical support to Joint Forces.

Radiological and chemical detection devices discussed in this publication are currently being replaced through modernization or new device developments. The users should rely on and adapt the application of doctrine as described to fit the new devices when issued/authorized.

This manual implements NATO Standardization Agreements (STANAGs) 2475, Medical Planning Guide of Nuclear, Biological, and Chemical Casualties Allied Medical Publication 8 (AMedP-8)—Nuclear; 2476, Medical Planning Guide of Nuclear, Biological, and Chemical Casualties AMedP-8—Biological; 2477, Medical Planning Guide of Nuclear, Biological, and Chemical Casualties AMedP-8—Chemical. It is also in consonance with the following NATO STANAGs and ABCA Quadripartite Standardization Agreements (QSTAGs):

TITLE	NATO STANAG	QSTAG
Warning Signs for the Marking of Contaminated or Dangerous Land Areas, Complete Equipment, Supplies and Stores	2002	501

Emergency Warning Signals and Alarms for Nuclear Biological and Chemical Defense (NBCD) Hazards or Attacks (NBC and Air Attacks Only)	2047	183
Interoperable Chemical Agent Detector Kits		608
Chemical Proof Casualty Evacuation Bag/Wrap		650
Commander's Guide on Nuclear Radiation Exposure of Groups	2083	898
Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas-ATP-45 (A)	2105	187
Friendly Nuclear Strike Warning	2104	189
Nuclear, Biological and Chemical Reconnaissance	2112	
Concept of Operations of Medical Support in Nuclear, Biological, and Chemical Environments-AMedP-7 (A)	2873	
Medical Aspects of NBC Defense Operations		1330
Principles of Medical Policy in the Management of a Mass Casualty Situation	2879	
Medical Aspects of Mass Casualty Situations		816
Guidelines on Air and Ground Personnel Using Fixed and Entry and Exit Procedures for Using Collective Protection Facilities	2941	2000
Training of Medical Personnel for NBC Operations	2954	

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

Participating Service command offices of primary responsibility will review this publication, validate the information, reference, and incorporate it in Service and command manuals, regulations, and curricula as follows:

a. Army. The Army will incorporate this publication in US Army training and doctrinal publications as directed by the Commander, US Army Training and Doctrine

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f. The US Army Medical Department Center and School developed this publication with the joint participation of the approving Service commands.

g. This publication reflects current Service and joint doctrine on prevention, protection, and medical management, of NBC casualties.

h. We encourage recommended changes for improving this publication. Key your comments to the specific page and paragraph and provide a rationale for each comment or recommendation. Send comments and recommendations directly to-

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References listed should be consulted for details beyond the scope of this publication.

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FIELD MANUAL
No.4-02.7
NAVY TACTICS TECHNIQUES PROCEDURES
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AIR FORCE MANUAL
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HEADQUARTERS
DEPARTMENT OF THE ARMY,THE
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MULTISERVICE HEALTH SERVICE SUPPORT IN A NUCLEAR, BIOLOGICAL, AND CHEMICAL ENVIRONMENT

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Chapter 1

Introduction: Policy and Environment

1-1. Current policy on conduct of Health Service Support. Planning for military operations at all levels inherently includes provisions for adequate health service support. **Commanders are responsible for maintenance of the health of their commands to assure mission accomplishment in the event of NBC attacks.** Maintaining the physiological and psychological health of military forces is a basic requirement for combat effectiveness. The Joint Force Commander (JFC) at all levels is faced with the possibility that any operation may have to be conducted in an NBC environment. The term "NBC environment" includes the deliberate or accidental employment or threat of NBC weapons and attacks with other chemical, biological, or radiological materials or toxic industrial materials (TIMs). The employment or threat of nuclear, biological, and chemical weapons and other toxic materials pose unique challenges to US military operations worldwide. Responsibility for operations in any theater involves peacetime preparations and transition to operations with forces from areas outside the theater, including other theaters and the United States, and inherently involves joint, multinational, and interagency dimensions. The Joint Force Commander (JFC) must plan and integrate US and multinational force capabilities to sustain the multinational operational tempo in all mediums (air, sea, land, and space). **The command surgeon is responsible for guiding and integrating all HSS capabilities available to the command to support mission accomplishment in an NBC environment.** In planning for HSS in potential NBC environments, preparations should include pre-exposure immunizations, pretreatments, prophylaxis, and medical barrier materials applicable to the entire force, including multinational, interagency, and civilian participants. *Basic doctrine for HSS operations is in JP 4-02, Doctrine for Health Service Support in Joint Operations.*

1-2. The NBC Environment and TIM Threat.

a. A number of potential adversaries have, or could rapidly acquire, biological and chemical weapons and other toxic materials and in some cases, nuclear/radiological capabilities. They may also have or seek to acquire clandestine and long-range delivery systems that can reach beyond their geographic regions. The majority of commanders' personnel's knowledge of the NBC threat is insufficient i.e. knowing or believing the enemy has a certain agent or a specific weapons delivery system is not enough in and of itself; much more detail is needed in order to optimize plans, and operational procedures.

b. Biological and chemical weapons/agents may be employed by assassins, terrorists, rebels, and insurgents, as well as well-formed battle organizations, across the continuum of operations. In addition, nuclear weapons will remain a threat on the future battlefield. Another weapon that may be used is the radiological dispersal device (RDD). The RDD can cause significant damage and present health hazards to fighting forces by exposing them to radiation without the thermal and full blast effects of nuclear weapons. The RDD can disperse radioactive material over an area of the battlefield; the area covered is dependent upon the amount of radioactive and explosive material used. In order to detonate a nuclear weapon, an adversary must first obtain

access to the appropriate weapons-grade material. However, an RDD can be produced and used by anyone with access to industrial or medical radioisotopes and explosives. Biological agents are easy to disperse on the battlefield without immediate detection; however, their effects on exposed troops can change the course of the battle. Some nations consider chemical weapons as a component of their munitions for the battlefield. As more nations enter the arena of developing biological and chemical weapons, their potential effects on our troops will increase. The enemy's use of TIMs as weapons or collateral damage to TIM storage facilities can severely affect the unit personnel's ability to continue the mission. The signs and symptoms of some TIM exposure can be the same as those presented from exposure to NBC weapons. Considerations of both the physical and biological effects of these weapons are required for HSS operations. Field Manual 4-02.283 provides additional information on nuclear and radiological effects; FM 8-284 provides additional information on biological agent effects; FM 8-285 provides additional information on CW effects; FM 8-500 provides detailed information on hazardous material (TIM) effects.

c. The Nuclear Threat.

(1) The proliferation of nuclear material and technology has made the acquisition and adversarial use of nuclear and radiological weapons more probable. Additionally, military personnel may be deployed to areas that could be radiological contaminated because of the presence of radioactive materials and nuclear facilities. However, radiation accidents involving industrial or medical radiological material and nuclear weapons incidents are the most likely threat to US forces and civilians. The least likely threats are theater and strategic nuclear war. (see Figure 1-1)

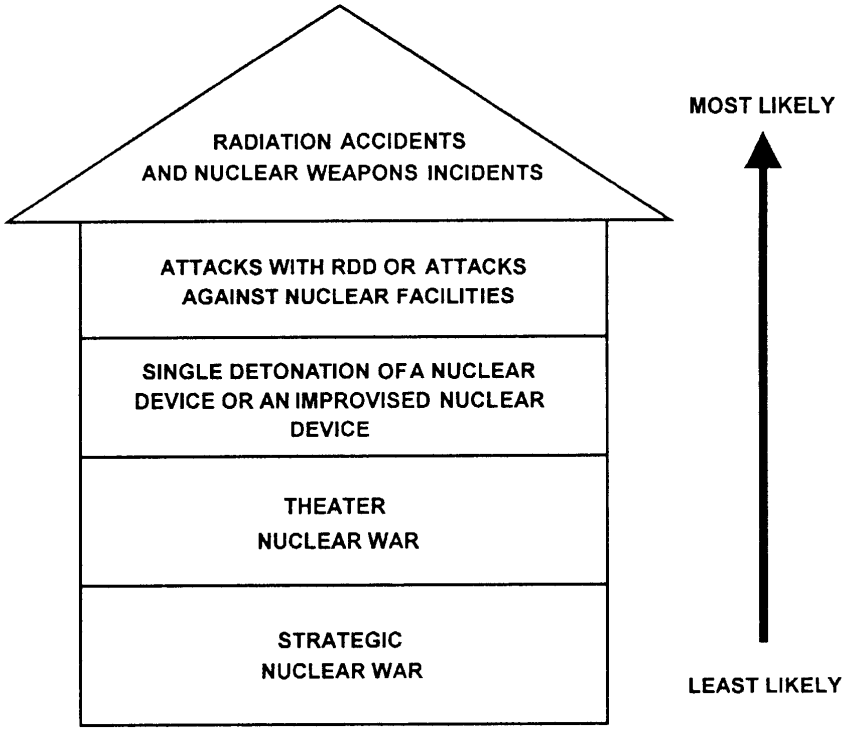


Figure 1-1, Likelihood of radiation threat

(2) In the cold war environment, there were two basic scenarios for an exchange of nuclear weapons: either a general strategic exchange of large-yield thermonuclear weapons, or the limited use of nonstrategic nuclear weapons on a theater battlefield.

- *Strategic Nuclear War*. Strategic nuclear war would use weapons that generally range in yield from hundreds of kilotons (KT) to multiples of megatons (MT). They are designed to destroy large population centers, destroy or disrupt national and strategic nuclear forces and their command and control (C2), and to destroy or disrupt national infrastructure, logistics, and warfighting capabilities. The exchange of multiple strategic nuclear weapons would result in catastrophic casualty numbers, which would overwhelm surviving local medical resources. Military personnel who are nominally capable of returning to short-term duty would be utilized despite significant radiation injury. Casualties would receive medical care and evacuation as soon as conditions permit according to mass casualty contingency plans. The only examples of this type of nuclear strike were the destruction of Hiroshima and Nagasaki in August of 1945. Even though the 1945 weapons were of a relatively low yield as compared to today's weapons, their employment was to accomplish strategic objectives. This event is now considered the least likely threat.

- *Theater Nuclear War.* In the cold war environment, theater nuclear war planning envisioned the use of both small, low-yield tactical nuclear weapons and larger yield theater-level weapons. Low-yield tactical nuclear weapons (delivered by tube artillery or medium battlefield rockets) were planned for use against specific enemy units, key terrain on the

battlefield, nuclear capable enemy units, or for shock value against specific troop concentrations. Generally, these would rarely exceed 10 KT. Also, there were a number of atomic demolition munitions (ADM) present on both sides during the cold war. Since low-yield tactical weapons have been removed from the inventory, it is no longer appropriate to use the term "tactical" The term "nonstrategic" is now used to describe the US theater-level capability. Current US theater-level nuclear weapons include gravity bombs, air launched cruise missiles (ALCM), and Tomahawk land attack missile/nuclear (TLAM/N). These larger yield (up to 400 KT) theater weapons would normally be used at the operational level against theater targets such as enemy long-range nuclear weapons systems, ports, airfields, and theater level logistic bases. They would also provide a deterrence and response to either the enemy's use, or threat of use, of any WMD. While large numbers of casualties would likely be generated within a given area, medical care would be available outside the area of immediate destruction. For a given nuclear detonation, casualties would depend on population density, terrain, weapon yield, weapon employment technique, and other factors. Casualties could also be produced at a later time due to fallout. The primary patient management concept would be to evacuate and distribute casualties to all available medical treatment facilities (MTFs).

1-3. The threat of Nuclear and Radiological Warfare against US Forces and Civilian Population.

a. The principal physical effects of nuclear weapons are blast, thermal radiation (heat), and nuclear radiation. These effects are dependent upon the yield (or size) of the weapon expressed in kilotons (KT), the physical design of the weapon (such as conventional and enhanced), and the method of employment. The distribution of energy (Figure 1-2) from the detonation of a moderate-sized (3 to 10 KT) weapon is as follows:

(1) Fifty percent as blast.

(2) Thirty-five percent as thermal radiation; made up of a wide spectrum of electromagnetic radiation, including infrared, visible, and ultraviolet light and some soft x-ray radiation.

(3) Fourteen percent as nuclear radiation, 4 percent as initial ionizing radiation composed of neutrons and gamma rays emitted within the first minute after detonation, and 10 percent as residual nuclear radiation (fallout).

(4) One percent as electromagnetic pulse (EMP).

b. Larger weapons are more destructive than smaller weapons, but the destructive effect is not linear. Table 1-1 presents a comparison of three aspects of nuclear weapons effects with yield.

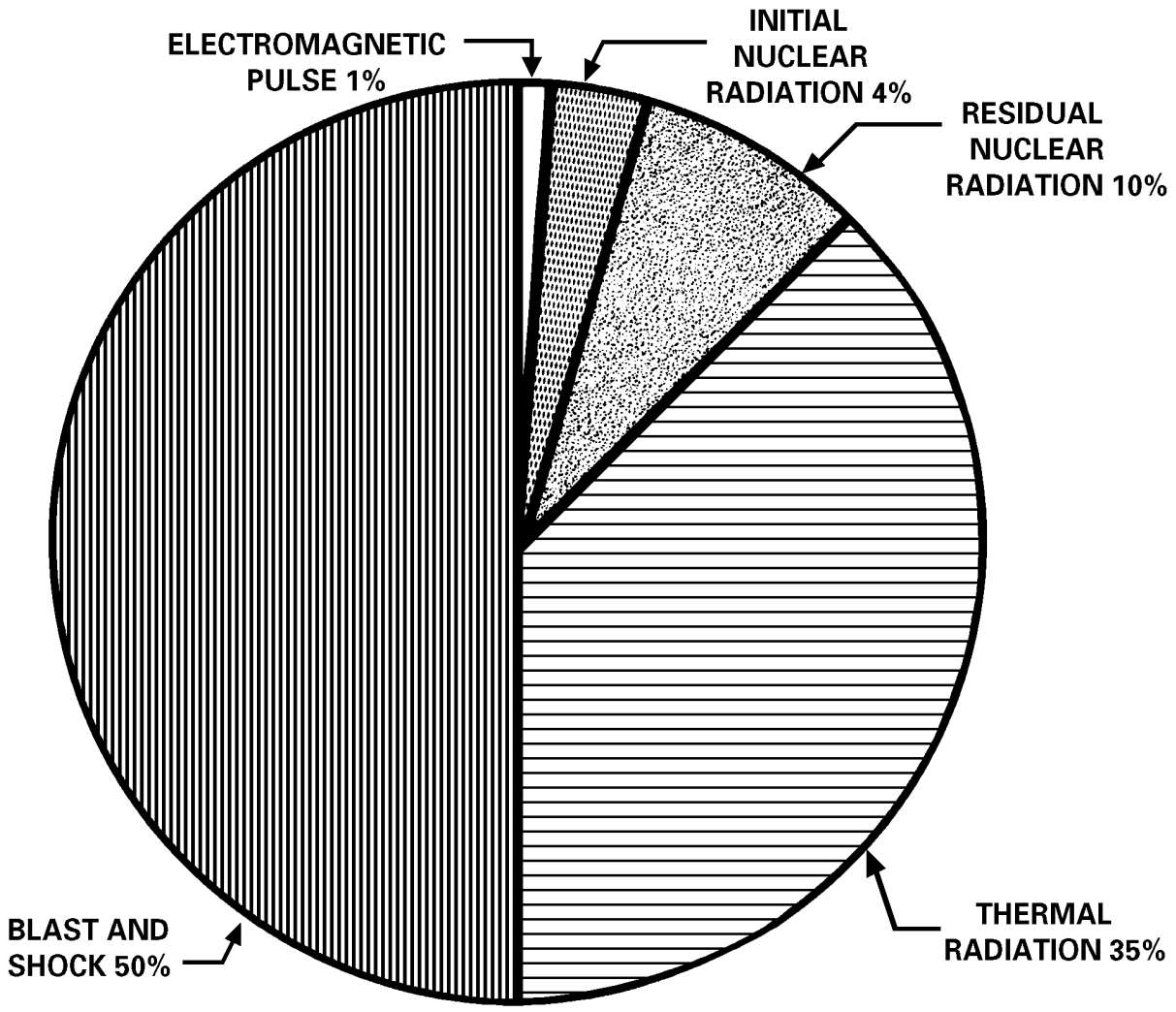


Figure 1-2 Distribution of energy.

c. The altitude at which the weapon is detonated determines the blast, thermal, and nuclear radiation effects. Nuclear blasts are classified as air, surface, or subsurface bursts.

(1) An airburst is a detonation in air at an altitude below 30,000 meters, but high enough that the fireball does not touch the land or water surface. The altitude is varied to obtain the desired tactical effects. Initial radiation will be a significant hazard, but there is essentially no local fallout. However, the ground immediately below the airburst may have a small area of neutron-induced radioactivity. This may pose a hazard to troops passing through the area.

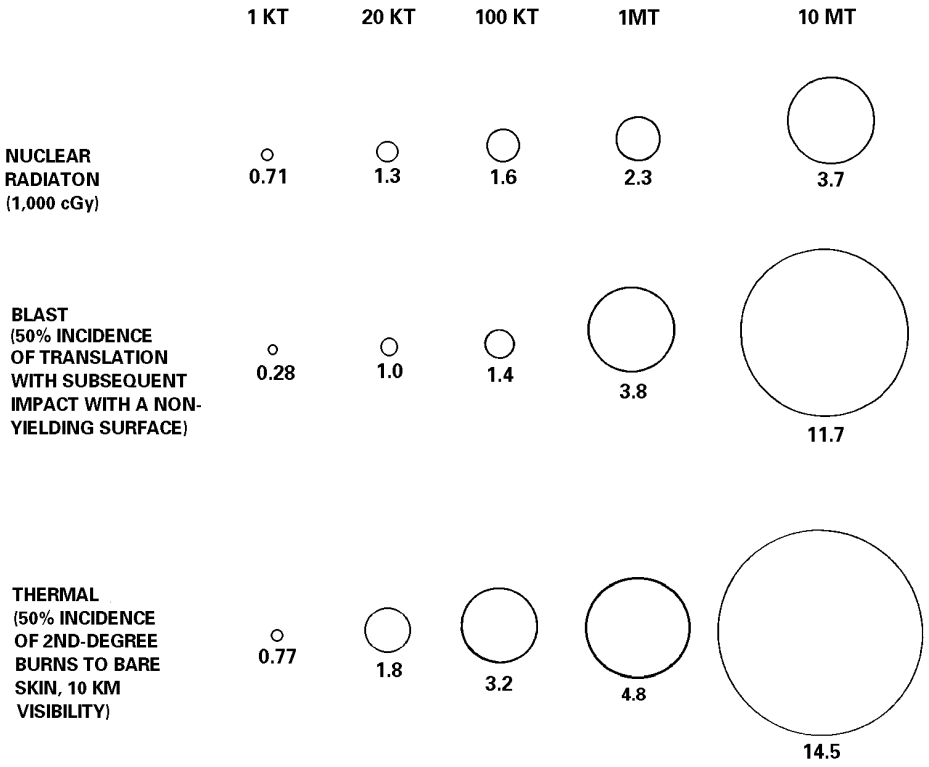
(2) A surface burst is a detonation in which the fireball actually touches and vaporizes the land or water surface. In this case, the area affected by blast, thermal radiation, and initial nuclear radiation will be smaller than for an airburst of comparable yield. However, in the region around ground zero, the destruction will be much greater and a crater is often produced. Additionally, all the material that was within the fireball becomes fallout and will be a hazard

downwind. A surface burst is the most likely type of terrorist detonation.

(3) A subsurface burst is an explosion in which the detonation is below the surface of land or water. Cratering usually results. If the burst does not penetrate the surface, the only hazard is from the ground or water shock. If the burst penetrates the surface, blast, thermal, and initial nuclear radiation will be present, though less than for a surface burst of comparable yield. Local fallout will be heavy over a small area.

(4) A high altitude burst occurs above 30,000 meters. Radiation and physical effects do not reach the ground and there is no local fallout. This is the only detonation where the effects of the EMP are significant. Nonhardened electronic equipment including many medical devices may become inoperative. The EMP damage is a moot point with other types of detonations, as its range is primarily limited to the area of intense physical destruction.

Table 1-1. Comparison of Weapons Effects (*Radii of Effects in Kilometers—Airburst*)



d. The physiological effects of nuclear weapons are the result of exposure to the blast; thermal radiation; ionizing radiation (initial or residual) effects; or a combination of these. For smaller weapons (less than 10 KT), ionizing radiation is the primary creator of casualties requiring medical care, while for larger weapons (greater than 10 KT), thermal radiation is the primary creator of casualties.

(1) The rapid compression and decompression of blast waves on the human body results in transmission of pressure waves through the tissues. Resulting damage is primarily at junctions between tissues of different densities (bone and muscle), or at the interface between tissue and airspace. Lung tissue and the gastrointestinal system (both contain air) are particularly susceptible to injury. The tissue disruptions can lead to severe hemorrhage or to an air embolism; either can be rapidly fatal. Direct overpressure effects do not extend out as far from the point of detonation as the drag force and are often masked by the drag force effects. A typical range of probability of lethality, with variations in overpressure for a 1 KT weapon, is shown in Table 1-2.

Table 1-2. Range of Lethality of Peak Overpressure

LETHALITY (APPROXIMATE %)	PEAK OVERPRESSURE (ATMOSPHERES)	DISTANCE FROM GROUND ZERO; METERS
1	2.3 - 2.9	150
50	2.9 - 4.1	123
100	4.1 +	110

- The significance of the data is that the human body is relatively resistant to static overpressure compared to rigid structures such as buildings. For example, an unreinforced cinder block panel will shatter at 0.1 to 0.2 atmospheres.

- Overpressure lower than those in Table 1-2 can cause nonlethal injuries such as lung damage and eardrum rupture. Lung damage is a relatively serious injury, usually requiring hospitalization, even if not fatal; whereas eardrum rupture is a minor injury, often requiring no treatment at all.

- The threshold level of overpressure for an unreinforced unreflected blast wave that can cause lung-damage is about 1.0 atmosphere.

- The threshold level for eardrum rupture is around 0.2 atmospheres; the overpressure associated with a 50 percent probability of eardrum rupture is about 1.1 atmospheres.

(2) Casualties requiring medical treatment from direct blast effects are produced by overpressure between 1.0 and 3.5 atmospheres. However, other effects (such as indirect blast injuries and thermal injuries) are so predominate that patients with only direct blast injuries make up a small part of the patient workload.

e. The drag forces (indirect blast) of the blast winds are proportional to the velocities and duration of the winds. The winds are relatively short in duration, but can reach velocities of several hundred km per hour. Injury can result from missiles impacting on the body or from the

physical displacement of the body against objects and structures.

(1) The distance from the point of detonation at which severe indirect injury occurs is greater than that for equally serious direct blast injuries. A high probability of serious indirect injury can occur when the peak overpressure is about 0.2 atmospheres. This range will increase with the increased size of the weapon; for a 1 KT weapon, the range is 0.22 km, whereas for a 20 KT weapon, the range is 0.76 km. At greater ranges injuries will occur and casualties will be generated, but not consistently.

(2) The drag forces of the blast winds produced by a nuclear detonation are so great that almost any form of vegetation or structure will be broken up or fragmented into missiles. Thus, multiple, varied missile injuries will be common, increasing their overall severity and significance. Table 1-3 lists ranges at which significant missile injuries can be expected.

Table 1-3. Ranges for Probabilities of Serious Injury from Small Missiles

	RANGES (km)		
YIELD OF (KT)	**1% PROBABILITY OF SERIOUS INJURY**	**50% PROBABILITY OF SERIOUS INJURY**	**99% PROBABILITY**
1	0.28	0.22	0.17
10	0.73	0.57	0.44
20	0.98	0.76	0.58
50	1.4	1.1	0.84
100	1.9	1.5	1.1
200	2.5	1.9	1.5
500	3.6	2.7	2.1
1,000	4.8	3.6	2.7

1 INCIDENCE OF INJURY BASED ON SKIN AND TISSUE PERFORATION.
2 MISSILES USED WERE 10 GRAM (gm) IN WEIGHT.

(3) The velocity to which missiles are accelerated is the major factor in causing injury. The probability of a penetration injury increases with increasing velocity, particularly for small, sharp missiles such as glass fragments. Small, light objects are accelerated to speeds approaching the maximum (wind) velocity. Table 1-4 shows data for probability of penetration related to size and velocity of glass fragments.

Table 1-4. Probability of Glass Fragments Penetrating the Abdominal Cavity

MASS OF GLASS FRAGMENTS (gm)	**1%**	**50%**	**99%**
	IMPACT VELOCITY (METERS PER SECOND)		
0.1	78	136	243
0.6	53	91	161
1.0	46	82	143

10.0	38	60	118

(4) Heavy, blunt missiles may not penetrate, but can result in significant injury, particularly fractures. The threshold velocity for skull fractures from a 4.5 milligram (mg) missile is about 4.6 meters per second (m/sec).

(5) The drag forces of the blast winds are strong enough to displace large objects (such as vehicles), or cause large structures to collapse (such as buildings) resulting in serious crushing injuries. Man himself can become a missile resulting in injuries (called translational injuries). The velocity at which the body is displaced will determine the probability and the severity of injury. Assuming a displacement of 3.0 meters, the impact velocity associated with various degrees of injury is shown in Table 1-5. The velocities in Table 1-5 can be correlated against yield. The ranges at which such velocities can occur and the probability of injury are given in Table 1-6.

Table 1-5. Translational Injuries

A. BLUNT INJURIES AND FRACTURES

PROBABILITY OF INJURY	VELOCITY (m/sec)
1%	2.6
50%	6.6
99%	16.5

B. FATAL INJURIES

PROBABILITY OF FATALITY	VELOCITY (m/sec)
1%	6.6
50%	17.0
99%	39.7

Table 1-6. Ranges for Selected Impact Velocities of a 70-Kilogram Human Body Displaced by Blast Wind Drag Forces for Different Yield Weapons

WEAPON YIELD	**VELOCITIES (m/sec)**		
(KT)	**2.6**	**6.6**	**17.0**
	RANGES (km)		

1	0.38	0.27	0.19
10	1.0	0.75	0.53
20	1.3	0.99	0.71
50	1.9	1.4	1.0
100	2.5	1.9	1.4
200	3.2	2.5	1.9
500	4.6	3.6	2.7
1,000	5.9	4.8	3.6

f. **Biological Effects of Thermal Radiation.** The thermal radiation emitted by a nuclear detonation causes burns in two ways—by direct absorption of the thermal energy through exposed surfaces (flash burns); or by the indirect action of fires in the environment (flame burns). Indirect flame burns can easily outnumber all other types of injury.

(1) Thermal radiation travels outward from the fireball in a straight line; therefore, the amount of energy available to cause flash burns decreases rapidly with distance. Close to the fireball all objects will be incinerated. The range for 100 percent lethality will vary with yield, height of burst, weather, environment, and immediacy of treatment. The critical factors determining the degree of burn injury are the flux (calories per square centimeter/second [cal/cm^2/sec]) and the duration of the thermal pulse. The total amount of thermal radiation needed to cause a flash partial thickness burn on exposed skin will vary with the yield of the weapon and the nature of the pulse (Table 1-7). Most burn patients will come from the zones where partial thickness burns occur. In areas where radiation, blast, and thermal intensity are highest, burn victims surviving long enough to reach medical care will be rare.

NOTE

The battle dress uniform (BDU), MOPP gear, or any other clothing will provide additional protection against flash burns. The airspace between the clothing significantly impedes heat transfer and may prevent or reduce the severity of burns, depending on the magnitude of the thermal flux.

Table 1-7. Factors for Determining the Probability of Partial Thickness Burns

YIELD OF WEAPON	1 KT	10 KT	100 KT	1 MT	10 MT
RANGE (km) FOR PRODUCTION OF PARTIAL THICKNESS BURNS ON EXPOSED SKIN	0.78	2.1	4.8	9.1	14.5

DURATION OF THERMAL PULSE IN SECONDS	0.12	0.32	0.9	2.4	6.4
Cal/cm2/sec REQUIRED TO PRODUCE PARTIAL THICKNESS BURNS ON EXPOSED SKIN	4.0	4.5	5.3	6.3	7.0

(2) Indirect (flame) burns result from exposure to fires caused by the thermal effects in the environment, particularly from ignition of clothing. The larger-yield weapons are more likely to cause firestorms over extensive areas. There are too many variables in the environment to predict either incidence or severity of casualties. Expect the burns to be far less uniform (in degree) and not limited to exposed surfaces. For example, the respiratory system may be exposed to the effects of hot gases produced by extensive fires. Respiratory system burns cause high morbidity and high mortality rates.

(3) The initial pulse of radiation in the optical and thermal bands can cause injuries in the forms of flash blindness and retinal scarring. The initial brilliant flash of light produced by the nuclear detonation causes flash blindness. This flash swamps the retina, bleaching out the visual pigments and producing temporary blindness. During daylight hours, this temporary effect may last for about 2 minutes. At night, with the pupil dilated for dark adaptation, flash blindness will affect personnel at greater ranges and for greater durations. Partial recovery can be expected in 3 to 10 minutes, though it may require 15 to 35 minutes for full night adaptation recovery. Retinal scarring is the permanent damage from a retinal burn. It will occur only when the fireball is actually in the individual's field of view and should be a relatively uncommon injury. The location of the scar will determine the degree of interference with vision. Because night vision apparatus electronically amplifies an image, it cannot transmit the flash intensity and will not cause eye injury.

g. **Physiological Effects of Ionizing Radiation**. A nuclear burst results in four types of ionizing radiation: neutrons, gamma rays, beta, and alpha radiation. The initial burst is characterized by neutrons and gamma rays while the residual radiation is primarily alpha, beta, and gamma rays. The effect of radiation on a living organism varies greatly by the type of radiation to which the organism is exposed. See Table 1-8 for characteristics of nuclear radiation.

(1) Alpha particles are extremely massive, charged particles (four times the mass of a neutron); they are a fallout hazard. Because of their size, alpha particles cannot travel far and are fully stopped by the dead layers of the skin or by the uniform. Alpha particles are a negligible external hazard, but if inhaled or ingested, can cause significant internal damage.

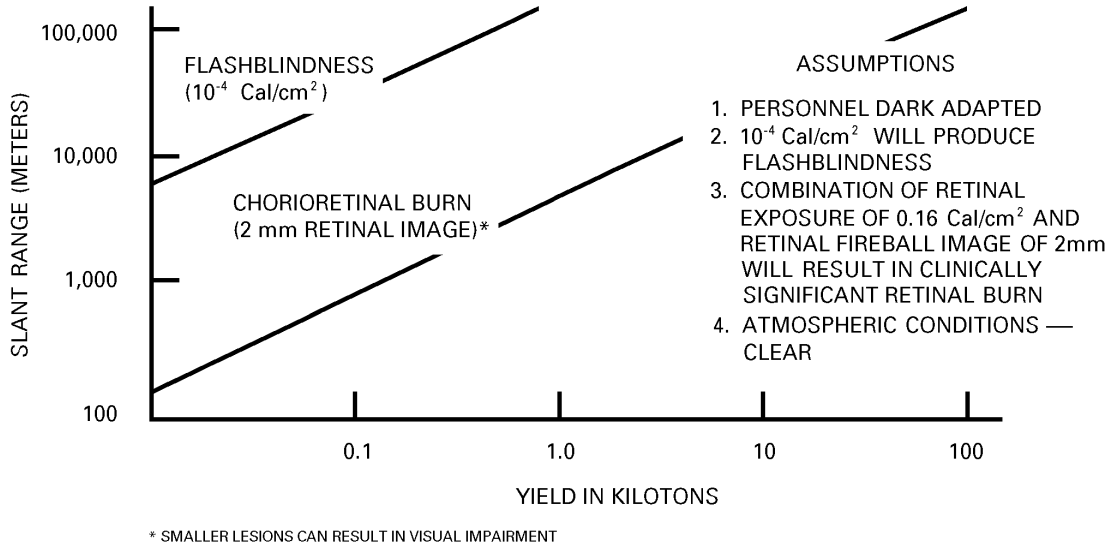


Figure 1-3. Threshold distance for minimal chorioretinal burn and flash blindness versus yield (airburst) at night.

Table1-8. Characteristics of Nuclear Radiation

NAME AND SYMBOL	WHAT IS IT	SOURCE	ENERGY AND SPEED	RANGE IN AIR	RANGE IN TISSUE	SHIELDING REQUIRED	BIOLOGICAL HAZARD
α ALPHA PARTICLE	HELIUM NUCLEUS	DECAY OF URANIUM AND PLUTONIUM	ENERGY VARIES: SPEED VARIES FROM 1/20 TO 1/10 SPEED OF LIGHT	~ 5 cm	CANNOT PENETRATE THE EPIDERMIS	NONE	NONE, UNLESS INGESTED OR INHALED IN SUFFICIENT QUANTITIES
β BETA PARTICLE	HIGH-SPEED ELECTRON	DECAY OF FISSION PRODUCTS AND NEUTRON INDUCED ELEMENTS	VARIES	5 METERS	SEVERAL LAYERS OF SKIN	STOPPED BY A FEW cm OF A1 OR MODERATE CLOTHING	SUPERFICIAL SKIN INJURY
γ GAMMA RAY	ELECTRO-MAGNETIC ENERGY	DECAY OF FISSION PRODUCTS AND NEUTRON INDUCED ELEMENTS	ENERGY VARIES: TRAVELS AT THE SPEED OF LIGHT	UP TO 500 METERS, BUT IS ENERGY DEPENDENT	VERY PENETRATING, BUT IS ENERGY DEPENDENT	DENSE MATERIAL, SUCH AS CONCRETE, STEEL PLATE, EARTH	WHOLE BODY INJURY, MANY CASUALTIES POSSIBLE
η NEUTRON	UNCHARGED PARTICLE	FISSION AND FUSION REACTIONS	VARIES	LESS THAN GAMMA, BUT IS ENERGY DEPENDENT	VERY PENETRATING, BUT IS ENERGY DEPENDENT	HYDROGENOUS MATERIALS, SUCH AS WATER OR DAMP EARTH	WHOLE BODY INJURY, MANY CASUALTIES POSSIBLE

(2) Beta particles are very light, charged particles that are found primarily in fallout radiation. These particles can travel a short distance in tissue; if large quantities are involved, they can produce damage to the basal stratum of the skin. The lesion produced is

similar to a thermal burn (called a beta burn).

(3) Gamma rays, emitted during the nuclear detonation and in fallout, are uncharged radiation similar to X rays. They are highly energetic and pass through matter easily. Because of its high penetrability, radiation can be distributed throughout the body, resulting in whole body exposure.

(4) Neutrons, like gamma rays, are uncharged, are only emitted during the nuclear detonation, and are not a fallout hazard. However, neutrons have significant mass and interact with the nuclei of atoms, severely disrupting atomic structures. Compared to gamma rays, they can cause 20 times more damage to tissue.

(5) When radiation interacts with atoms, energy is deposited resulting in ionization (electron excitation). This ionization may involve certain critical molecules or structures in a cell, producing its characteristic damage. Two modes of action in the cell are direct and indirect action. The radiation may directly hit a particularly sensitive atom or molecule in the cell. The damage from this is irreparable; the cell either dies or is caused to malfunction. The radiation can also damage a cell indirectly by interacting with water molecules in the body. The energy deposited in the water leads to the creation of toxic molecules; the damage is transferred to and affects sensitive molecules through this toxicity.

(6) The most radiosensitive organ systems in the body are the male reproductive, the hematopoietic, and the gastrointestinal systems. The relative sensitivity of an organ to direct radiation injury depends upon its component tissue sensitivities. Cellular effects of radiation, whether due to direct or indirect damage, are basically the same for the different kinds and doses of radiation. The simplest effect is cell death. With this effect, the cell is no longer present to reproduce and perform its primary function. Changes in cellular function can occur at lower radiation doses than those that cause cell death. Changes can include delays in phases of the mitotic cycle, disrupted cell growth, permeability changes, and changes in motility. In general, actively dividing cells are most sensitive to radiation. Additionally, radiosensitivity tends to vary inversely with the degree of differentiation of the cell.

(7) Predicting radiation effects is difficult because often it is unknown which organs were exposed. Thus, most predictions are based on whole body irradiation. Partial body and specific organ irradiation will occur due to shielding by equipment, from fallout particles, or from internal deposition. Depending upon the organ system, the irradiation can be severe. The severe radiation sickness resulting from external, whole body irradiation and its consequent organ effects is a primary medical concern. The median lethal dose (LD) of radiation that will kill 50 percent of the exposed persons within a period of 60 days (designated as LD50/60) is estimated to be approximately 4.5 gray (Gy) if appropriate medical care is not provided to the casualties. Medical intervention should raise this figure to approximately 10 Gy. This larger figure includes most of the casualties who would be actually capable of reaching medical care following a nuclear detonation, and nearly all those who could be exposed to a RDD. For acute effects of single high dose rate exposures of whole-body irradiation to healthy adults see Table 1-9.

(8) Recovery of a particular cell system will occur if a sufficient fraction of a given stem cell population remains after radiation injury and appropriate stimulation and protection are received. Complete recovery may appear to occur; however, the immune system may repair incompletely with consequent greater susceptibility to future insult from a variety of agents. It is possible for late somatic effects to have a higher probability of occurring because of the radiation damage. Efficacy of both prior and future immunization in this group is not adequately understood.

(9) Interactions between radiological injury and chemical or biological agents appear to be synergistic. Insult by these agents in radiologically injured personnel, even in individually subclinical dosages, may result in significant clinical illness.

1-4. Handling and Managing Radiologically Contaminated Patients.

a. Radiologically Contaminated Patients. Personnel from contaminated areas may have fallout on their skin and clothing. Although the individual will not be radioactive, he may suffer radiation injury from the contamination. Removal of the contamination should be accomplished as soon as possible; definitely before admission into a clean treatment area. The distinction must be made between a radiation-injured soldier and one who is radiologically contaminated. Although personnel may have received substantial radiation exposure, this exposure alone does not result in the individual being contaminated. Contaminated personnel do not pose a short-term hazard to the medical staff, rather the contamination is a hazard to the individuals' health. However, without patient decontamination, medical personnel may receive sufficient exposure to create beta burns, especially with extended exposure.

b. Handling Radiologically Contaminated Patients. To properly handle radiologically contaminated personnel, medical personnel must first detect the contamination. Detectors that may be used are the AN/PDR27 and AN/VDR2 to monitor patients for contamination. Generally, a reading on the meter twice the current background reading indicates that the patient is contaminated. Monitoring is conducted when potentially contaminated personnel arrive at the MTF. This monitoring is conducted at the MTF's receiving point before admitting the patient. Contaminated patients must be decontaminated before admission. Removal of radiological contamination is less important than immediate lifesaving treatment and providing the best possible medical care. Lifesaving care before decontamination is provided outside the MTF.

c. Decontamination. Removing all outer clothing and a brief washing or brushing of exposed skin will reduce 95 percent of contamination; vigorous bathing or showering is unnecessary. See Appendix E for patient decontamination procedures.

d. Internal Contamination. Internalization of radioactive isotopes will primarily occur via inhalation, ingestion, and contaminated wounds. Extensive internal decontamination should only be undertaken when individual dose estimates indicate that the individual will benefit from the procedures. Soldiers who wear their protective mask will be adequately protected from inhalation and ingestion of radioactive particulate matter. Internal contamination is considered a

delayed problem and does not influence triage categories, as does irradiation injury.

e. Treatment. Treatment procedures for radiation injuries are described in FM 4-02.283, FM 8-9, and the NATO Handbook, *Emergency War Surgery*. Appropriate medical intervention and bone marrow resuscitation will prevent most deaths secondary to irradiation and infection.

Table 1-9. Acute Clinical Effects of Single High Dose Rate Exposures of Whole-body Irradiation of Healthy Adults

DOSE (RANGE)		0–100 cGy (SUBCLINICAL RANGE)	100–1000 cGy (SUBLETHAL RANGE)			OVER 1000 cGy (LETHAL RANGE)	
			100–200 cGy	200–600 cGy	600–1000 cGy	1000–3000 cGy	OVER 3000 cGy
INITIAL PHASE	INCIDENCE OF NAUSEA & VOMITING	NONE	5–50%	50–100%	75–100%	100%	
	TIME OF ONSET	------	APPROX 3–6 HRS	APPROX 2–4 HRS	APPROX 1–2 HRS	LESS THAN 1 HR	
	DURATION	------	LESS THAN 24 HRS	LESS THAN 24 HRS	LESS THAN 48 HRS	LESS THAN 48 HRS	APPROX 48 HRS
	COMBAT EFFECTIVE-NESS	100%	100%	CAN PERFORM ROUTINE TASKS. SUSTAINED COMBAT OR COMPARABLE ACTIVITIES HAMPERED FOR 6–20 HRS.	CAN PERFORM ONLY SIMPLE ROUTINE TASKS. SIGNIFICANT INCAPACITATION IN UPPER PART OF RANGE. LASTS MORE THAN 24 HRS.	PROGRESSIVE INCAPACITATION FOLLOWING AN EARLY CAPABILITY FOR INTERMITTENT HEROIC RESPONSE.	PROGRESSIVE INCAPACITATION FOLLOWING AN EARLY CAPABILITY FOR INTERMITTENT HEROIC RESPONSE.
LATENT PHASE	DURATION	------	MORE THAN 2 WEEKS	APPROX 7–15 DAYS	NONE TO APPROX 7 DAYS	NONE TO APPROX 2 DAYS	NONE
SECONDARY PHASE	SIGNS & SYMPTOMS	NONE	MODERATE LEUKOPENIA	SEVERE LEUKOPENIA; PURPURA, HEMORRHAGE; INFECTION; EPILATION ABOUT 300 cGy.		DIARRHEA; FEVER; DISTURBANCE OF ELECTROLYTE BALANCE.	CONVULSIONS; TREMOR ATAXIA; LETHARGY.
	TIME OF ONSET POST EXPOSURE	------	2 WEEKS OR MORE	SEVERAL DAYS TO 2 WEEKS		2–3 DAYS	
	CRITICAL PERIOD POST EXPOSURE	------	NONE	4–6 WEEKS		5–14 DAYS	1–48 HRS
	ORGAN SYSTEM RESPONSIBLE	NONE	HEMATOPOIETIC TISSUE			GASTROINTESTINAL TRACT	CENTRAL NERVOUS SYSTEM
HOSPITAL-IZATION	PERCENTAGE	NONE	LESS THAN 5%	90%	100%	100%	100%
	DURATION	------	45–60 DAYS	60–90 DAYS	90–120 DAYS	2 WEEKS	2 DAYS
INCIDENCE OF DEATH		NONE	NONE	0–80%	90–100%	90–100%	
AVERAGE TIME OF DEATH		------	------	3 WEEKS TO 2 MONTHS		1–2 WEEKS	2 DAYS
THERAPY		NONE	REASSURANCE HEMATOLOGIC SURVEILLANCE	BLOOD TRANSFUSION, ANTIBIOTICS		MAINTENANCE OF ELECTROLYTE BALANCE	SEDATIVES

1

1-5. The threat of Biological Warfare Agents against US Forces and Civilian Populations.

a. Biological warfare (BW) is the intentional use of viruses, bacteria, other microorganisms, or toxins derived from living organisms to cause death or disease in humans, animals, or plants.

b. In 1943, the US began research in and experimentation with several human and plant pathogens for use as BW weapons. In 1969, the US adopted a policy to cease offensive BW research and never again to produce, stockpile, weaponize, or use biological agents. By 1970 all offensive BW research was terminated. The US biological arsenal was destroyed by the end of 1972. In addition, the US is a party of the 1972 Biological Weapons Convention (BWC), which prohibits offensive BW agent research, stockpiling, weaponization, and use. However, several foreign governments and terrorist organizations have continued to develop offensive BW programs. The US conducts research to develop vaccines, chemoprophylaxes, diagnostic tests, and therapies to minimize the potential impact of a BW attack.

c. Biological warfare has interested several foreign governments and terrorist organizations for a number of reasons—

(1) Biological warfare agents are relatively easy to obtain. Naturally occurring viruses and bacteria which cause disease are obtainable from soil, water, animal reservoirs, clinical specimens, and clinical and research laboratories. Also, the development of recombinant genetic engineering has introduced the potential to genetically modify viruses and bacteria to enhance their ability to cause disease. Such modifications may include antibiotic resistance, enhanced invasiveness or toxin production, or enhanced ability to evade host immune defenses.

(2) Biological warfare agents are relatively easy and inexpensive to produce. The technology used to produce antibiotics, vaccines, and other industrial and food products can easily be converted to BW agent production. Such technology is readily available and is commonly used by industry; therefore, production of BW agents may be easily concealed.

d. Effects of Biological Weapons. Biological warfare is the intentional use, by an enemy, of live agents or toxins to cause death and disease among personnel, animals, and plants, or to deteriorate materiel.

(1) Live Agents.

- Live agents are living organisms like viruses, bacteria, and fungi. They can be delivered directly (artillery or aircraft spray), or through a vector such as a flea or tick. Advances in modern weaponizing of biological agents have become easier.

- For some agents, only a few organisms are needed to cause infection. Live agents are small and light; they can be spread great distances by the wind and contaminate unfiltered or nonairtight places.

- Aerosolized particles of 1 to 5 micron (μ) size carrying live agents are small and light. They require time after they are ingested to multiply enough to overcome the body's defenses. This incubation period may vary from hours to days or weeks depending on the type

of organism. Thus, to be effective, a live agent attack would need to be launched well in advance of a tactical assault.

- These agents are sensitive to environmental conditions (for example humidity and sunlight). Many bacterial agents will not survive outside the host organism (human and animals).

- Live agents are not detectable by any of the five physical senses; usually the first indication of a biological attack is the ill personnel. The diseases caused by live agents may be difficult to control when the aerosol attack is directed against a large population. Some diseases may be transmitted from person-to-person after the initial attack; examples include plague, smallpox, and some viral hemorrhagic fevers.

- Because of their incubation period and life cycle, likely areas for live agent use are in the combat service support (CSS) area; but attacks in forward areas cannot be ruled out.

(2) Spore Forming Biological Agents. Spore formers such as anthrax can survive for an extended time, even under very adverse environmental conditions (dry, extremes of temperatures, and flooding). Once inhaled, ingested, or injected into the human body, the spores germinate and produce the illness.

(3) Toxins.

- Toxins are by-products (poisons) produced by plants, animals, or microorganisms. It is the poisons that harm man, not the organisms that make the toxins. In the past, the only way to deliver toxins on a large scale was by using the organism. With today's technology large quantities of many toxins can be produced; thus, they can be delivered without the accompanying organism.

- Toxins have several desirable traits. They are poisonous compounds that do not grow, reproduce, or die after they have been dispersed; they are more easily controlled than live organisms. Field monitors capable of providing prompt warning of a toxin attack are not available; therefore, personnel must learn to quickly recognize signs of attack, such as observing unexplained symptoms of victims. Toxins produce effects similar to those caused by chemical agents; however, the victims will not respond to the first-aid measures that work against chemical agents. Unlike live agents, mycotoxins (T2) can penetrate intact skin; other toxins cannot. Because the effects on the body are direct, the symptoms of an attack may appear very rapidly. The potency of most toxins is such that very small doses will cause injuries and/or death. Thus, their use by an enemy may be an alternative to chemical agents because it allows the use of fewer resources to cover the same or a larger area. Slight exposure at the edges of an attack area may produce severe symptoms or death from exposure to toxins because of their extreme toxicity. Lethal or injury downwind hazard zones for toxins may be far greater than those of CW agents.

e. Behavior of Biological Weapons. Biological agents can be disseminated in a spectrum of

physical states. They may be living microorganisms or spore forms of the organism. See Table 1-10 for stability of various biological agents. They may be spread by—

- Arthropods.
- Contact with infected animals.
- Contamination of food and water.
- Aerosol, liquid, or solid dispersion.

The only requirement is that they must be stable enough to survive transport and dissemination. The toxicity of biological agents is not the same for everyone; each individual does not react exactly the same way to the same amount of an agent. Some are more resistive than others because of race, sex, age, or other factors. The dose is the quantity of a biological agent received by the subject. The penetration of agents by various routes need not be accompanied by irritation or damage to the absorbent surface. There are often unique signs and identifying symptoms depending on entry route (inhalation, ingestion, or dermal).

(1) Biological agents dispersed by spray often enter the body through the respiratory tract (inhalation injury). The agent may be absorbed by any part of the respiratory tract from the mucosa of the nose and mouth to the alveoli of the lungs.

(2) Liquid droplets and (less commonly) solids may be absorbed from the surface of the skin, digestive tract, and mucous membranes. Agents penetrating the skin may form temporary reservoirs under the skin.

(3) Contaminated food and water can produce casualties when ingested.

Table 1-10. Types and Characteristics of Some Biological Agents

TYPE OF AGENT	STABILITY	INCUBATION TIME	AEROSOL	NONAEROSOL
ANTHRAX	HIGH	HOURS TO 7 DAYS	INHALATION	SKIN, MOUTH
BOTULINUM TOXIN	HIGH	24 TO 36 HOURS	INHALATION	MOUTH, WOUND
BRUCELLOSIS	HIGH IN WET	1 TO 4 WEEKS	INHALATION	MOUTH, SKIN, ENVIRONMENT EYES
CHOLERA	MODERATE	HOURS TO 5 DAYS		MOUTH
PLAGUE (PNEUMONIC)	LOW	2 TO 4 DAYS	INHALATION	
PLAGUE (BUBONIC)	MODERATE	2 TO 10 DAYS		BITE OF VECTOR
RICIN	HIGH	<36 HOURS	INHALATION	MOUTH
SMALLPOX	HIGH	7 TO 17 DAYS	INHALATION	LESION CONTACT
STAPHYLOCOCCAL ENTEROTOXIN B	HIGH	1 TO 6 HOURS	INHALATION	MOUTH
TRICHOTHECENE MYCOTOXIN	HIGH	MINUTES TO HOURS	INHALATION	MOUTH, SKIN
TULAREMIA	LOW	2 TO 10 DAYS	INHALATION	MOUTH, SKIN, BITE OF VECTOR
VENEZUELAN EQUINE ENCEPHALITIS		MODERATE	1 TO 6 DAYS INHALATION	BITE OF VECTORS
VIRAL HEMORRHAGIC FEVERS	LOW	DAYS TO MONTHS	INHALATION	BITE OF VECTORS

1-6. Management of Biological Warfare Patients.

a. Management. Management of patients suffering from the effects of BW agents may include the need for isolation. Barrier nursing for patients suspected of suffering from exposure to BW agents will reduce the possibility of spreading the disease to health care providers and other patients. Specimens must be collected and submitted to the designated supporting laboratory for identification. For details on hospital infection control aspects of managing BW casualties, see FM 8-284.

b. Mass Casualty. A BW agent attack can produce a mass casualty situation at all levels of HSS. A major problem with a BW mass casualty situation is that HSS personnel are more susceptible to becoming a casualty to BW agents. Also, the ill patient may be the first indicator that a BW agent has been dispersed.

c. Decontamination. Decontamination is an individual and unit responsibility. However, some individuals may arrive at the MTF that have not been decontaminated or that become contaminated en route to the MTF. These individuals must be decontaminated at the MTF before they are admitted to prevent contamination of the MTF and exposure of medical personnel to the biological agent. See Appendix E for details on patient decontamination.

d. Treatment. Specific treatment is dependent upon the BW agent used. Patients are treated for symptomatic presentation unless the BW agent identity is known. Field Manuals 8-9 and 8-284 provide detailed information on medical management and treatment.

1-7. The threat of Chemical Warfare agents against United States Forces and Civilian Populations.

a. Chemical warfare (CW) agent (also referred to as chemical agents) remains a continuing threat to U.S. forces through the 2000s. Delivery may be accomplished by multiple means, causing extensive injury and contamination. Traditionally, threat commanders have regarded chemical weapons as a part of their conventional arsenal. The Chemical Weapons Convention CWC), signed by 130 countries in January 1993, will take many years to fully implement and to verify the destruction of known chemical stock weapons stockpiles. Some countries with offensive chemical warfare programs, like North Korea and Iraq, have not signed the CWC. In sprite of the CWC and other diplomatic efforts, chemical weapons will be available to threat forces in regions where U.S. forces may be deployed.

b. In addition to established threat areas, many countries have shown that chemical weapons are readily obtainable. The ease of obtaining these weapons greatly increases the complexity and extent of the total threat. For example, nonmilitary organophosphate insecticide factories may also be used to produce nerve agents.

c. Chemical weapons are most effectively employed against untrained or unprotected targets. Civilians fixed sites (airfields, depots, cities, and ports) are especially vulnerable. These sites may be targeted as part of the plan to defeat U.S. force projection.

d. Effects of Chemical Weapons

(1) A chemical agent is a chemical that is used to kill, seriously injure, or incapacitate man because of its physiological effects. They can be disseminated by artillery, aircraft, rocket, or by nonconventional means used by terrorists. When first employed in combat during World War I, the chemical weapon (chlorine) was so effective that the attacking Germans were not prepared to exploit the success.

(2) Chemical agents are very effective weapons against poorly trained and equipped forces; however, they are less effective against well-trained forces.

e. Behavior of Chemical Weapons**.** Chemical agents can be disseminated as a gas, vapor, or aerosol under ambient conditions. They have a range of odors varying from none to highly pungent characteristics. Their stability is dependent upon the environmental conditions in the area of employment. See Table 1-11 for persistency of various chemical agents.

(1) The toxicity of a chemical agent is not the same for everyone; each individual does not react exactly the same way to the same amount of an agent. Some are more resistant than others because of physiological factors. The dose is the quantity of a chemical received by the individual for percutaneous or oral doses and as a time-weighted concentration, milligrams-minute (m3), for inhalation. It is usually expressed as milligrams of agent per kilogram of subject body weight (mg/kg). The LD50 is the dose that kills 50 percent of the exposed population. The incapacitation dose 50 (ID50) is the incapacitation dose for 50 percent of the exposed subjects. The penetration of agents by various routes need not be accompanied by irritation or delayed superficial damage to the absorbent surface, but there are often unique signs and symptoms identifiable by the route of entry.

- Gaseous, vapor, and aerosol chemical agents often enter the body through the respiratory tract (inhalation injury). The agent may be absorbed by any part of the respiratory tract from the mucosa of the nose and mouth to the alveoli of the lungs. Aerosol particles larger than 5 μ tend to be retained in the upper respiratory tract; particles in the 1 to 5 μ range are retained in the deep volume of the lungs; while those below 1 μ tend to be breathed in and out again; although a few are retained in the deep volume of the lungs.

- Vapors and droplets of liquids can be absorbed from the surface of the skin and mucous membranes. Toxic compounds that are harmful to the skin can produce their effects in liquid or solid state. Agents penetrating the skin may form temporary reservoirs under the skin; the vapors of some volatile liquids can penetrate the skin and cause intoxication. Additionally, wounds and abrasions may present areas that are more permeable than intact skin.

(2) Chemical agents may be divided into two main categories (persistent and nonpersistent) that describe how long they are capable of producing casualties. Table 1-11 lists the common chemical agents, their effects and time of effectiveness. Table 1-12 lists the types and characteristics of common chemical agents.

- Persistent agents continue to present a hazard for considerable periods (days) after delivery by remaining as a contact hazard, or by slowly vaporizing to produce a hazard by inhalation.

- Nonpersistent agents disperse rapidly after release and present an immediate, short duration (hours) hazard. They are released as airborne particles, aerosols, and gases.

Table 1-11. Common Chemical Warfare Agents

COMMON NAME	EFFECT	TIME TO EFFECT
TABUN (GA)		INHALATION: SECONDS TO MINUTES
SARIN (GB)	LETHAL NERVE AGENTS	TOPICAL: MINUTES
SOMAN (GD)		INGESTION: MINUTES TO HOURS
V-AGENTS		
HYDROGEN CYANIDE	LETHAL BLOOD AGENT	MINUTES
MUSTARD	BLISTER AGENTS	1 TO 12 MINUTES
LEWISITE		MINUTES
LSD AND BZ	INCAPACITATING AGENTS	15 TO 60 MINUTES
PHOSGENE	LUNG-DAMAGING (CHOKING)	MINUTES
CHLORINE		SECONDS TO MINUTES

Table 1-12. Types and Characteristics Chemical Agents

TYPE OF AGENT	SYMBOL	PERSISTENCE SUMMER	PERSISTENCE WINTER	RATE OF ACTION	ENTRANCE VAPOR/AEROSOL	ENTRANCE LIQUID
NERVE	GA, GB, GD	10 MIN-24 HR	2 HR-3 DAYS	VERY QUICK	EYES, LUNGS	EYES, SKIN, MOUTH
	VX	2 DAYS-1 WK	2 DAYS-WEEKS	QUICK	EYES, LUNGS	EYES, SKIN, MOUTH
CHOKING	CG, DP	1-10 MIN	10 MIN-1 HR	IMMEDIATE	LUNGS EYES	

Table 1-12. Types and Characteristics Chemical Agents (Continued)

TYPE OF AGENT	SYMBOL	PERSISTENCE SUMMER	PERSISTENCE WINTER	RATE OF ACTION	ENTRANCE VAPOR/AEROSOL	ENTRANCE LIQUID
	HD, HN	3 DAYS-1 WK	WEEKS	SLOW	EYES, SKIN, LUNGS	EYES, SKIN
BLISTER	L, HL	1-3 DAYS	WEEKS	QUICK	EYES, SKIN, LUNGS	EYES, SKIN, MOUTH
	CX	DAYS	DAYS	VERY QUICK	EYES, LUNGS, SKIN	EYES, SKIN, MOUTH
BLOOD	AC, CK	1-10 MIN	10 MIN-1 HR	VERY QUICK	EYES, LUNGS, EYES, MOUTH, INJURED SKIN	

f.. **Characteristics of Chemical Agents.** The effectiveness of a chemical agent is a measure of how much agent is required to produce the desired effect. Thus, an agent that is toxic at a lower dose than another similar agent is more effective. Besides dose required for a given effect, persistency may be used to measure effectiveness. Persistency depends on the agent's physical characteristics, the amount of agent delivered, its physical state, weapons system used, the terrain, and weather in the target area. The desired effects will determine the physical, chemical, and toxicological properties of the chemical agent employed.

(1) Nerve agents are primarily organophosphorus esters similar to insecticides. Those of military importance are combined under this term. Although some have been given names, they are usually known by their code letters: GA; GB; GD; and VX. They are all liquids, varying in volatility that is in a range between gasoline and heavy lubricating oil. Their freezing points are -40 degrees Celsius or lower.

- Liquid nerve agents are pale yellow to colorless and are almost odorless. They are moderately soluble in water and highly soluble in lipids (oil). They are rapidly destroyed by strong alkalies and chlorinating compounds. Normal clothing is readily penetrated by liquid or vapor agents. Butyl rubber and synthetic material are more resistant than natural fibers. Agents can penetrate into nonabsorbent material such as web belts and can continue to present a hazard by desorption (off-gassing) of the vapor. Although local sweating and twitching may occur, usually there is no local irritant change after cutaneous exposure. Toxicity depends upon the route of entry and physical characteristics.

- Nerve agents strongly inhibit the cholinesterase enzymes. When acetylcholine is released by the nerve junction, it is hydrolyzed by the enzyme. Acetylcholine is the chemical

mediator for transmission of the nerve impulses in numerous synapses of the central nervous system (CNS) and the autonomic nervous system and at the endings of the cholinergic nerves (for example: affecting the smooth muscles of the iris, ciliary, bronchial tree, and gastrointestinal tract). The inhibition of cholinesterase by nerve agents is almost irreversible, so the effects are prolonged. Until the cholinesterase level is restored to normal, there is an increased susceptibility to nerve agent exposure. During this time, the effects of repeated exposure are cumulative and the patient may feel "subpar" (for example: tired, fatigue easily, poor appetite, impaired concentration) until recovery is complete.

- Nerve agent poisoning is easily identified by the characteristic signs and symptoms as follows:

(*a*) **MILD** symptoms (self-aid). Casualties with MILD symptoms may experience most or all of the following:

- Unexplained runny nose.
- Unexplained sudden headache.
- Sudden drooling.
- Difficulty in seeing (dimness of vision) (miosis).
- Tightness in the chest or difficulty in breathing.
- Localized sweating and muscular twitching in the contaminated area.
- Stomach cramps.
- Nausea.

(*b*) Casualties with **MODERATE** symptoms (buddy aid) will experience an increase in the severity of most or all of the MILD symptoms. Especially prominent will be an increase in fatigue, weakness, and muscle fasciculations. The progress of symptoms from MILD to MODERATE indicates either inadequate atropine treatment or continuing exposure to agent.

(*c*) **SEVERE** symptoms (buddy aid). Casualties with SEVERE symptoms may experience most or all of the MILD symptoms, plus most or all of the following:

- Strange or confused behavior.
- Wheezing, dyspnea (severe difficulty in breathing), and coughing.
- Severely pinpointed pupils.
- Red eyes with tearing.

- Vomiting.
- Severe muscular twitching and general weakness.
- Involuntary urination and defecation.
- Convulsions.
- Unconsciousness.
- Respiratory failure.

(2) There are three major families of blister agents (vesicants); HD and HN, L, and CX. Most vesicants (except CX) are relatively persistent. Mustards can modify the structure of nucleic acids, cellular membranes, and proteins by combining with certain functional groups (particularly the sulfhydryl-containing enzymes) for which they have an affinity.

- The cutaneous syndrome is divided into four phases: latent, erythema, vesication, and necrosis. Vesicants can penetrate the skin by contact with either liquid or vapor. The latent period is characteristic of the agent. For mustards it is usually several hours, for L it is short, and for CX it is negligible. The latent period is also affected by the dose, temperature, and humidity. The symptoms of the erythema phase are red, painful itching followed by painful necrosis that heals slowly.

- In the eyes, vesicants produce intense pain and photophobia. Blistering of the eyelids and mucous membranes can result in temporary blindness. Even after recovery, scars on the cornea can reduce visual acuity.

- In the respiratory tract, these agents attack the mucous membranes irritating them. They can paralyze vocal chords and can lead to chemical pneumonitis, or possibly death.

- Although blister agents can affect other organs and produce deleterious effects, the skin, eyes, and respiratory tract are the principle organs affected.

(3) Chemical agents that attack lung tissue (choking agents) and cause pulmonary edema are classed as lung damaging agents. Choking agents consist of CG and DP, CL, and PS. Phosgene is typical of the lung-damaging agents; it is used as the example here.

- Phosgene is a colorless gas that has an odor resembling new mown hay. Although effects are primarily confined to the lungs, phosgene may also cause mild irritation of the eyes and upper respiratory tract. Phosgene causes a shift in the membrane potential of the alveoli allowing the passage of fluid into the alveoli, resulting in massive pulmonary edema and severely impairing the exchange of oxygen (O_2) and carbon dioxide (CO_2) between the capillary blood and the alveolar air.

- Initially hypoxemia occurs and is followed shortly by hyperventilation when the

frothy edema fluid fills the bronchioli and CO_2 expiration stops.

- Signs and symptoms during and immediately following exposure are coughing, tightness of chest, nausea, occasionally vomiting, headache, and lacrimation (tearing).

(4) Blood agents consist of AC and CK; both are readily absorbed by the mucous membranes and the intact skin. The odor of AC resembles bitter almonds, but many people cannot detect it. Detecting the odor of CK is difficult because of its irritating and lacrimatory effects. It is also poorly absorbed by the metallic salt-impregnated charcoal filters in the protective mask. These agents inhibit certain enzymes (particularly cytochrome oxidase) that are important for oxidation-reduction in the cells; therefore, cell respiration is inhibited and oxygen carried by the hemoglobin is not consumed causing the venous blood to remain bright red. Initial symptoms are characterized by violent convulsions, increased deep respiratory movements, followed by cessation of respiration within one minute, slowing of heart rate to death. High concentrations exert their effects rapidly; however, if the patient is still alive after the cloud has passed, he will probably recover spontaneously.

(5) Incapacitating agents are chemicals that produce a temporary disabling condition that persists for hours to days after exposure to the agent has ceased (unlike that produced by riot control agents). While not required, medical treatment produces a more rapid recovery. Characteristics of these agents are that they—

- Are highly potent and logistically feasible.
- Produce their effects mainly by altering or disrupting the higher regulatory activity of the CNS.
- Produce effects that last for hours or days rather than momentary or fleeting.
- Do not seriously endanger life, except in exceedingly high doses.
- Produce no permanent injury.

The two types likely to be encountered are CNS depressants and CNS stimulants.

(a) Central nervous system depressants are compounds that have a predominant effect of depressing or blocking the activity of the CNS; often by interfering with the transmission of information across synapses. An example of this type of agent is BZ. The action of acetylcholine, both peripherally and centrally, appears to be blocked by BZ. Low doses disrupt higher integrative functions of memory, problem solving, attention, and comprehension. High doses produce toxic delirium that destroys the ability to perform any military task. Within the CNS, BZ seems to produce its effects in the same way as atropine. Small doses cause sleepiness and decreased alertness with elevated heart rate, dry skin and eyelids, drowsiness, increased pupil size, and elevated skin temperatures. Progressive intoxication is marked by an inability to respond effectively to the environment (4 to 12 hours), followed by increasing activity and random/unpredictable behavior (12 to 96 hours). Because the patient cannot sweat,

heat stress becomes a problem.

(b) Central nervous system stimulants are agents that cause excessive nervous activity, often by boosting or facilitating transmission of impulses across synapses. The effect is to "flood" the cortex and other higher regulatory centers with too much information, making concentration difficult and causing indecisiveness and an inability to act. These include LSD, psilocybin, and mescaline. Intoxication shows sympathetic stimulation (rapid heart rate, sweaty palms, pupillar enlargement, and cold extremities) and mental excitation (nervousness, trembling, anxiety, and inability to relax or sleep); feelings of tension, exhilaration, heightened awareness, paranoid ideas, and profound states of terror may also occur.

1-7. Management of Chemical Agent Patients

a. Management. Movement of chemical agent casualties can spread the contamination to clean areas. All casualties are decontaminated as far forward as the situation permits. All patients must be decontaminated before they are admitted into a clean MTF. The admission of one contaminated patient into an MTF will contaminate the facility; thereby reducing its treatment capabilities.

b. Mass Casualty. A mass casualty situation is presented when chemical agents are employed. Additional HSS personnel and equipment must be provided in a short period of time if the level of care is to be maintained. Treatment at far forward MTFs is limited to life- or limb-saving care. Patients that can survive evacuation to the next level of care are not treated at the forward facility. This provides time for treating those patients that cannot survive the evacuation time.

c. Decontamination. Decontamination is an individual and unit responsibility. However, some individuals may arrive at the MTF that have not been decontaminated or that become contaminated en route to the MTF. These individuals must be decontaminated at the MTF before they are admitted to prevent contamination of the MTF and exposure of medical personnel to the chemical. See Appendix E for detailed information on patient decontamination procedures.

d. Treatment. Field Manuals 8-9 and 8-285 provide treatment procedures for chemical agent patients.

1-9. The threat of Toxic Industrial Material (TIM) Agents against US Forces and Civilian Population.

a. US forces frequently operate in environments in which there are toxic materials, particularly toxic industrial chemical (TIC). A number of these chemicals could interfere in a significant manner across the range of military operations. Most TICs are released as vapors. The vapors tend to remain concentrated downwind from the release point and in natural low-lying areas such as valleys, ravines, or man made underground structures. Explosions may create and spread liquid hazards, and vapors may condense to liquids in cold air. Gases and vapor can pose serious atmospheric health or explosive hazards, whereas liquids and solids may be used to contaminate

potable water or food supplies. Some adversary forces could target industrial plants, agricultural warehouses, or treatment facilities located on or near a deployed site. The most important action in case of massive industrial chemical release is immediate evacuation outside of the hazard's path. For additional information on TIM hazards, see National Institute for Occupational Safety and Health, Pocket Guide to Chemical Hazards, and US Department of Transportation, North American Emergency Response Guidebook.

b. In planning for operations in areas in which there may be toxic materials including industrial chemicals, the combatant and subordinate commanders should include consideration of these potential hazards as part of the intelligence preparation of the battlespace (IPB) process. These hazards could occur from massive deliberate or accidental release from industrial sites as well as storage and transport containers.

c. Certain countries have embarked on extensive efforts to acquire and develop nuclear, biological, and chemical weapons. Depending on their delivery systems, these weapons can pose a regional and a global threat. The Defense Intelligence Agency (DIA) has estimated that the Middle East will become the region of greatest concern in terms of nuclear weapons over the next 10 to 20 years. DIA judges that certain states in this region will be able to begin stockpiling nuclear weapons in the next two decades; much sooner if they are successful in purchasing fissile material, or if they are successful in purchasing complete weapons.

1-10. Military Operations Other Than War (MOOTW).

a. The Armed Forces of the United States participate in MOOTW in efforts to deter war, resolve conflict, promote peace, and support civil authorities in domestic and overseas emergency or attack situations as permitted by law. MOOTW may be conducted as singular operations, as the precursor to combat operations, in parallel with ongoing combat operations, or following the cessation of combat activity.

b. State-supported and non-state terrorist groups may employ NBC weapons, or natural and manmade disasters may contaminate areas with toxic materials whose mitigation will require the efforts of specialized military forces. The conduct of MOOTW in NBC environments may require coordination and cooperation with agencies, organizations, and individuals, outside the military chain of command or direct control. In many MOOTW situations the JFC may be in a supporting role to civil authorities, or to host nation (HN) authorities. Regardless of the role, the JFC and joint force elements must be prepared for NBC use and contamination with toxic materials at any point, including the transition from non-combat to combat environment. JP 3-07, Joint Doctrine for Military Operations Other than War, and other JPs in the 3-07 series detail guidance for the range of MOOTW. Additionally, CJCSI 3214.01, Military Support in Foreign Consequence Management Operations, defines responsibilities for planning and conducting military CM operations in response to incidents on foreign soil involving WMD.

c. HSS planning activities generally include hospitalization, preventive medicine (PVNTMED), veterinary services, medical logistics, blood supply and distribution, medical regulating and patient movement evacuation. Plans for overseas and CONUS operations should

include provision for surge medical requirements using on-hand and rapidly deployable capabilities. Special consideration is required for HSS for NEO evacuees who may have been exposed to NBC or other toxic agents. In the United States, there may be a requirement to augment civilian medical capabilities in the handling of casualties resulting from NBC attacks or other toxic material contamination. The ability of domestic and HN medical facilities to handle mass casualties from NBC effects should be assessed and factored into US joint and multinational HSS planning.

- Close coordination with HSS and other public health providers in the theater is a vital means of detecting chemical and biological attacks, since casualties from such an attack may appear initially in the civilian medical system.

1-11. Impact of NBC on Air and Space Forces, Land Forces and Maritime Forces. NBC attacks have the potential to significantly degrade the contribution of Air and Space Forces to operating objectives, constrain the maneuverability of Land Forces by unforeseen areas of contamination, and cripple Maritime Forces that are in proximity to land. It is imperative that medical NBC defense be fully integrated into the deliberate planning process of Air, Space, Land and Maritime defense forces to maximize readiness. Key elements include casualty estimates, medical surveillance, prophylaxis (including immunizations), diagnostics, mass casualty management, evacuation, and patient decontamination requirement for HSS operations. Joint force plans should recognize that NBC attacks have the potential to create mass casualties. The potential for high casualties may make HN medical facilities unavailable to the joint force. Gaps in the medical NBC defense capabilities of multinational forces must be addressed in order to ensure multinational cohesion and effectiveness in both planning and operations. Joint and multinational exercises must include realistic standards for conducting medical operations in NBC environment.

Chapter 2

Medical Threat in a Nuclear Biological and Chemical Environment

2-1. Medical Threat

a. Medical threat is the composite of all ongoing or potential enemy actions and environmental conditions that will reduce combat effectiveness through wounding, injuring, causing disease, and/or degrading performance. Soldiers are the targets of these threats. Weapons or environmental conditions that will generate wounded, injured, and sick soldiers, beyond the capability of the HSS system to provide timely medical care from available resources, are considered major medical threats. Weapons or environmental conditions that produce qualitatively different wound or disease processes are also major medical threats. Added to the combat operational and disease and nonbattle injury (DNBI) medical threats are adversary use of the following types of weapons, agents, and devices:

- Biological warfare agents.
- Chemical warfare agents.
- Nuclear weapons.
- Toxic industrial materials.
- Radiological dispersal devices.
- Directed-energy devices/weapons.
- Chemical, biological, radiological, nuclear, and high-yield explosives.

b. *Nuclear Weapons and Radiological Dispersal Device Threats.* Since the breakup of the Soviet Union, the number of countries with known nuclear capable military forces has almost doubled. Available information suggests that a number of countries in the Middle East, Asia, and Africa have or may have nuclear weapons capability within the next decade. Table 2-1 lists those countries known to have, suspected of possessing, or seeking, nuclear weapons. Planners can expect, as a minimum, 10 to 20 percent casualties within a division-sized force that has experienced a nuclear strike. In addition to the casualties, a nuclear weapon detonation can generate an electromagnetic pulse (EMP) that will cause catastrophic failures of electronic equipment components. Radiological dispersal devices, comprised of an explosive device with radioactive material, can be detonated without the need for the components of a nuclear weapon. The RDD can disperse radioactive material over an area of the battlefield causing effects from nuisance levels of radioactive material to life-threatening levels without the thermal and, in most cases, the blast effects of a nuclear detonation.

Table 2-1. Countries Possessing or Suspected of Possessing Nuclear Weapons

KNOWN TO POSSESS	SUSPECT OR SEEKING
UNITED STATES OF AMERICA	IRAQ
RUSSIA	NORTH KOREA
UKRAINE	IRAN
BELARUS	LIBYA
KAZAKSTAN	ALGERIA
PEOPLE'S REPUBLIC OF CHINA	SOUTH AFRICA
FRANCE	ISRAEL
UNITED KINGDOM	
PAKISTAN	
INDIA	

c. *Biological Warfare*

(1) Biological warfare (BW) is defined by the US intelligence community as the intentional use of disease-causing organisms (pathogens), toxins, or other agents of biological origin (ABOs) to incapacitate, injure, or kill humans and animals; to destroy crops; to weaken resistance to attack; and to reduce the will to fight. Historically, BW has primarily involved the use of pathogens in assassinations or as sabotage agents in food and water supplies to spread contagious disease among target populations.

(2) For purposes of medical threat risk assessment, we are interested only in those BW agents that incapacitate, injure, or kill humans or animals.

(3) Known or suspect BW agents and ABOs can generally be categorized as naturally occurring, unmodified infectious agents (pathogens); toxins, venoms, and their biologically active fractions; modified infectious agents; and bioregulators. See Table 2-2 for examples of known or suspected BW threat agents. Also, Table 2-3 presents possible developmental and future BW agents.

Table 2-2. Examples of Known or Suspect Biological Warfare Agents

PATHOGENS	TOXINS
BACILLUS ANTHRACIS (ANTHRAX)	BOTULINUM TOXIN
FRANCISELLA TULARENIUS (TULAREMIA)	
	MYCOTOXINS
YERSINIA PESTIS (PLAGUE)	ENTEROTOXIN
BRUCELLA SPECIES (BRUCELLOSIS)	RICIN

VIBRIO CHOLERAE (CHOLERA)
VARIOLA (SMALLPOX)
VIRAL HEMORRHAGIC FEVERS

Table 2-3. The Future of Biological Warfare Agents

CURRENT THREAT	FUTURE
PATHOGENS	MODIFIED PATHOGENS
LIMITED NUMBER OF TOXINS (ORGANO-TOXINS)	EXPANDED RANGE OF TOXINS
AGENTS OF BIOLOGICAL ORIGIN	PROTEIN FRACTIONS AGENTS OF BIOLOGICAL ORIGIN

(4) Many governments recognize the industrial and economic potential of advanced biotechnology and bioengineering. The same knowledge, skills, and methodologies can be applied to the production of second and third generation BW agents. Naturally occurring infectious organisms can be made more virulent and antibiotic resistant and manipulated to render protective vaccines ineffective. These developments complicate the ability to detect and identify BW agents and to operate in areas contaminated by the BW agents. The first indication that a BW agent release/attack has occurred may be patients presenting at a medical treatment facility with symptoms not fitting the mold for endemic diseases in the area of operations (AO). See Appendix H for sampling requirements, sampling procedures, packaging and shipping, and chain of custody requirements.

d. *Chemical Warfare*

(1) Since World War I, most western political and military leaders have publicly held chemical warfare (CW) in disrepute. However, evidence accumulated over the last 50 years does not support the position that public condemnation equates to limiting development or use of offensive CW agents. The reported use of chemical agents and biological toxins in Southeast Asia by Vietnamese forces; the confirmed use of CW agents by Egypt against Yemen; and later by Iraq against Iranian forces; and the probable use of CW agents by the Soviets in Afghanistan indicate a heightened interest in CW as a force multiplier. Also, an offensive CW capability is developed as a deterrent to the military advantage of a potential adversary. Table 2-4 lists those countries known or suspected of having offensive chemical weapons.

(2) The Russian Republic has the most extensive CW capability in Europe. Chemical strikes can be delivered with almost any type of conventional fire support weapon system (from mortars to long-range tactical missiles). Agents known to be available in the Russian inventory include nerve agents (O-ethyl methyl phosphonothiolate [VX], thickened VX, Sarin [GB], and thickened Soman [GD]); vesicants (thickened Lewisite [L] and mustard-Lewisite mixture [HL]); and choking agent (phosgene). Although not considered CW agents,

riot control agents are also in the Russian inventory.

(3) The US is in the process of destroying its stockpiles of CW weapons. Many weapons have already been destroyed and the storage facilities have been rendered safe of all CW agent residues.

Table 2-4. Nations Known or Suspected of Possessing Chemical Weapons

KNOWN TO POSSESS	SUSPECTED OF POSSESSING
UNITED STATES OF AMERICA	PEOPLE'S REPUBLIC OF CHINA
RUSSIA	NORTH KOREA
FRANCE	EGYPT
LIBYA	ISRAEL
IRAQ*	ETHIOPIA
IRAN	TAIWAN
SYRIA	BURMA

* Following the Persian Gulf War (1990-91), the United Nations (UN) began destroying CW munitions discovered during inspection visits to Iraq by UN arms control inspectors. Included among the CW munitions discovered were some 2,000 aerial bombs and 6,200 artillery shells filled with mustard and several thousand 122 millimeters (mm) rocket warheads filled with nerve agent (GB). Iraq also declared surface to air missile (SCUD) warheads filled with nerve agent (GB and GF). Table 2-5 provides a list of known CW Agents.

Table 2-5. Chemical Warfare Agents

NERVE	VESICANT	INCAPACITATING	CHOKING	BLOOD
TABUN (GA)	SULFUR MUSTARD (HD)	CNS DEPRESSANT (BZ)	PHOSGENE (CG)	HYDROGEN CYANIDE (AC)
GB	HL	CHLORINE (CL)	DIPHOSGENE (DP)	CYANOGEN CHLORIDE (CK)
GD	L	CHLOROPICRIN (PS)		
GF	PHOSGENE OXIME (CX)	D-LYSERGIC ACID		
VX		DIETHYLAMIDE (LSD)		

e. *Toxic Industrial Materials*

Toxic industrial materials can present a medical threat for deployed forces. Toxic industrial materials are comprised of toxic industrial biologicals (TIBs), toxic industrial chemicals (TICs), and toxic industrial radiological (TIR) materials. These materials are found throughout the world and are used on a daily basis for commercial and private purposes. Large storage facilities, transportation tankers (over the road and railcars), as well as smaller containers of material, pose a danger to the health of personnel. Accidental spills or releases and terrorist actions can all lead to release of these materials into the environment causing potential casualty producing effects.

Medical treatment facilities and nuclear power plants use radioactive materials that can pose a health hazard if accidentally released or used by hostile forces, terrorists, or others to contaminate an area. Biological materials used in medical research and pharmaceutical manufacturing may be used by hostile forces, terrorists, or others to produce casualties. Many TICs produce the same effects on personnel as CW agents. As a matter of fact, many TICs are of the same chemical structure as CW agents. However, there is quite a difference in their potency; in most TICs the potency is much lower. For example, chlorine used to treat water supplies has also been used as a CW agent; organophosphate pesticides can cause the same effects as some nerve agents. Hostile forces, terrorists, or others may use RDDs to produce casualties as well. For detailed information on toxic industrial materials see FM 8-500.

2-2. Obtaining Medical Intelligence Information on Nuclear, Biological and Chemical Threat

a. Operations in NBC environments place a great need for HSS demands on intelligence. Clear and commonly shared assessment of adversary NBC capabilities, US, multinational, and HN's HSS capabilities and limitations in countering adversary NBC use, are of great importance. NBC threat information gathered by the component/joint intelligence staff is used by the deployed medical staff for planning and employment of HSS assets. Threat assessments should include the identification of industrial sites in the theater that can produce toxic industrial hazards. TIM could become a health hazard to deployed forces if these sites are accidentally or intentionally destroyed or left in a normal operation. Threat information is also used to prepare the medical threat/intelligence database. The Armed Forces Medical Intelligence Center (AFMIC) consolidates intelligence products for HSS functions.

b. The AFMIC responds to requests from the armed forces for emergency, up-to-date medical intelligence. The mission and functions of AFMIC are to:

(1) Produce required foreign scientific and technical intelligence (S&TI) and general medical intelligence.

(2) Produce foreign BW intelligence studies and reports on the capabilities of foreign countries to acquire, develop, produce, or employ any agent of biological origin as a weapon .

(3) Produce intelligence studies on the medical aspects of foreign chemical warfare capabilities.

(4) Organize and execute the medical aspects of the DOD Foreign Medical Materiel Exploitation Program (FMMEP).

(5) Coordinate the acquisition, exploitation, and disposition of foreign medical materiel obtained in support of DOD FMMEP.

(6) Plan, coordinates, and provide intelligence studies in accordance with DOD S&TI production policies and procedures.

(7) Prepare medical intelligence funding and manpower requirements for submission to the DOD general defense intelligence program.

(8) Manage and maintain the medical intelligence database and the medical portion of the DOD S&TI database.

(9) Provide quick responses on foreign medical intelligence to DOD elements and other government agencies as required.

(10) Assist in debriefing personnel on matters related to medical intelligence.

(11) Sponsor medical intelligence briefings and training for selected Reserve and active military units and individual mobilization designees, as required.

(12) Maintain coordination and liaison with members of the technical intelligence community on matters involving medical intelligence

(13) Provide a medical intelligence advisor to the military services

(14) *Transmit* a weekly wire of current medical intelligence developments.

(15) Above information can be obtained from http://mic.afmic.detrick.army.mil

c. Accurate and timely medical intelligence is a critical health service support tool for planning, executing and sustaining all military operations. Medical intelligence (MEDINTEL) should be structured to provide support that is proactive, aggressive, predictive, and flexible. A supporting intelligence element should exist at some point in the medical unit's chain of command. This element, whether military or civilian, should be the primary source for the HSS planner to access the necessary intelligence for the execution of HSS operations. The HSS personnel must develop a feedback system with the supporting intelligence element to provide as well as receive intelligence updates.

- In obtaining intelligence to meet specific medical requirements, first determine if local intelligence data or AFMIC MEDINTEL publications can satisfy your requirements. If significant requirements remain unanswered then you may submit a DD Form 1497, Intelligence Production Requirement (IPR), or information requirement (IR) and forwarded through intelligence channels. The IPR or IR will be reviewed by the component/joint Intelligence Officer, Joint Military Staff Operations Directorate (J-3), or up or down to the level where the desired information is available. These requests could conceivably be passed up to the primary source of the DOD strategic intelligence, the Defense Intelligence Agency (DIA). In this case, DIA may validate the requirements and submit them to the AFMIC. The requirements become a task (s) for AFMIC to supply a response back to the requester.

d. There are other specialized organizations that provide expert information resources on medical aspects of NBC threats, casualty prevention, NBC agent sample and specimen

collection, and medical care and management of casualties. These include the Defense Threat Reduction Agency, the Armed Forces Radiobiology Research Institute, the Naval Medical Research Center, the US Army Medical Research Institute of Infectious Disease, the US Army Medical Research Institute of Chemical Defense, and the US Army Nuclear and Chemical Agency.

Chapter 3

Health Services Support Planning Considerations

3-1. Planning Considerations

a. The theater campaign embodies the combatant commander's vision of the arrangement of related major operations necessary to attain strategic objectives. Campaign planning is a primary means by which combatant commanders arrange for strategic unity of effort and through which they guide the planning of joint operations within their theater. Health Service Support is integral to theater strategic, deliberate, and crisis planning and execution. To provide adequate HSS, definitive planning and coordination with component / Joint planning and intelligence staffs are required. Theater campaign planning synthesizes mobilization, deployment, employment, sustainment, and subordinate operations into a coherent whole. HSS activities must maintain preparedness to ensure adequate preparations before and during the transitions to these operations in a joint environment. *Additional guidance is available in Joint Pub 3-0, Doctrine for Joint Operations and Joint Pub 4-02, JTTP for HHS in Joint Operations.*

b. Planning for HSS must include all aspects of HSS requirements. HSS supports all phases of operations taking into account the unique characteristics and effects of the range of NBC weapons. HSS planning begins with preventive medicine support as part of the early entry force on to post – NBC attack that must include efforts to conserve available HSS personnel and resources for medical treatment. The geographic combatant commander establishes the command 's HSS requirements and uses directive authority to ensure the proper coordination of all HSS capabilities in the force (to include general HSS services, shelter, food, water, environmental and occupational health, medical prophylaxis, medical pre-treatments, immunizations, antidotes, and fluids). *Refer to JP-05, Doctrine for Planning Joint Operations for additional information on deliberate and crisis action planning.*

c. Proper planning of HSS permits a systematic examination of all factors in a projected operation and ensures interoperability with the campaign plan or operational plan (OPLAN). Timely, effective planning and coordination are essential in the HSS's organization system. Health threat, medical intelligent, casualty patients estimates, theater patient movement policy, hospitalization, patient movement and available lift all plays a significant part in supporting the joint force's mission. The medical planner must consider the above listed factors in planning HSS in joint operations in support of the JFC. Joint Pub 4-02, Doctrine for Health Service Support in Joint Operations reflects more detail on planning. Joint planning considerations for HSS in NBC environment should include

d. NBC attacks have the potential to significantly degrade the contribution of Air and Space Forces to operating objectives, constrain the maneuverability of Land Forces by unforeseen areas of contamination, and cripple Maritime Forces that are in proximity to land. It is imperative that medical NBC defense be fully integrated into the deliberate planning process of Air, Space, Land and Maritime defense forces to maximize readiness. Key elements include casualty estimates, medical surveillance, prophylaxis (including immunizations), diagnostics, mass casualty

management, evacuation, and patient decontamination requirement for HSS operations. Joint force plans should recognize that NBC attacks have the potential to create mass casualties. The potential for high casualties may make host nation medical facilities unavailable to the joint force. Gaps in the medical NBC defense capabilities of multinational forces must be addressed in order to ensure multinational cohesion and effectiveness in both planning and operations. Joint and multinational exercises must include realistic standards for conducting medical operations in NBC environment. Figure 3-1 describes those factors, which should be considered and included in joint planning for operations in a NBC environment.

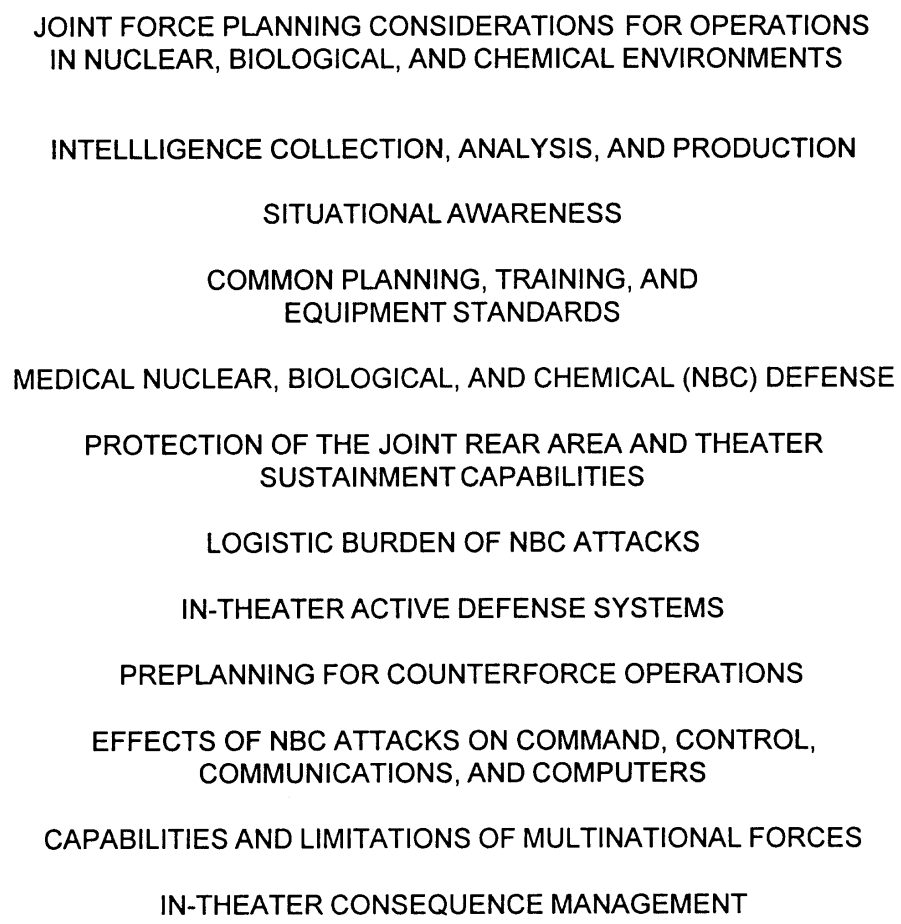


Figure 3-1, Joint Force Planning Considerations For Operations In A Nuclear, Biological, And Chemical Environments

e. Joint Force Commanders and subordinate commands must balance the need for HSS against operational support requirements. Planning the flow of resources into theater and the continued sustainment of those resources should involve input from the commander and planning, operations, and logistics staffs to ensure campaign objectives are met with minimal overall

operational risk. This must be considered during all phases of campaign planning and execution. Medical planners should provide the commander a risk analysis and recommendations on courses of action to support NBC related operations.

3-2. Health Service Support in Multinational Operations

a. Health service support in multinational operations possesses a unique challenge. Language, values, religious systems, economics and social outlooks can have great impact on the delivery of HSS. Forces of member nations must be supported either by national assets or through the coalition. Because resources contributions will vary between nations, some may contribute logistically, while others contribute military force. Commanders of multination forces should seek to ensure that member forces are appropriately supplied consistent with nation capabilities and the term established at the formation of the alliance and/or coalition. JFCs should strive to develop and implement simple rules of engagement that can be tailored by member forces to their particular situation.

b. Plans in multinational operations should be coordinated with member forces.

c. Logistics is a major challenge for multinational operations. Planning issues to consider are

- logistic doctrine
- stockage levels, logistic mobility, interoperability, infrastructure, national resource limitations. Host nation and coalition support limitations/agreements. JFCs typically form multinational logistic staff sections early to facilitate coordination and support of operations. Significant logistic operations include the securing and protection of medical personnel, medical supplies and medical equipment.

d. Operations abroad may involve military support to other countries' civil authorities. This support is controlled by the US ambassador/country team or provided directly by the JFC in accordance with bilateral or multinational arrangements**.** In all circumstances, commanders participating in joint operations must reduce their forces ' vulnerability to NBC attack and be prepared to mitigate and recover from the consequences of an NBC attack. JFC, joint and multinational elements must be prepared for NBC use and contamination with toxic materials at any point, including the transition from non-combat to combat environments. *Joint Publication (JP) 3-07, Joint Doctrine for Military Operations Other Than War, and other JPs in the 3-07 series reflect upon detail guidance for the range of MOOTW.*

e. Planning considerations for HSS in multi-national operations in an NBC environment should include those activities contained in Figure 3-2. Health Service Support Activities in Multi-National Operations.

HEALTH SERVICE SUPPORT ACTIVITIES IN
MULTINATIONAL OPERATIONS

- PUBLIC HEALTH ACTIVITIES, TO INCLUDE PREVENTIVE MEDICINE AND VETERINARY CARE, FOOD SANITATION, WATER QUALITY MONITORING, SANITARY FACILITY EVALUATIONS, IMMUNIZATIONS OF HUMANS AND ANIMALS, PEDIATRIC MEDICAL SUPPORT, AND RESUSCITATION AND STABILIZATION OF ACUTE ILLNESS AND INJURIES
- DIAGNOSTIC AND TREATMENT TRAINING
- DEVELOPMENT OF HEALTH SERVICE SUPPORT (HSS) LOGISTIC PROGRAMS
- DEVELOPMENT OF CONTINUING HSS EDUCATION PROGRAMS
- DEVELOPMENT OF HSS MEDICAL INTELLIGENCE AND THREAT ANALYSIS
- DEVELOPMENT OF A HOST NATION MILITARY FIELD HSS SUPPORT SYSTEM FOR TREATMENT AND EVACUATION
- ASSISTANCE IN THE UPGRADE, STAFFING, AND SUPPLYING LOGISTIC SUPPORT OF EXISTING HSS FACILITIES

Figure 3-2. Health Service Support Activities in Multinational Operations

3-3. Logistic Support in a Nuclear, Biological, and Chemical Environment. The ability to sustain combat operations with an appropriate level of logistic support is vital to operational success. Operations in NBC environments can place significant burdens on the logistic system. Plans supporting deployment; reception, staging, onward movement, and sustainment must continually be reviewed. The JFC must ensure that logistic units of components commands can survive and operate effectively in NBC environments. Operations in contaminated environments demand close attention by commanders to the joint logistic principles of sustainability, survivability, flexibility, and responsiveness. Logistic planning and training include considerations for reducing vulnerabilities to NBC attacks and assuring logistic support operations.

a. Regardless if operations are conducted in a mature theater (forwarded-deployed forces with significant amount of logistic infrastructure already in place) or immature theater (have few if any, deployed forces and minimal logistic infrastructure) medical supplies and equipment must have environmental controlled warehouses or covered shelters to reduce the vulnerability to contamination. Host nation support (HNS) agreements will play a large part in securing needed protection for these supply items.

b. When assessing the likely nature and frequency of possible attacks on logistic facilities, the JFC and his combatant commanders should consider the number of available delivery means and chemical and biological warheads and the ability of the adversary to deliver an agent to significantly disrupt operations. In planning logistic sites the attack range of adversary air and surface weapon delivery systems armed with chemical, biological, or possible nuclear warheads should be assessed.

(1) In a NBC environment, geographic combatant commanders are responsible for sustainability, survivability, flexibility, and responsiveness of logistic supplies. The JFC's

Surgeon is responsible for the protection of medical supplies and equipment in an NBC environment. Close planning with command counterparts will greatly enhanced the survivability of the needed vital medical resources.

(2) Blood and blood components are valuable commodity of medical supply, as such the handling and protection of these live tissue will require special procedures. Storage, potency periods, protection, inventory management and innovative technology all play important part in managing blood supply in an NBC environment. To be successful, blood support must be a highly organized and cooperative effort on the part of; medical logistic, operations and plans, blood bank, laboratory, transportation and primary medical care personnel. The primary mode for blood distribution is via air transportation.

c. Logistic principles and considerations serve as a guide to commanders and their staffs for planning and conducting logistic support for joint operations in a NBC environment. To support the national military strategy, logistic must be responsive in and capable of meeting military personnel, equipment, mobility, medical readiness, infrastructure, and sustainment across the range of the military operation. Thus the application of logistic principles to the specific mission and situation dictates the concept of logistic support to be used. Figure 3-3 shows the Principles of Logistics. The principles of logistics support are not a checklist but rather a guide for analytical thinking and prudent planning.

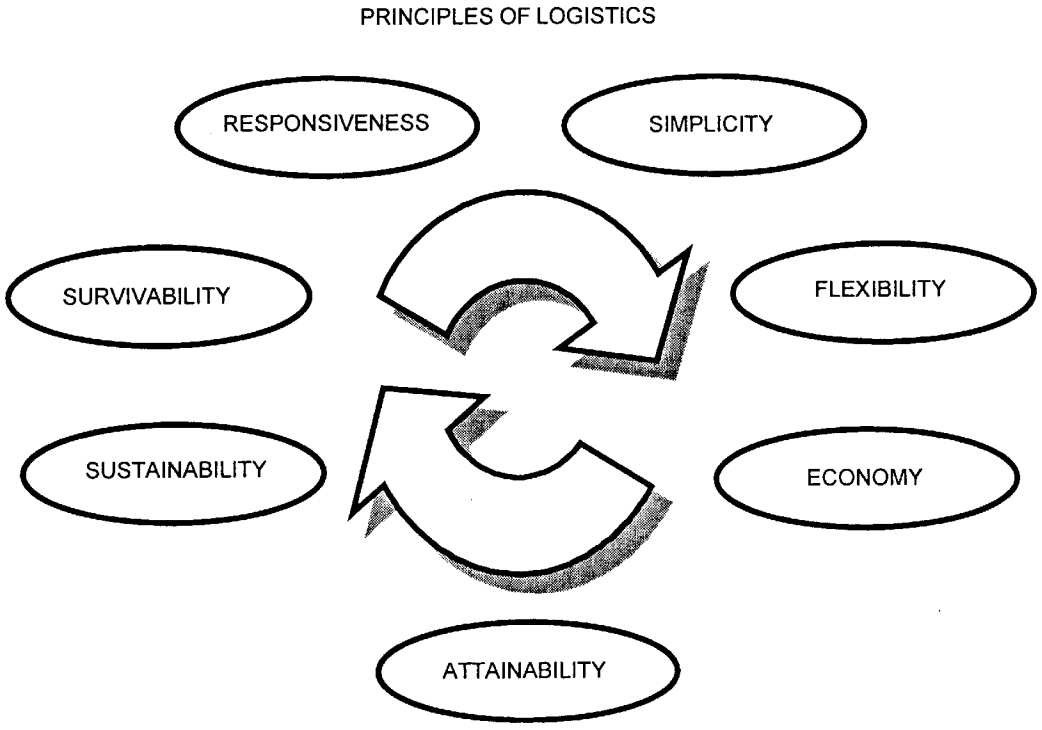


Figure 3-3. Principles Of Logistics

d. In a NBC environment, Class VIII supplies and equipment must be protected from contamination. Supplies and equipment not in use or needed in the protected operational areas are stored in medical chest, shipping containers, or wrapped in layers of plastic that are inside covered areas, such as closed military-owned demountable containers (MILVANs) or tents. When contamination is present, only open these storage areas for operational area emergency resupply. Use plastic sheeting or other material to provide an additional barrier between the supplies/equipment and the contamination.

Chapter 4

Phases of Health Service Support supporting in a potential Nuclear, Biological, and Chemical Environment

4-1. Peacetime preparation and training

a. Force Health Protection (FHP) encompasses a full spectrum of operational medical concepts designed to establish future benchmarks for the military health systems challenges Joint Vision 2010. FHP is more than clinical medicine; it involves enhanced methods of preventing casualties before, during and after a military operation. FHP:

1. Emphasizes fitness, preparedness, and preventive measures.
2. Improves the monitoring and surveillance of threats and forces engaged in military operations.
3. Enhances service members' and commanders' awareness of health threats before they can affect the force.
4. Supports the health needs of the fighting forces and their family across the continuum of medical services.

b. Military medical readiness training is founded on training military healthcare providers in the art of military medicine. It will include an understanding of how the combat environment affects service members and the related preventive and clinical interventions; hazard exposures and regional diseases; baseline clinical competence, including mass casualty management; clinical knowledge and skills specific to combat-unique injuries; and familiarity with platform-specific roles, supplies, and equipment.

4-2. Predeployment procedures

a. Predeployment requires detailed planning, crossing numerous functional areas and departments such as; personnel service administration and support, medical and dental, financial support, legal support, family support, religious support, postal services, family services and public affairs and logistic support. Medical Commanders and planners must look beyond mobilization. They must project the unit's theater requirements and provide the required support. In preparing for deployment unit commanders should consider but not be limited to:

1. Requesting medical threat information on the area of operation (AO) from the Armed Forces Medical Intelligence Center.

2. Confirming all personnel have up-to-date prescribed immunizations for the AO and are physically fit for deployment.

3. Ensuring each person receives DoD-prescribed immunizations, medications, prophylaxis, and NBC pretreatments.

4. Ensuring personnel treat uniforms with approved insect repellent.

5. Incorporating preventive medicine measures (PMM) into the standing operating procedures (SOPs)

6. Have required field sanitation devices on hand and operational.

7. Designating safety personnel to ensure safety procedures are being practice.

8. Ensure personnel have adequate personal hygiene supplies to include insect spray and sunscreen.

9. Ensure personnel have adequate clothing and equipment for AO (hot or cold); also chemical protective over garment, gloves, over boots, and protective mask.

10. Distribute preventive medicine guidelines.

11. Educate personnel and their family to dispel rumors. Get accurate information to personnel.

12. Establish a Medical Surveillance System.

13. Establish an Occupational and Environmental Health Program

b. Logistic requirements and sustainment operations are a critical concern to the battlefield commander throughout the campaign. Deploying units must be self-sustaining for a specified period of time after arrival within theater. Pre-positioned logistics may augment the supplies and equipment that accompany deploying units.

c. Mobility strategy demands that we be able to move personnel and materiel to the scene of a crisis at a pace and in numbers sufficient to achieve quick, decisive mission success. Air and sealift users must supply a full and complete description of all air and sealift requirements in order for the Navy and Air Force to match transport assets against those requirements. This is accomplished through the time-phased force and deployment data (TPFDD) validation process. Medical planners must insure NBC defense personnel and equipment are correctly reflected in the TPFDD. This is the supported commander of combatant command's statement of his requirements by unit type, time period and priority for arrival used in the joint mobility strategy. The TPFDD is both a force requirements document and a prioritized transportation movement document. The TPFDD also defines the support commander of combatant command's non-unit related cargo and personnel requirements to include civilians to sustain his forces. In meeting commander of combatant command's requirements after initial strategic lift, pre-position assets, and host nation/contract services, tailoring of the force in relation to existing plans may occur.

4-3. Deployment Procedures

During deployment commanders should maintain vigilance to ensure the health and NBC preparedness of their units. This should include just in time training for self-aid and buddy care, individual protective equipment inspections, and other factors that may impact the health of the force.

1. Have up-to-date Medical surveillance/documentation in accordance with applicable policies.
2. Coordinate with Preventive Medicine personnel prior to and during site survey.
3. Ensure personnel use work/rest cycle during early staged of deployment to become acclimatized to the AO, mission permitting.
4. Coordinate with supply and logistic channel for food, water and ice from US military-approved sources.
5. Ensure personnel take prophylaxis and pretreatments as prescribed.
6. Ensure personnel keep all immunizations up-to-date.
7. Ensure all personnel practice good personal hygiene.
8. Ensure personnel drink adequate amount of water.
9. Ensure personnel wear hearing protection when needed.
10. Request Preventive Medicine support when needed
11. Enforce the use of individual PMM equipment.

4-4. Sustainment of Health Service Support Operations in a Nuclear, Biological, and Chemical Environment

a. Planning for and maintaining a sound medical surveillance program for all operations can maximize force effectiveness by eliminating or reducing the effects of medical threats. HSS supports all phases of operations, taking into account the unique characteristics and effects of NBC weapons. Although most definitive care is rendered outside the area of immediate combat in a non-tactical environment, triage, patient decontamination, and initial resuscitative care may be necessary in the combat area. HSS planners must ensure that units can locate clean areas to establish medical treatment facilities or employ collective protected facilities in areas that have the potential for being contaminated by NBC weapons.

b. The combatant commander and his planners establishes the command 'HSS requirements and ensure the proper coordination of all HSS capabilities. These capabilities include the following; general HSS services, shelter, food, water, environmental and occupational health, medical prophylaxis, medical pre-treatments, immunizations, antidotes, and fluids.

c. Adversary use of NBC weapons can cause large numbers of casualties. It is imperative that Commanders and HSS planners have a process in place to treat NBC casualties. Effective care and management of casualties caused by NBC weapons requires planning to treat large numbers of individuals as discussed in Chapter 7.

d. During the initial planning stages, planners must include a comprehensive, and workable, plan to manage contaminated patients who may need to be evacuated from the theater of operations. Contaminated patients must be decontaminated before entering the air evacuation system unless the combatant commander and Commander USTRANSCOM direct otherwise.

Therefore, units must establish decontamination and processing procedures.

e. When biological agents are a threat, decontamination / isolation and processing procedures must be in place to prevent the spread of infection. Every attempt should be made to contain infection within the area of operation. Adequate preplanning is particularly critical when infectious casualties (e.g., smallpox, plague) are anticipated. Preplanning coordination with USTRANSCOM on the use of air assets, and the US Department of State for permission to fly infectious casualties over other nation air space, must be accomplished. Refer to chapter 7 of this manual, FM8-284 / NTRP 4-02.21(NAVMED P-5042)/ AFMAN (I) 44-156 / MCRP 4-11.1C, Treatment of Biological Warfare Agent Casualties, AFTTP 3-42.3, Health Service Support in NBC Environments, and AFTTP 3-42.5 Aeromedical Evacuation for more detailed information.

f. The demand for preventive medicine services will increase commensurate with the NBC threat. Preventive medicine personnel and the command surgeon assist the JFC in determining the health risks associated with NBC hazards; the safety of drinking water; the appropriate time for using pre-treatments, prophylaxis, and immunizations, and other preventive medicine measures. Preventive medicine personnel must establish and maintain a medical surveillance program. This program should be established before the first deployer enters the theater and continue after the personnel depart. To maintain combat effectiveness commanders and HSS personnel must continually evaluate capabilities and make adjustments to conform to JFC priorities.

4-5. Redeployment of Health Service Support assets after military actions have been complete

a. Redeployment involves the transfer of units, individuals, or supplies deployed in one area to another area, or to another location within the area, or to the zone of interior for the purpose of further employment, or to the continental United States (CONUS) or outside the continental United States (OCONUS) home/demobilization station for the purpose of further operational employment or demobilization. Forces redeployed out of area as quickly as mission, enemy, terrain, personnel, time available and civilian considerations allow upon the achievement of objectives. However, the JFC may have follow-on operations or security concerns that require a well-planned sequence to the drawdown of forces. The JFC may order restoration operations to be completed prior to the redeployment of all forces. The tactical commander must plan redeployment consistent with follow-on operational mission requirements.

b. Careful contingency planning must be conducted, prior to the theater operation that provides workable guidelines for the disposition of casualties, the ill, and troops rotating out of theater. If biological agents have been used in the theater of operations, redeployment planning must include the health screening of troops before their movement out of the theater to prevent the spread of disease. Planning must also incorporate close coordination with multinational unit commanders, who have forces in the theater, to insure disease containment.

c. There are four phases to redeployment.

1. Recovery and reconstitution and preredeployment activities.

2. Movement to and activities at ports of embarkations (POEs).
3. Movements to ports of debarkations (PODs).
4. Reception, staging, onward movement, and integration.

Although many of the considerations for redeployment correspond to those for a deployment, there are differences. During deployment, elements of a unit configured for strategic movement with the ultimate goal of reassembling the elements into an effective force in theater. During redeployment, unless the unit is redeploying to a new theater, the goal is to move forces home rather than building a force for theater operations. Therefore, redeployment preparation involves re-establishing unit integrity and accountability of personnel and equipment. In the reconstitution process, commanders re-establish the unit by undoing organizational changes made to the unit for operations in the theater. Unit may or may not redeploy to home stations as pure units. Redeployments to new theaters may require organizational modifications, as in original deployments.

d. The JFC must consider actions to attain specific NBC related objectives and conditions; particularly those associated with disabling or destroying NBC capabilities. The JFC must also oversee the orderly transition of authority to US, international, interagency, or host nation agencies, as the level of hostility lessens, the composition of forces changes. The desired end state is typically a more normal peacetime environment. However, the president, secretary of defense, or Congress-imposed time limitations may require redeployment prior to achieving mission success or establishing desired conditions for redeployment. Such early withdrawal requires detail tactical planning for the protection and orderly movement of forces while a threat remains. Cease-fire agreements or political negotiations may cause changes in redeployment plans. Upon given notice from the JFC, the geographic commander establishes when HSS requirements and capabilities is to be drawdown or no longer needed. Those NBC defense operations, which have been underway, may need to continue if residual toxic hazards and adversary threats remain. Units need to maintain high states of readiness and security during the post-conflict stage.

Chapter 5

Health Service Support in a Toxic Industrial Material Environment

5-1. General background on Toxic Industrial Material)

a. Although the hazards of weaponized chemicals have long been recognized, the hazards of industrial materials have only recently become more widely understood. Deliberate terrorist release or inadvertent release of TIM significantly increases hazards to the indigenous population and US forces. While CW agents are highly toxic and lethal in small amounts, the countries producing them are generally known and are few in numbers when compared with the quantities and universal nature of TIM. TIM should be recognized for the multiple health hazards they pose as well as the potential risks resulting from an explosion or fire-associated products. Most TIM will present a vapor (inhalation) hazard. Vapor concentration at or near the point of release may be very high and may reduce the oxygen concentration below that required in supporting life. Examples of common activities associated with TIM are listed in Table 5-1.

Table 5-1. Location and types of TIM.

LOCATION	TYPE OF TIM
Airports	Aviation gasoline, jet fuel.
Farm and garden supply warehouses	Pesticides
Shipping terminals	Bulk petroleum and chemicals
College laboratories	Organic chemicals, radioactive materials
Electronics manufacturers	Arsine, arsenic trichloride
Food processing and storage areas	Ammonia
Glass and mirror plants	Fluorine, hydrofluoric acid
Pipelines and propane storage tanks	Ammonia, methane, and propane

Plastic manufacturers	Isocyanates, cyanide compounds
Landscaping businesses	Ricin (a food and water poison), fertilizer, herbicides
Medical and Pharmaceutical facilities	Radioactive isotopes, mercury, biological materials
Inorganic chemical plants	Chlorine
Hard rock ore mines	Potassium and sodium cyanide
Pesticide plants	Organophosphate pesticides
Petroleum storage tanks	Gasoline, diesel fuel, jet fuel, kerosene
Photographic supply distributors	Cyanides, heavy metals
Rail and trucking lines	Anhydrous ammonia; sulfuric phosphoric and hydrochloric acids, and flammable liquids
Chemical manufacturing plants	Chlorine. Peroxides, and other industrial gases
Power stations and transformers	Polychlorinated biphenyls (PCBs)
Large refrigeration units (grocery stores, dairy processing plants)	Anhydrous ammonia
Grain Storage	Explosive Hazard
Pools, and sewage and water treatment facilities	Chlorine

1

TIM is often available in enormous quantities, do not require extensive research, and can be mass-produced. TIM could be released from industrial plants or storage depots through accidental or deliberate damage as a consequence of a strike against a particular facility or as a desperation measure. TIM could also be attractive as improvised weapons and have the potential for inclusion in clandestine weapons programs or contingency plans.

b. TIM is almost universal in their distribution and are available in amounts that dwarf the amounts of CW agents ever produced. Industrial materials include chlorine, ammonia, solvents, and pesticides, fertilizers, and petrochemicals and are extensively used in the manufacture of plastics. TIM are used within industrial plants, sold and transported to other plants, and distributed through commercial and retail outlets. TIM can be found in almost every town, city, or country in the world, whether in a chemical industry, a warehouse, a rail yard, or an agricultural supply company.

c. The American Chemical Manufacturers Association (ACMA) estimates that over 25,000 commercial facilities worldwide produce, process, or stockpile chemicals that fall within the purview of the Chemical Weapons Convention. These include dual-use chemicals, which can be used both for legitimate industrial purposes and as CW agents. Each year, more than 70,000 different chemicals amounting to billions of tons of material are produced, processed, or consumed by the global chemical industry. Many of these chemicals may be sufficiently hazardous to be a threat, either by deliberate or accidental release. The release of large volumes of hazardous chemicals (HAZCHEMs) can produce environmental damage that could result in pollution of water supplies and long-term ecological damage.

d. Beyond their toxicity, TIM can have other significant hazards. Industrial chemicals are often corrosive and can damage the eyes, skin, respiratory tract, and equipment (especially electronic equipment). Many industrial materials are flammable, explosive, or react violently with air or water. These hazards can be greater than the immediate toxic effects from an industrial chemical release. Most industrial chemicals can have both short-term and long-term health effects, ranging from short-term transient effects to long-term disability, to rapid death.

5-2. Operational Planning for TIM Hazards

a. In concurrence with deliberate and crisis action planning, JFC's planners, geographic combatant commanders, command surgeon's HSS planners, and Preventive Medicine Personnel should develop an understanding of the potential hazard from TIM in the AO. Information required to support vulnerability analysis and assessment during the planning process (deliberate or crisis action) include some of the following key factors:

(1) Identifying all possible industrial plants, storage sites, and shipment depots.

(2) Identifying TIM routinely produced, used, or processed in the area. Knowledge of the manufacturing process used at an industrial plant is especially important as TIM is often used as intermediates in the productions of plastics, pesticides, and herbicides.

(3) Assessing the effects of the release of TIM either as a result of collateral damage or an accident.

(4) Assessing whether the deliberate release of a TIM is realistic in this particular situation. Factors that should be considered in this assessment are as follows:

- Favorable terrain and meteorological conditions.
- Political environment (serves as a bargaining chip).
- Military advantage or benefit to be gained.
- Psychological impact.

(5) Assessing the need for special detectors and modifications of detectors.

(6) Assessing potential information items for the commander. These items include the following:

(7) How does one determine if there is a potential threat?

(8) Is there a special way one needs to react to these chemicals that is different from the way he has been trained?

(9) Where is it safe to be?

(10) How much exposure is safe?

(11) What decontamination equipment can be used or is needed?

(12) What are the short-term and long-term health effects?

(13) What are the effects on noncombatants?

(14) What are the effects on military equipment?

5-3. Hazard Level Zones Determination

a. Plans supporting determination of hazards levels (hot, warm and cold zones) for each hazard site and immediate evacuation from the hazard's path are the best defense against the TIM hazard. As a minimum, commanders should consult with the engineer officer, NBC defense officer, legal officer, medical officer, intelligence officer, preventive medicine staff, meteorologists, fire and security personnel, emergency response hazardous materials incidents team, and public affairs officer (PAO) when planning hazard level zones. These staff officers can provide guidance for hazard isolation, entry denial, evacuation, and in-place protection.

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b. When evacuating the hazard area, individuals should wear clothing that prevents deposition of liquid on and minimizes injury to exposed skin. Do not permit evacuees to congregate at

established safe distances. Evacuation to established safe distance does not guarantee complete safety for evacuated personnel. When possible, move evacuated personnel to a designated location by a specific route, and to a distance where additional movement is not required following a radical wind shift. Refer to Concept of Shelter in Place, North American Guide-DOT Emergency Response Guidebook for Hazardous Material Spills, http://www.dot.gov/gydebook.htm.

5-4. Vulnerability Mitigation to TIM Hazards

a. Selected measures that support vulnerability mitigation include securing key information, assessing vulnerability, conducting detection, and taking protective measures.

(1) Securing Key Information. Each TIM incident has special problems and considerations. During planning, attempt to secure pertinent information involving production, storage facilities, distribution, and transportation of TIM. As a minimum, obtain the type, quantity, and specific risk from fire, explosion, toxicity, corrosive effects, and/or persistency. Sources for this information include appropriate scientific or civilian industrial personnel, CW treaty experts, safety reports, and materiel safety data sheets (MSDSs) on the facility, international code markings on storage tanks, and local civilian authorities that have emergency-response procedures and resources. Refer to AFMIC's intelligence and USACHPPM information as additional resources.

(2) A thorough vulnerability analysis provides an initial estimate of the threat and is the first step toward mitigating the operational effects of damage or destruction of a TIM facility. Determining the TIM hazard or threat and possible countermeasures in the area of operations is a primary responsibility of the medical and supporting Preventive Medicine personnel. They are supported by the NBC and civil-affairs staffs. Before entry into the area, area assessment teams provide information involving TIM hazard production, storage facilities, and suspected hazard areas.

NOTE: Military NBC protection, detection, and decontamination equipment was not designed for handling TIM

(3) In conducting detection, some plants, facilities, storage containers, or transport containers may be identified by markers. These could take the form of international HAZCHEM markers that are diamond shaped and contain information that can be used to identify the exact industrial chemical. When encountering a suspect industrial chemical, attempt to identify the exact TIM and all possible information on the materials. For proper handling, protection, and hazard-management information, responders seek guidance from their C^2 element. Other sources for assistance include the Chemical Transportation Emergency Center (CHEMTREC) hot line, for emergency assistance within the US/Canada: 1-800-424-9300 or outside CONUS: 1-202-483-7617 (toll free if necessary). Commanders also identify the local civilian authorities that may have additional emergency response procedures and resources, which can be used.

(4) Mission Oriented Protective Posture (MOPP) gear, NBC detection equipment, and NBC decontamination procedures are specifically designed for use and tested against chemical warfare agents. TIMs present unique hazards that may render NBC equipment and

procedures ineffective. Each TIM should be evaluated individually to establish protection and response procedures, and to select associated equipment requirements. The military protective mask may be used under emergency conditions to protect against the immediate toxic effects of some TIMs and while evacuating from the immediate hazard zone. However, the effectiveness of the protective mask in a TIM environment is substance-specific. Preventive medicine personnel should recommend acquisition and use of appropriate protective equipment such as self-contained breathing apparatus (SCBA), substance-specific cartridges or canisters, and change-out requirements tailored to the TIM threat at each location.

5-5. Precautions and decontamination in TIM Hazards

a. Personnel or equipment that may have been contaminated with TIM/ can be decontaminated by washing with large amounts of warm, soapy water. Contaminated clothing should be immediately removed and disposed of in a safe manner; however, when no release has occurred, establish a minimum hazard level zone based upon mission requirements, surveys, and assessments of the TIM facility.

b. If a TIM release occurs, evacuate beyond the hazard level zone established. Reduce safety exclusion areas only after a detailed survey and assessment of the extent of the probable hazard area. When friendly units are required to operate in an area where a potential TIM facility exists, planners should include the following actions:

(1) Coordinate with civil host nation emergency-response teams.

(2) Identify the probable TIM, extent of possible contamination, minimum protective equipment, and personnel safety considerations.

(3) Coordinate with higher headquarter (HQ) and the host nation to identify support availability.

(4) Develop an incident response plan. For detailed information and procedures for response plans, refer to service-specific publications that provide templates for plan development (i.e., Air Force Instruction [AFI] 32-4001, Air Force Manual [AFM] 32-4004, and AFM 32-4013). FM 3-11.21, MCRP 3-37.2C, NTTP 3-11.24, AFTTP(I) 3-2.37, NBC Aspects of Consequence Management, 12 December 2001.

(5) Implement the TIM reconnaissance plan and assign units to prepare and execute the recon missions.

(6) Use commercial detectors, which can provide confirmation of individual TIM.

(7) Coordinate with theater medical elements (e.g., preventive medicine teams) for follow-on industrial hygiene assessments, as dictated by mission requirements.

(8) Coordinate with decontamination elements for decontamination of contaminated personnel and equipment.

(9) Coordinate for delivery of collected samples to the to supporting laboratory.

(10) Avoid hazard areas as long as possible. When conducting reconnaissance or rescue operations near or within the hazard, equip ground survey teams with respiratory protection (i.e., SCBA) and skin protection certified for the TIM. Use aerial, visual reconnaissance to help collect information to support command and control staff.

5-6. TIM Information-Management Resources

a. The US Department Of Transportation (DOT) Emergency Response Guidebook lists hazardous materials (HAZMATs) commonly shipped in the US. This publication is a guide for first responders during the initial phase of a HAZMAT incident. It highlights especially hazardous materials and provides an index of protective actions to take and a table of initial isolation and protective-action distances.

b. The National Institute of Occupational, Safety and Health (NIOSH) Pocket Guide to Chemical Hazards provides reference information in a table format, which can be used for hazard assessment and management. The information includes chemical names, synonyms, trade names, exposure limits, physical and chemical properties, chemical incompatibilities and reactivities, personal protection measures, and health hazards.

c. Field Manual 8-500 Hazardous Materials Injuries is a first responder guidance to a TIM hazards. This manual details basic procedures to be accomplish with existing medical protocols.

Chapter 6

Casualty Prevention

6-1. General

a. Casualty prevention, a force-multiplying tool for commanders, is essential throughout the health life cycle of service members. Before deployment, good health requires control of environmental and occupational health threats to prevent casualties and help maintain a healthy and fit force. During deployment, the enemy and the total environment both generate threat to the forces. The enemy threat produces most combat-related casualties commonly called battle injuries (BI), while the total environment threat produces disease and non-battle injury (DNBI) casualties. Implementation of casualty prevention management will prevent casualties from environmental, occupational, operational, nuclear, biological, and chemical warfare threats.

b. Prevention of DNBI casualties require the full commitment of individual service member and unit commanders. HSS support for preventing DNBIs will include refined military medical health surveillance, collection and analysis, and objective exposure measurements to identify DNBI threats, determine effective methods of assessment, and develop countermeasures to meet actual and potential threats. DNBI reports can be used to identify potential BW attacks in conjunction with other data and reports.

c. Geographic dispersion of forces and improved personal protective and concealment systems will prevent injuries while maintaining the lethality of U.S. forces.

d. Prevention of NBC casualties requires full use of detection capabilities, timely reporting, and use of protective measures.

6-2. Performing Medical Surveillance and Occupational and Environmental Health Surveillance Activities

a. Medical surveillance and occupational and environmental health surveillance are the ongoing, systematic collection, analysis, and interpretation of data essential to the planning, implementation, and evaluation of military force health. The determination of unit-specific rates of illness and injuries (including related NBC/TIM casualties) of public health significance is the foundation of these programs. Surveillance is closely integrated with the timely dissemination of these data to those responsible for prevention and control of DNBI. Implementing guidance for DOD is found in DOD Instruction 6490.3. The establishment of uniform and standardized health surveillance and readiness procedures for all deployments is listed in Chairman of the Joint Chiefs of Staff (CJCS) Memorandum MCCM-251-98.

b. Surveillance forms a basis for medical resource allocations, refines knowledge of the medical threat, and permits continual assessment of the effectiveness of measures used to prevent and control DNBI. The surveillance teams gather and analyze this information and reports to

commanders, command surgeon medical planners, and other who require this information. This information and analysis provides decision support to commanders.

6-3. Medical Countermeasures For NBC Casualty Prevention

a. Combatant commanders must ensure preventive medicine supplies and equipment are provided and maintained to support implementation of their prevention responsibilities. Additionally, they should maximize the use of joint training to exploit existing tri-service preventive medicine expertise. Preventive medicine training should become an integral part of predeployment preparation.

b. Effective HSS includes a combination of preventive and curative measures. Commanders must ensure that all personnel are trained to survive and accomplish their missions in NBC environments. The HSS activities must optimize their ability to care for NBC casualties and conventional injuries. Commanders must ensure that personnel keep immunizations current, use available chemoprophylaxis, and pre-treatments against suspect agents, and apply contamination avoidance procedures.

c. Area of operations endemic disease and BW threats, based upon current medical intelligence, must be identified during predeployment period. It is important to monitor health of the force to gauge the predeployment health status of units and to identify preexisting (baseline) health characteristics of individual. Infectious diseases should be prioritized and monitored according to the threat each poses to the fighting force and the achievement of the force's mission. Countermeasures should be employed according to the established operational risk management process. Appropriate medical countermeasures must be implemented, particularly in the area of: food and water vulnerability, waste disposal, and personal protection measures (immunizations, chemoprophylaxis, and insect repellents.).

d. Preventive measures in HSS planning for NBC environments are:

(1) Development of the body's natural defenses through individual and unit health and fitness programs.

(2) Integration of military preventive medicine and civilian public health service (PHS) preventive capabilities to the extent feasible.

(3) Protection of medical supplies and equipment by using chemical agent-resistant coatings

(4) Frequent testing of all food and water sources and supplies for NBC contamination.

(5) Force protection measures extended to HSS organizations and facilities based on JFC priorities to ensure HSS availability in the event of adversary NBC attacks.

(6) Integration of HSS units and facilities into joint force plans and activities to limit NBC exposure and contamination following an NBC attack, through application of NBC defense principles.

e. During deployment, vigilant monitoring of DNBI rates (sick calls, outpatient treatment, and hospital admissions) in relation to the numbers of disease vectors and existing local pathogens is required for effective planning and refinement of appropriate countermeasures to infectious

disease. Information drawn from the historical data, type of deployment, duration of the deployment, and the level of support needed can be used to create a predictive DNBI model.

6-4. Sample Identification of NBC Contaminants

The sample identification of biological and chemical agents are contain in Appendix H of this publication. Refer to *Army FM 8-285, Navy NAVMED P-5041, Air Force AFJMAN 44-149, and Marine Corps MCRP 4-11.1A, Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries; and Army FM 8-284, Navy NAVMED P-5042, Air Force AFMAN (I) 44-156, Marine Corps FMFM 11-11, Treatment of Biological Warfare Agent Casualties, Army FM 4-02.283, Navy NTRP 4-02.21,Air Force AFMAN 44-161 (I), Marines Corps MCRP 4-11.1B, Treatment of Nuclear and Radiological Casualties, and Air Force Medical Service CONOPS for the Air Force Prevention and Aerospace Medicine (PAM) Teams,* for additional information.

6-5. Regulating Requirements for International Transport

All samples/specimens should be sealed in plastic bags, or other containers to prevent leakage during transport. The containers must contain sufficient absorbent material to absorb the entire contents in the event of a leak. This minimizes the risk of contamination to escort and laboratory personnel. The sample/specimens must be packaged in an International Air Transportation Association (IATA)-approved sample transport container for shipment/delivery to the CONUS laboratory. If an IATA sample transport container is not available, ice (wet or dry depending upon required temperature) may be used for initial packaging and transport in-theater. However, the ice must not be in direct contact with the samples/specimens; place the ice in plastic bags, or other such material, to cool the samples/specimens during transit. Conversely, the samples/specimens (or packing container) may need to be insulated to minimize temperature extremes during shipping. However, for transport out of theater, the samples/specimens must be packaged in an IATA-approved container.

Refer to Army FM 8-285, Navy NAVMED P-5041, Air Force AFJMAN 44-149, and Marine Corps FMFM 11-11, Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries; and Army FM 8-284, Navy NAVMED P-5042, Air Force AFMAN (I) 44-156, Marine Corps MCRP 4-11.1C, Treatment of Biological Warfare Agent Casualties; and Army FM 4-02.283, Navy NTRP 4-02.21, Air Force AFMAN 44-161 (I), Marine Corps MCRP 4-11.1B, Treatment of Nuclear and Radiological Casualties for additional information.

Chapter 7

Casualty Management

General: Future casualty management operational strategies include effective care and management by HSS organizations. Organizations should be prepared to treat large numbers of casualties in the event of NBC weapon use. Casualties may additionally include civilians, members of multinational forces, and enemy forces. Large numbers of individuals with psychological concerns should also be expected. Each element of the medical and evacuation treatment process must balance patient care issues with the goal of conserving and restoring the command's combat capabilities.

7-1. Nuclear

a. Types of injuries associated with nuclear warfare.

(1) *Flash Injury.* The intense light of a nuclear fireball can cause flash blindness. The duration of blindness depends upon the length of exposure and the light conditions. However, even at night it is unlikely that flash blindness will last more than a few minutes. Most individuals can continue their mission after the short recovery period. Severe cases may have retinal and optic nerve injuries that lead to permanent blindness; these cases will require evacuation to an MTF.

(2) *Blast Injury.* Blast injuries consist of two types--

- Primary injuries due to overpressures such as ruptured eardrums and lungs.
- Secondary injuries such as lacerations and puncture wounds, as well as translation injuries from the severe winds.

(3) *Thermal Injury.* Thermal injuries are generated by--

- Direct thermal radiation (flash burns and eye injuries).
- Indirect (flame) effects.

(4) *Radiation Injury.* Casualties produced by ionizing radiation alone or with other injuries will be common. Radiation complicates treatment by its synergistic action. The short duration of field medical treatment limits the ability to determine the patient's total radiation exposure. Additionally, total exposure may not be received at one time, but as the result of several operations in contaminated regions.

b. Management of Casualties Injured from Nuclear Weapons

(1) *Management.* Management of military casualties injured from the immediate effects of nuclear weapons (flash, blast, thermal) is the same as for conventional battlefield

injuries, although the injury severity may be increased. First aid (self-aid, buddy aid, and combat lifesaver [CLS]) for lacerations, broken bones, and burns are performed.

(2) *Mass Casualty.* A mass casualty situation will develop from a nuclear attack; that is, the number of patients requiring care exceeds the capabilities of treatment personnel and equipment. Thus, correct triage and evacuation procedures are essential. Triage classifications for nuclear casualties differ from conventional injured casualties. Nuclear casualty triage classifications are as follows:

- Immediate treatment group (T1). Those requiring immediate lifesaving surgery. Procedures should not be time-consuming and should concern only those with a high chance of survival, such as respiratory obstruction and accessible hemorrhage.

- Delayed treatment group (T2). Those needing surgery, but whose conditions permit delay without unduly endangering safety. Life-sustaining treatment such as intravenous fluids, antibiotics, splinting, catheterization, and relief of pain may be required in this group. Examples are fractured limbs, spinal injuries, and uncomplicated burns.

- Minimal treatment group (T3). Those with relatively minor injuries who can be helped by untrained personnel, or who can look after themselves, such as minor fractures or lacerations. Buddy care is particularly important in this situation.

- Expectant treatment group (T4). Those with serious or multiple injuries requiring intensive treatment, or with a poor chance of survival. These patients receive appropriate supportive treatment compatible with resources, which will include large doses of analgesics as applicable. Examples are severe head and spinal injuries, widespread burns, or high doses of radiation; this is a temporary category.

c. Handling and Managing Radioactively Contaminated Casualties.

(1) *Radiological Contaminated Casualties.* Military casualties from fallout areas may have fallout on their skin and clothing. Although the personnel will not be radioactive, he may suffer radiation injury from the contamination. Removal of the contamination should be accomplished as soon as possible; definitely before admission into a clean treatment area. The distinction must be made between radiations injured personnel and one who is radiological contaminated. Although military casualties may have received substantial radiation exposure, this exposure alone does not result in the individual being contaminated. Normally, contaminated casualties do not pose a short-term hazard to the medical staff; rather the contamination is a hazard to the person's health. However, without patient decontamination, medical personnel may receive sufficient exposure to create beta burns, especially with extended exposure.

(2) *Handling Radiological Contaminated Casualties.* To properly handle radiological contaminated military casualties, medical personnel must first detect the contamination. Two detectors, the AN/PDR27 and the AN/VDR2, are used to monitor casualties for contamination. Generally, a reading on the meter twice the current background reading indicates that the casualty is contaminated. Monitoring is conducted when potentially contaminated soldiers arrive at the MTF. This monitoring is conducted at the MTF's receiving

point before admitting the casualty. Contaminated casualties must be decontaminated before admission.

(3) *Decontamination.* Radioactive decontamination is easy. Removing all outer clothing and a brief washing or brushing of exposed skin will reduce 99 percent of contamination; vigorous bathing or showering is unnecessary. Do not let radiological contamination interfere with immediate lifesaving treatment or the best possible medical care. See Appendix E for details on patient decontamination.

(4) Treatment. Treatment procedures for radiation injuries are described in the *NATO Handbook "Emergency War Surgery" and Army FM 4-02.283, Navy NTRP 4-02.21, Air Force AFMAN 44-161 (I), Marine Corps MCRP 4-11.1B, Treatment of Nuclear and Radiological Casualties.*

7-2. Biological

a. The impact of biological warfare on HSS may be a few patients with diarrhea, or a mass casualty situation. The first indication of a BW attack or use will most likely be patients arriving at an MTF with an illness. The routes of entry for BW agents are the same as endemic diseases (that is, through inhalation, ingestion, or percutaneous inoculation). Biological agents are most likely to be delivered covertly and by aerosol. Other routes of entry are thought to be less important than inhalation, but are nonetheless potentially significant.

(1) Aerosol

- *Inhalation.* Inhalation of agent aerosols, with resultant deposition of infectious or toxic particles within alveoli, provides a direct pathway to the systemic circulation. The natural process of breathing causes a continuing flux of biological agent to exposed individuals. The major risk is pulmonary retention of inhaled particles. Droplets as large as 20 microns can infect the upper respiratory tract; however, natural anatomic and physiological processes generally filter these relatively large particles, and only much smaller particles (ranging from 0.5 to 5 microns) reach the alveoli efficiently.

- *Ingestion.* Food and water supplies may be contaminated during an aerosol BW attack. Unwary consumption of such contaminated materials could result in disease.

- *Percutaneous.* Intact skin provides an excellent barrier for most, but not all, biological agents. However, mucous membranes and damaged skin constitute breaches in this normal barrier through which agents may readily pass.

(2) *Contamination of Food and Water.* Direct contamination of food and water could be used as a means to disseminate infectious agents or toxins. This method of attack is most suitable for sabotage activities and might be used against limited targets such as water supplies or food supplies of a specific unit or base.

(3) *Other Considerations*

- *Arthropod-borne.* The spread of diseases by releasing infected arthropods such as mosquitoes, ticks, or fleas. These live vectors can be produced in large numbers and infected by allowing them to feed on infected animals, infected blood reservoirs, or artificially produced sources of a BW agent.

- *Long-term survival of infectious agents.* Preservation of toxins for extended periods and the protective influence of dust particles onto which microorganisms adsorb when spread by aerosols have been documented. Therefore, the potential exists for the delayed generation of secondary aerosols from contaminated surfaces. To a lesser extent, particles may adhere to an individual or to clothing, creating additional exposure hazards.

- *Person-to-person.* The spread of potential biological agents by person-to-person has been documented. Man, as an unaware and highly effective carrier of a communicable agent, could readily become a source of dissemination (for example, plague or smallpox).

b. Management of Biological Warfare Casualties

(1) *Management.* Management of Casualties suffering from the effects of BW agents may include the need for isolation. Casualties suspected of suffering from exposure to BW agents may require isolation or quarantine to reduce the possibility of spreading the disease to health care providers and other casualties. Specimens must be collected and submitted to the designated supporting laboratory for identification.

(2) *Mass Casualty.* A BW agent attack can produce a mass casualty situation at all levels of care. Therefore HSS planners must insure that mass casualty situations are included in medical plans.

(3) *Decontamination.* Biologically contaminated patients require decontamination before admission into a medical treatment facility. Contamination can be removed by use of soap and water, a diluted disinfectant solution, or a 0.5 percent hypochlorite solution. See Appendix E for details on patient decontamination.

(4) Treatment. Treatment is dependent upon the BW agent used. Patients are treated *as described in Army FM 8-284, Navy NTRP 4-02.23(NAVMED P-5042), Air Force AFMAN (I) 44-156, Marine Corps MCRP 4-11.1C, Treatment of Biological Warfare Agent Casualties for additional information.*

7-3. Chemical

a. Health service support operations in a CW environment will be complex. In addition to providing care in protected environments or while dressed in protective clothing, medical personnel will have to treat chemical injured and contaminated casualties in large numbers. Types of injuries associated with chemical warfare are--

(1) *Nerve Agent Injury.* Nerve agent injuries are classified as mild, moderate, and severe. Classification is based upon the signs and symptoms presented in the individual, The individual may only be having minor problems, or may be convulsing and exhibiting severe respiratory distress. Some individuals can return to duty after receiving a single injection of the

Mark I; others may require multiple doses of the Mark I, convulsion antidote for nerve agent (CANA), and assisted ventilation.

(2) *Blister Agent Injury.* Individuals exposed to blister agents may not know that they have been exposed to the agent for hours to days later. The first indication of exposure may be small blisters on the skin. Others will have immediate burning because of the high level of exposure. The individual with a few small blisters or reddening of the skin can continue the mission. An individual suffering mild injuries may require admission to a MTF for treatment, then returned to duty; whereas, the individual with severe injuries may have to be evacuated out of the theater.

(3) *Incapacitating Agent Injury.* Incapacitating agents produce injury by depressing the CNS, or stimulating the CNS. These agents affect the CNS by disrupting the high integrative functions of memory, problem solving, attention, and comprehension. Relatively high doses produce toxic delirium, which destroys the ability to perform any task.

(4) *Blood Agent Injury.* Blood agents produce their effects by interfering with oxygen use at the cellular level. The agent prevents the oxidative process within cells. In high concentrations there is an increase in the depth of respiration within a few seconds. The casualty cannot voluntarily hold his breath. Violent convulsions occur after 20 to 30 seconds with cessation of respiration within 1 minute. Cardiac failure follows within a few minutes. Inhalation is the usual route of entry.

(5) *Lung-Damaging Agent Injury.* Lung-damaging (choking) agents attack lung tissue, primarily causing pulmonary edema. The principle agents in this group are phosgene, diphosgene, chlorine, and chloropicrin.

b. Management of Chemical Agent Casualties

(1) *Management.* Movement of chemical agent casualties can spread the contamination to clean areas. All casualties are decontaminated as far forward as the situation permits. All patients must be decontaminated before they are admitted into a clean MTF. The admission of one contaminated patient into an MTF will contaminate the facility; thereby, reducing treatment capabilities in the facility.

(2) *Mass Casualty.* As with other NBC weapon/agent employment a mass casualty situation is presented when chemical agents are employed. Additional HSS personnel and equipment must be provided in a short period of time if the level of care is to be maintained. Treatment at far forward MTFs is limited to life- or limb-saving care. Casualties that can survive evacuation to the next echelon of care are not treated at the forward facility. This provides time for treating those patients that cannot survive the evacuation time.

(3) *Decontamination.* Decontamination of chemically contaminated patients requires the removal of their contaminated clothing and the use of a variety of decontamination kits and solutions. See Appendix E for details on patient decontamination.

(4) *Treatment. Army FM 8-285, Navy NAVMED P-5041, Air Force AFMAN 44-149, Marine Corps FMFM 11-11, Treatment of Chemical Agent Casualties and Conventional*

Military Chemical Injuries provides additional information on treatment procedures for chemical agent patients.

7-4. Management of NBC Casualties in an MTF

a. Many factors must be considered when planning for hospitalization on the integrated battlefield. To the maximum extend possible; MTFs are located away from tactical or logistical targets. The MTF staff must be able to defend against a Level 1 threat and survive NBC strikes while continuing their mission. Level 1 threat includes sabotage and associated threats by individuals or small groups (two or three) of infiltrators. This threat may include the introduction of chemical or biological agents to the MTF area, the water supply, or food supplies; the destruction of equipment and/or supplies; and gathering intelligence information. On the larger scale of surviving NBC strikes and continuing to support the mission, operating in a contaminated environment will present many problems for MTF personnel. The use of NBC weapons or systems will create large numbers of casualties in short periods; compromise both the quality and quantity of health care delivered by posing a serious contamination threat to medical personnel; constrain mobility and evacuation; and contaminate the logistical supply base. These factors have the potential of severely degrading health care delivery. In the delivery of MTF support, consider the following assumptions:

(1) Although health care facilities are not targeted, their location close to other combat support (CS) and combat service support assets make them vulnerable to NBC strikes for several reasons--

- The use of persistent chemical agents, high yield nuclear weapons, or biological agents in these areas is highly likely.
- Delivery systems for these weapons are characterized by poor accuracy and wide area coverage. Chemical and biological agents may present a hazard some distance downwind from the area of attack; also, residual radiation may extend for hundreds of kilometers from ground zero.
- MTFs located near road networks and airfields for access to evacuation increase their exposure to tactical strikes of NBC weapons.
- There are ever increasing numbers of countries and individuals with the ability to manufacture and delivery NBC weapons/agents. This activity increases their use potential at all levels of conflict.
- The increasing number of terrorist attacks against military installations, a medical facility may become a target of opportunity.

(2) NBC casualties may have signs and symptoms that are unfamiliar to Mtf personnel. These casualties may include--

- Heat stress casualties due to the use of MOPP Level 4 for extended periods.

- Psychological stress casualties due to isolation in MOPP and the impact of the NBC weapons. (Twenty-five percent of casualties may be in this category.)
- Chemical casualties.
- Chemical agent antidote overdose casualties.
- Biological casualties.
- Radiation casualties.
- Combined conventional and NBC injuries.
- Conventional casualties with no NBC injuries

(3) In addition to the wounding effects of NBC weapons on troops, their use will have other effects upon the delivery of casualty care.

- Treatment may have to be delayed due to the need for decontamination. Patients from forward areas should already be decontaminated; however, contaminated casualties may arrive from forward MTFs and units located within geographical area of the MTF and require decontamination
- The arrival of contaminated patients at the hospital will require hospital personnel to perform triage; administer emergency medical treatment (EMT) procedures in the patient decontamination area; supervise augmentation personnel performing patient decontamination; and constantly monitor the hospital for contamination. Medical treatment facility commanders must insure that they have enough personnel to man decontamination teams for each treatment facility, at each level of care, in accordance with their service guidelines. See Appendix E for patient decontamination procedures.
- Casualties may have been triaged at a lower level of care. However, due to contamination or the mass casualty situation, triage must be performed for all casualties as they arrive at the MTF. Triage ensures casualties receive life- or limb-saving care in a timely manner.
- Conditions may mandate the use of nonmedical vehicles to evacuate patients. The use of these vehicles may limit en route medical care and complicate patient unloading procedures, but may be the only way to clear the battlefield and ensure timely care of casualties at the MTF-.
- Mission-oriented protective posture reduces the efficiency of all personnel:
    - Fine motor skills--wearing gloves reduces the ability to grasp and manipulate small items.
    - Gross motor skills--MOPP impedes the ability to move about.
    - Visual skills--the mask reduces visual fields and acuity.
    - Auditory skills--the mask and hood greatly reduces vocalization and hearing abilities.

- Stamina--MOPP creates significant heat and mental stress. Heat injuries can occur in a very short period of time.

- At MOPP Level 3 or 4, all but the most basic patient care procedures have to be suspended.

NOTE: Medical units should insure that they have an ample supply of 7mm butyl rubber gloves available so that staff can continue to perform medical procedures that require the ability to palpate and finger dexterity for fine motor tasks.

(4) Without collective protective systems, MTFs may operate for a limited time in a nonpersistent agent environment, but are incapable of operating in a persistent agent environment.

- Chemical/biological filters will be a critical item of supply. Therefore health service logistics activities must insure that sufficient quantities of replacement filters are available or are on order to meet mission requirements.

- Liquid chemical agents can penetrate either the tent, expandable, modular, personnel (TEMPER) in about six hours, or the general purpose (GP) tentage in a shorter period of time. . These agents will penetrate the wrappings on medical supplies, sterilized equipment and supplies, and medications / solutions that are in the open air and come in contact with agent liquid, vapor, or contaminated dust. The vapor, liquid, and dust can also contaminate open water/food supplies. It is critical that these items be in a covered area or covered containers prior to an attack. They can also contaminate water/food supplies.

- Without a collective protective system, treatment procedures in an actively contaminated area involving an open wound or the respiratory tract in the presence of a chemical or biological agent hazard is limited. Exposing open wounds and the respiratory tract to the agent increases the effects of these agents on the patient.

- Without hardened protection, the hospital, staff, and casualties are susceptible to the blast, heat, and missiling effects of nuclear weapons.

- MTF biomedical equipment is vulnerable to the effects of the EMP produced by nuclear weapons. The EMP has no known harmful effects to humans, animals, or plants, but is very damaging to electronic equipment.

- It is very difficult to decontaminate most hospital equipment. Decontamination may only be possible by aging (allowing the agent to off-gas).

- MTFs are not kept in reserve. All personnel and equipment losses due to contamination or radiation will have to be replaced by out-of-theater resources.

b. Protection of Medical Treatment Facilities

(1) Protection of MTF assets requires intensive use of intelligence data and careful planning. The limited mobility of MTFs makes their site selection vital to minimize collateral damage from attacks on other units.

- MTFs must be located as close to the supported troops as possible to provide responsive care in support of the tactical commander's plan. However, their limited mobility and a lack of CPS systems must be considered when selecting their locations.

- Protective factors (distance from other CS/CSS units and interposed terrain features) must be balanced against the operational factors (accessibility and time required for patient transport).

- Regardless of the weapon systems used, relatively large portions of any tactical area will remain uncontaminated. MTFs should avoid movement through or operation in contaminated areas.

(2) Many defensive measures will either impede or preclude performance of the hospital mission. A successful MTF defense operation against an NBC threat is dependent upon accurate, timely receipt of information via the NBC report. This warning data will allow hospital units to operate longer without the limitations and problems associated with MOPP use, and then adopt a defensive posture when absolutely necessary. The detailed information on the areas affected and the types of agents used allows the MTF staff to--

- Project the number and types of patients to be expected.

- Establish a patient decontamination area.

- Request patient decontamination assistance.

(3) *Protective procedures*

(a) Because most MTF sections operate in sheltered areas (tentage or metal shelter), some protection is provided against vapor, liquid, and particulate (fallout) hazards. Locating equipment, such as trucks, under trees or other cover provides similar effects. Setting up MTFs in existing structures (concrete or steel buildings) will provide the maximum protection from hazards and eliminate many decontamination problems.

(b) Concealment and good operation security (OPSEC) will help prevent identification of a unit. Camouflaging the MTF may add to the NBC protection, but this effect must be weighed against the loss of Geneva Conventions protection.

(c) Dispersion is a defensive measure employed by tactical commanders; however, hospital operations limit the value of this technique. One technique that may be used is locating sections of the MTF, such as the motor pool, personnel billets, laundry, and logistical storage, further from the MTF complex than normal. This would increase dispersion without severely compromising the hospital mission.

(d) The MOPP does not protect against all effects of radiation from nuclear weapons. However, it provides some protection in preventing beta burns. By covering all body surfaces, especially hairy areas, MOPP greatly expedites the decontamination process.

(4) *Nuclear*

(a) Most protective measures against nuclear attack require engineer and/or intensive logistic support. This support includes placing sandbag walls around tents; digging trenches for patient occupation; or constructing earthen berms. Occupying existing structures, depending upon their strength and potential flammability, may be the best protection against the effects of a nuclear strike. The remainder of this section presents a variety of factors to be considered when selecting the protective posture for the MTF. Leaving equipment packed and loaded until actually needed for operations will help protect materiel in an NBC environment.

(b) Personnel and casualty protection requirements will depend upon the threat. Is it fallout or the direct effects of the detonation?

- If the threat is nuclear fallout, the hospital structure provides protection; the fallout can be brushed or washed off. This allows protection while permitting patient care to continue virtually uninterrupted. A need to relocate the MTF will depend upon the degree of contamination; the amount of decontamination possible; and the projected stay before a normal move in support of tactical operations.

- MTF tentage alone offers little protection against blast and missiling effects. If the casualties are to remain in the tents, they are placed on the floor. Place all equipment on the ground or as low as possible, and secure all loose objects. In GP tents, sandbags can be piled around the base of the tent poles to add stability. The tent poles and casualties beds should keep the canvas off the ground enough (if the tent collapses) to continue minimal casualty care and evacuation; however, be aware of possible tent pole breakage.

- MTF units are very susceptible to the thermal effect of a nuclear detonation. Tents will not provide protection against the thermal pulse. If the thermal effect (fires) is an impending threat, casualties and personnel in tentage must move to trenches or other nonflammable areas.

(5) Biological

The most likely use of a biological agent (such as anthrax) is spreading the agent by the airborne route. While such agents may produce large numbers of casualties, initially casualties will be seen at the MTF in small numbers. When a trend is identified, the use of a biological agent maybe suspected. General protective measures are the same as for any infectious disease; specific protective measures are used once the vector or method of transmission has been identified. Designating a single MTF to care for these patients (from a patient care or disease transmission standpoint) may not be necessary. However, if there are a limited number of cases, consolidating them all at one facility maximizes the use of limited diagnostic laboratory and personnel assets. Biological attack protective measures are the same as those for chemical agents when bombs, sprays, or gases are used. The difficulty in rapidly identifying biological agents may force the use of higher levels of MOPP for longer periods of time. Faced with this situation, a careful evaluation of the mask-only posture is necessary before implementing any level of MOPP.

(6) *Chemical*

- *(a) Individual protection.* When CPS systems are not available, using the correct MOPP level is essential in hospital mission performance. The level of MOPP assumed depends upon the level of threat

- An alternative approach for the hospital commander is the use of the mask-only posture. This posture is acceptable when the hazard is from vapor only (except mustard). Casualties and personnel in tents and expandable shelters are protected from solid or liquid contamination (transfer hazards for a limited time). Personnel can work much more efficiently and for longer periods with mask-only posture instead of MOPP Level 3 or 4. However, the commander must weigh these factors against the potential contamination transfer risk. This risk should be small, except in areas where patients or materiel are received from the outside. Individuals returning to, or bringing materiel from the outside must be extremely careful not to bring contamination into the mask-only area. When considering this alternative, remember that, except those casualties in casualty protective wrap (PPW), the casualties must also be at mask-only posture.

- Medical facilities must insure that they have an adequate supply of new replacement filters on hand for patients as well as staff. Casualties who have gone through decontamination will need to have their filters replaced immediately after decontamination. Decontamination team members will need to have their filters replaced frequently if they come in contact with large amounts of contamination.

- The MTF must have a warning system that alerts all personnel of impending or present hazards. This system must include visual and auditory signals; the signals must operate inside and outside the MTF complex. There are numerous problems associated with warning personnel; they include--

  - The wide area covered by the MTF operations.
  - Some personnel will be asleep at all times of the day or night.
  - The considerable noise from the power generation and environmental control equipment.
  - Tentage and equipment, which interrupts the line of sight.

- When the NBC alarm is activated, all personnel (including off duty personnel) report to their duty stations as soon as they are in MOPP. This allows for 100 percent personnel accounting and provides additional personnel to secure patients and materiel.

- With all openings secured and the ventilation system turned off, the non-chemically protected hospital is at its best posture. For nonpersistent agents (vapor hazards), personnel and casualties stay at the designated MOPP level until the all clear signal is given; then normal operations are resumed.

NOTE

Casualties with injuries that prevent them from assuming a protective posture should be evacuated immediately to a clean treatment facility.

(b) Environmental protection. As noted previously, hospital complexes offer some protection against liquid or fallout contamination, but little against vapor hazards.

- When MOPP Level 1 posture must be assumed, close and secure all tent flaps, vents, and doors to prevent, the entrance of liquids or particles. All hospital personnel outside of shelters assume command directed MOPP Level. Cover or move all equipment and supplies into shelters (tents and trees), if possible. The best policy is to keep all equipment and supplies not immediately needed covered or in closed containers.

- When MOPP Level 3 or mask-only posture is assumed, shut down the hospitals ventilation system if in a non-chemically protected facility to prevent drawing vapors or fallout contamination into the hospital. This measure also provides some protection of the internal environment during the time required for the vapor to penetrate the tentage. For chemically protected facilities keep the ventilation on to maintain positive airflow.

(c) Patient protection

- Casualty protection depends upon prior planning and timely warning of the chemical threat. Each casualty's protective mask must be available and serviceable. If the patient came from a contaminated area, the mask must be decontaminated and the filters changed. The mask decontamination and filter change may have to be performed by MTF personnel. If ambulatory casualties' medical conditions permit, they may be able to perform this task. Check all masks for serviceability as soon as the mission permits, but always before they are needed. Do not wait until the warning has been received to begin checking the mask. Each area must have an established plan for operations (to include assisting patients assuming MOPP or other protective posture) in the NBC environment.

- MTF staff always masks themselves first, and then assist casualties in masking. On convalescent and minimal care wards, most casualties can put on their masks. For those who cannot, other casualties can assist them after putting on their own masks. On the intermediate care wards, some casualties will be able to put on their masks, but many will require assistance. Casualties should assist each other put on their mask; especially on the minimal care wards. Intensive care and emergency room staff will have to assist their casualties in masking.

- Many casualties with head and neck wounds, or who are on life-support devices will be unable to wear their individual protective masks; these casualties must be placed in PPW. While the PPWs have two ports for intravenous or blood infusion lines, the staff may have to adapt for other devices (Foley catheters, traction, and cardiac monitor) by using tape and other means to seal the gaps created in the seal around the edge of the PPW. Casualties requiring assisted ventilation are at extreme risk, unless their air supply is protected. The sequence of

protecting everyone is mask yourself first; assist those casualties who can wear their protective masks; and then place patients in the PPW.

CAUTION

Remember, personnel must be protected from exposure to the chemical agent on the mask; they assume MOPP Level 4 before beginning any decontamination process.

(d) Materiel protection. Protection of materiel, especially expendable supplies, requires covers and barriers. All materiel not required for immediate use is kept in shipping containers, medical chests, or under cover (tentage, plastic sheeting, and tarpaulin) for protection against particulate or liquid hazard. Protection against vapor hazard may require multiple barriers through which the vapor must penetrate. For example, intravenous solutions are in their individual plastic bags, in the cardboard shipping box, on a covered pallet, in a military-owned demountable container (MILVAN). This presents four barriers against the vapor hazard. These principles should be used to the maximum extent practical.

7-5. Medical Treatment Facility Contamination Control

a. The medical facility must designate a hot line that delineates the area of possible liquid contamination (hot zone) and the warm zone, and the cold zone. Contaminated casualties are evacuated across the hotline to the warm for triage and decontamination. After decontamination the casualties cross or are moved across the hotline to the cold zone for continued care and evacuation. The hot line (away from the medical treatment facility) is considered contaminated by liquid agent. The casualty decontamination site is located in this area. The area on the other side of the hot line, near the medical facility is considered the clean area and should be free from liquid contamination. No individual is to cross the hot line until they are decontaminated.

b. This line must be manned by personnel who can serve as security to insure that contaminated individuals do not enter the clean treatment facility or clean treatment area.

c. Engineering controls, such as concertina wire or other sturdy fence material, should be used when available to restrict travel across the hot line, to the clean area, except through guarded entry control points.

d. At these entry control points casualties are checked for contamination using the ICAM, M8 paper, or other detection devices.

7-6. Emergency Services

a. Providing emergency services will be complicated by several factors:

(1) Varying levels of treatment received prior to arrival at the MTF.

(2) Combined conventional wounds and NBC agent effects.

(3) Heat-related complications associated with MOPP use.

(4) Increased numbers of psychological casualties who must be triaged quickly to allow for treatment of those who need emergency management

(5) The need to have EMT personnel at the arrival point for triage, for emergency treatment in the dirty area, for care at the decontamination area, for triage and care at the hot line (line that delineates liquid contamination), and for care at the medical treatment facility in the clean area.

(6) The potential of having to triage and provide casualty care while in MOPP gear.

(7) Reduced ability for EMT personnel to communicate between the various phases of the decontamination / treatment process.

(8) The need to provide supervision/guidance to the decontamination augmentation personnel from the supported units. These personnel may not have any medical training.

b. Contaminated casualties must be triaged in the decontamination area that is established at the MTF. Contaminated casualties **will not** be brought into the clean EMT area until decontaminated. All casualties are screened for contamination. Based on the findings, the casualty is routed to the contaminated triage station, or to the clean triage station. Contaminated casualties are triaged, then routed to the decontamination area, or to the contaminated treatment area. Casualty admission to the clean treatment area may be delayed; however, life- or limb-saving care is provided in the contaminated treatment area before decontamination.

7-7. General Medical Services

a. The provision of general medical services in the hospital will be continued with minimal interruptions in the NBC environment. The noninvasive nature of these services allows their continuation at most MOPP levels.

b. General medical services will be constrained by MOPP Levels 3 and 4 and the mask-only posture. Most of these constraints will be--

(1) Communication limitations.

(2) Loss of the oral route for administering medications to casualties.

(3) Limited ability to accurately evaluate the eyes, nose, and mouth of patients wearing a protective mask.

(4) Reduced ability to perform examination/assessment of casualties in PPW or MOPP Levels 3 and 4.

(5) Inability to provide oxygen therapy or ventilator support to a casualty in a vapor hazard environment, unless a CB filter mask is available.

(6) Logistical constraints based upon the fact that key areas such as dietetics, supply, and laundry are not in CPS. These three services may be reduced or delayed in the NBC environment.

7-8. Surgical Services

a. Surgical services will be severely limited in the NBC environment outside of a collective protective shelter. At any level above MOPP 0 surgical services are halted if performed in an unprotected, contaminated, area except for life and limb expedient procedures. These emergency procedures may be performed with limited contamination risk to the casualty if performed in a relatively contamination free area, such as the emergency treatment area that has not been contaminated by an NBC attack, where MOPP gear is worn by staff only as a precautionary measure. Surgery cannot be safely performed outside a CPS in a contaminated area due to a variety of factors including--

(1) Lack of protected ventilation for patients during and after surgery.

(2) Inability to maintain a sterile field while using MOPP gear.

(3) Direct access for agent through open wounds to the circulatory and respiratory systems.

(4) Decreased dexterity and vision resulting from MOPP gear use.

(5) Inability to quickly place the patient in a PPW should the need arise.

b. Due to the relatively high number of trauma cases, hospital services may be severely constrained by NBC contamination. The MTF location and the possible need for hasty relocation are two major planning considerations for the command staff.

c. Patient accounting and medical regulating are critical factors in the transfer of casualties from a MTF without CPS that must move out of an NBC environment. MTFs without CPS stop receiving casualties when a persistent hazard is identified; casualties on hand are transferred to a clean MTF.

7-9. Nursing Services

a. Providing nursing care in a contaminated medical treatment area without collective protective sheltering is influenced by the amount of protective gear worn by the nursing staff and the casualties. The casualties may be in their MOPP gear, in a PPW, or wearing only their protective mask; any of which will interfere with care. Nursing personnel may be at any MOPP level, or in protective mask only.

b. Direct assessment of a casualty's vital signs is extremely limited at MOPP Level 3 or 4; however, a carotid artery pulse can be taken by palpating the neck area. The patient's respiratory rate and level of consciousness may be assessed visually. Palpitation of the blood pressure through a PPW may be possible if it is relatively strong, or at least in the normal range. The casualty's temperature cannot be monitored; this is an area of concern due to the possibility of heat stress.

c. Only gross neurological signs can be assessed through the PPW. However, even this assessment is complicated by the presence of miosis and by the health care providers mask. Cardiac and urinary output monitoring is continued uninterrupted for casualties wearing a mask only, and for casualties in the PPW.

d. Oral hygiene and bathing are postponed until a safe environment is available (MOPP Level 2 or less). All toileting will occur within the MTF complex using bedpans, urinals, a bucket, a container with a plastic liner, or a chemical toilet.

e. At MOPP Level 3 or 4, feeding must be postponed. A nutritional assessment is needed to determine how long each casualty can tolerate a fasting state when the MOPP Level 3 or 4 remains for over 24 hours.

f. Intravenous (IV) medications are mixed in a CPS area, or in a clean area and then transported in a protective wrap (multilayers of plastic, medical chest, or layered cardboard) to the user. However, IV solutions, blood, and injections can be given to casualties on an unprotected ward. Normally, oral medications are only given at MOPP Level 2 or lower.

g. Treatment procedures that have the potential of contaminating the casualty's pulmonary or circulatory systems are conducted only at MOPP Level 2 or below. However, EMT procedures may have to be performed in the contaminated treatment area, or the casualty decontamination area.

h. Continuous oxygen therapy requires a collective protection environment or a CB filter supported respirator.

i. Delivery of nursing care at MOPP Level 3 or 4 is limited due to the sensory restrictions of MOPP gear. Time is taken to reassure the patients on a personal basis, as much as possible, and by routinely monitoring the ward environment. Communications are difficult and identities are masked. Use of handwritten nametags for staff and casualties (including casualties in PPW) to ensure that the identity of all personnel is maintained.

j. As with all procedures, the time required for record keeping rises markedly at MOPP Level 3 or 4. Contaminated paperwork cannot be evacuated with the casualty. Transcribe essential information onto uncontaminated documents for evacuation with the patient. A record of patient exposure time to a contaminated area is prepared to assess the cumulative risk to the casualty.

Chapter 8

Casualty Movement

8-1. Coordination of Casualty Movement in a NBC Environment

a. The health service support (HSS) casualty movement mission in joint operations is designed to minimize the effects of wounds, injuries, and disease by the rapid evacuation of ill and injured personnel through the area and/or theater of operations. This mission is accomplished by a proactive casualty movement program and a phased health care system that extends from actions taken at the point of wounding, injury, or illness through evacuation from a theater for treatment at a MTF in the Continental United States (CONUS). Saving life and limb and quickly evacuating casualties is one measure of this system effectiveness. The use of NBC weapons in a battle and the release of TIM in an incident will challenge medical personnel to provide the same level of HSS support as required in a conventional battle. **. In the event of the use of biological agents JFC planners and commanders must insure that every effort is made to contain the disease in the conflict theater. Careful contingency planning must be conducted prior to the theater operation that provides workable guidelines for the disposition of casualties, the ill, and troops rotating out of theater. Every effort must be made to insure that the disease is not spread beyond the theater of operations. This must include close coordination with commanders of all multinational forces in the theater to insure containment of the disease.**

8-2. Casualty Evacuation in a Nuclear, Biological, and Chemical Environment

a. An NBC environment forces the unit commander to consider to what extent he will commit evacuation assets to the contaminated area. Generally, if most or all of a supported force is operating in a contaminated area, most or all of the medical-evacuation assets will operate there. However, efforts should be made to keep some ambulances free of contamination.

b. On the modern battle space three basic modes of evacuating casualties exist (personnel, ground vehicles, and aircraft). Using personnel to physically carry the casualties involves a great deal of inherent stress. Cumbersome MOPP gear, added to climate, increased workloads, and the fatigue of battle, will greatly reduce personnel effectiveness. If evacuation personnel are to be sent into a radiological contaminated area, an operational exposure guide (OEG) must be established. Radiation exposure records must be maintained by the command designated personnel and made available to the commander, staff, and medical leader. Based on the OEG, or similar reports, the commander or medical leader will decide which evacuation elements to send into the contaminated area. Again, every effort is made to limit the number of evacuation assets that are contaminated. Evacuation considerations should include the following:

(1) A number of ambulances will become contaminated in the course of battle. Optimize the use of resources; use those already contaminated (medical or nonmedical) before employing uncontaminated resources.

(2) Once a vehicle or aircraft has entered a contaminated area, it is highly unlikely that it can be spared long enough to undergo a complete decontamination. This will depend upon the contaminant, the tempo of the battle, and the resources available to the evacuation unit. Normally, contaminated vehicles (air and ground) will be confined to dirty environments.

(3) Use ground ambulances instead of air ambulances in contaminated areas; they are more plentiful, are easier to decontaminate, and are easier to replace. However, this does not preclude the use of aircraft.

(4) The relative positions of the contaminated area, as it relates to the operational area, such as forward line of own troops (FLOT), and threat air defense systems will determine where helicopters may be used in the evacuation process. One or more helicopters may be restricted to contaminated areas; use ground vehicles to cross the line separating clean and contaminated areas. The ground ambulance proceeds to an MTF with a patient decontamination station; the patient is decontaminated and treated. If further evacuation is required, a clean ground or air ambulance is used. The routes used by ground vehicles to cross between contaminated and clean areas are considered dirty routes and should not be crossed by clean vehicles. Consider the effects of wind and time upon the contaminants; some agents will remain for extended periods of time.

(5) **Always** consider the rotorwash of helicopters when evacuating patients, especially in a contaminated environment. The intense winds will disturb the contaminants and further aggravate the condition. The aircraft must be allowed to land and reduce to flat pitch before patients are brought near. This will reduce the effects of the rotorwash. Additionally, a helicopter must not land too close to a decontamination station (especially upwind) because any trace of contaminants in the rotorwash will compromise the decontamination procedure.

NOTE: Aircrews, landing zone personnel, deck hands, and supporting personnel must be at at the command directed MOPP level when operating in or through potentially contaminated areas.

c. Helicopter aircrew members must wear protective masks and MOPP gear when flying in contaminated areas, especially during the landing, to preclude inhalation of contaminated dust. Off gassing of chemical agents from contaminated casualties clothing will be less of a problem for aircrews once the craft is airborne if the door are left open to insure adequate ventilation. Low flying helicopters may fly through chemical / biological clouds, so patients and crew should be in full protective gear when flying at low altitudes. Crews should be cautious of liquid chemical residue on the aircraft when transporting chemical casualties and should wear protective ensemble, to include MOPP rubber gloves, to protect against liquid contamination.

d. Immediate decontamination of aircraft and ground vehicles is accomplished to minimize crew exposure. Units include deliberate decontamination procedures in their standing operating procedures (SOP).

e. Coordination of casualty evacuation must continue, even in an NBC environment. The medical leader must recognize the constraints NBC places on operations; then plan and train to overcome these deficiencies.

NOTE

The key to mission success is detailed preplanning. A health service support plan (HSS PLAN) must be prepared for each support mission. Ensure that the HSS PLAN is in concert with the tactical plan. Use the plan as a starting point and improve on it while providing HSS.

f. Commanders operating in NBC threat environment must consider the commitment of evacuation assets to contaminated areas. In planning for evacuation, the JFC considers the nature of the actual contamination hazard. Radiological contamination and radioactive fallout impose different operating conditions than persistent or nonpersistent chemical agents or lethal or nonlethal biological agents or toxic industrial materials. We have three basic modes of evacuating casualties (personnel [litter bearers], ground vehicles, and aircraft).

g. To minimize the spread of contamination inside the rotor winged aircraft and waterborne landing craft, plastic sheeting should be placed under the litter to catch any contaminant that drips off the patient or litter. The plastic sheeting can be removed with the patient, removing any contamination with it. When plastic sheeting is not available, placing a blanket under the litter will reduce the amount of agent that makes contact with the inside of the aircraft.

h . Medical evacuation by United States Air Force (USAF) aircraft will be severely limited until runway repairs and decontamination has occurred. Aerial flights from contaminated areas into uncontaminated airspace and destinations may be impossible for extended periods of time; some nations will not allow casualties from contaminated areas to travel through or over their country. Therefore, casualty holding on-site (or in theater) for an extended period of time must be anticipated.

i. Every effort should be made to decontaminate the casualty at a MTF prior to the patient reaching an aeromedical staging area or naval patient evacuation staging area.

j. Casualty protection during evacuation must be maintained. Casualties that have been decontaminated at the PDS at an MTF will have had their MOPP ensemble removed. The forward deployed MTFs will not have replacement MOPP ensembles for the casualties. These casualties must be placed in a casualty protective wrap (PPW) or other NBC protective garment before they are removed from the clean treatment area for evacuation (see the PPW instruction sheet/PPW label for use of the PPW). The PPW provides the same level of protection as the MOPP ensemble. The casualty does not have to wear a protective mask when inside the PPW. The casualty is placed inside the PPW that is on a litter. The PPW may also have a battery-operated blower that can provide a reduction of the body heat load and reduce the carbon dioxide level within the PPW. The PPW will provide protection for the casualty for up to 6 hours and is a one-time use item. The blower is reusable, remove it and the attachment devices from the used PPW and return it to the patient movement items inventory.

WARNING

DO NOT place contaminated casualties in the PPW.
It is for use with uncontaminated/decontaminated casualties only.
The placement of a contaminated patient in a PPW increases the effect of the agent. The purpose of the PPW is to provide protection for the casualty from contamination, not to prevent the spread of contamination.

8-3. Casualty Movement in Joint Operations

a. The five level of care by which HSS is organized are:

(1) **Level I.** Level I care consists of care rendered at the unit level. It includes self-aid, buddy aid, and combat lifesaver skills, examination, and emergency lifesaving measures such as the maintenance of the airway, control of bleeding, prevention and control of shock, splinting or immobilizing fractures, and the prevention of further injury. Treatment may include restoration of the airway by invasive procedures; use of IV fluids and antibiotics; and the application of splints and bandages. These elements of medical management prepare patients for return to duty (RTD) or for transportation to a higher level of care. Supporting medical units are responsible for coordinating the movement of patients from supported medical facilities.

(2) **Level II.** Level II care includes physician-directed resuscitation and stabilization and may include advanced trauma management, emergency medical procedures, and forward resuscitative surgery. Supporting capabilities include basic laboratory, limited x-ray, pharmacy, and temporary holding facilities. Patients are treated and RTD, or are stabilized for movement to a MTF capable of providing a higher level of care. Surface or air movement is coordinated for transfer to a facility possessing the required treatment capabilities. Level II is the first level where Group O liquid packed red blood cells will be available for transfusion.

(3) **Level III.** Care is administered that requires clinical capabilities normally found in a facility that is typically located in a reduced –level enemy threat- environment. The facility is staffed and equipped to provide resuscitation, initial wound surgery, and postoperative treatment. This level of care may be the first step to restoration of functional health, as compare to procedures that stabilize a condition to prolong life. Blood products available may include fresh frozen plasma, Group A, b, and O liquid cells and may include frozen Group O red cells and platelets.

(4) **Level IV.** In addition to providing surgical capabilities found at Level III, this level also provides rehabilitation and recovery therapy for those who can RTD within the theater patient movement policy. This level of care can be only available in mature theaters.

(5) **Level V.** Level V definitive care includes the full range of acute convalescent, restorative, and rehabilitation care and is normally provided in CONUS by military and the Department of Veterans Affairs hospitals, or civilians hospitals that have committed beds for casualty treatment as part of the National Defense Medical System. On occasion, OCONUS military or allied and /or host nation hospitals in Commander of Combatant Command-approved safe havens may also be used. This level may include a period of minimal care and increasing physical activity necessary to restore patients to functional health and allow them to RTD or to a useful and productive life.

In Figure 8-1 the Level of Care and Patient Evacuation Flow for each Service is illustrated.

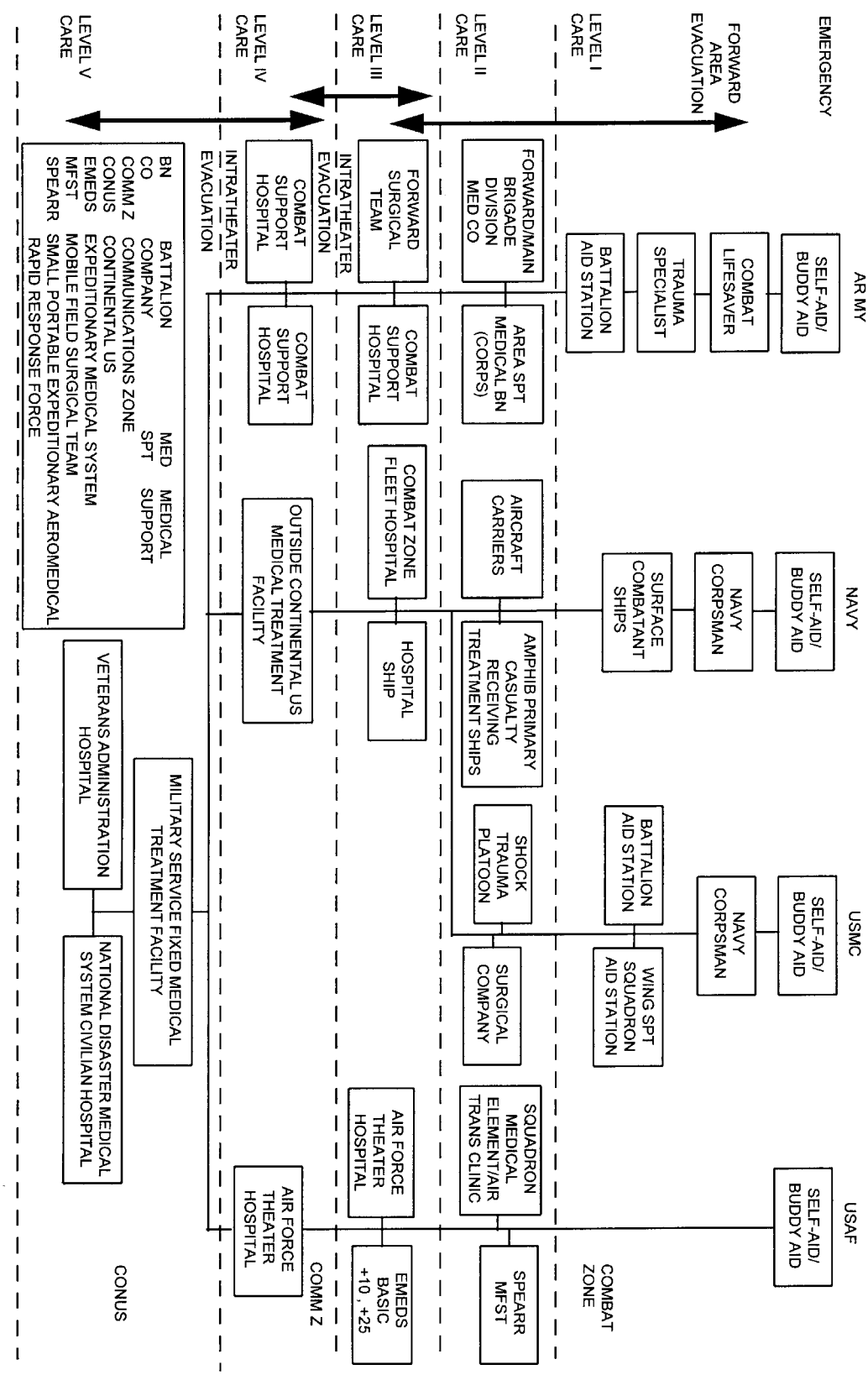


Figure 8-1. Levels of Care-Patient Evacuation Flow For All Services

b. Casualty movement in combat areas is normally a Service responsibility using organic assets (personnel, ground vehicles, watercraft, and aircraft). The combatant commander, with the advice from the command surgeon, is responsible for moving patients within the theater and deciding the extent to which evacuation assets will be committed to contaminated areas. The USTRANSCOM establishes, operates, trains, and maintains a common-user aeromedical evacuation (AE) system for intratheater and intertheater patient movement.

(1) Casualty evacuation may be conducted in conjunction with combat operations, troop movements, or logistics movements within an AO. The JFCs should integrate and coordinate the use of evacuation resources towards the common propose of reducing mortality while maintaining medical treatment, in support of the theater, and subordinate joint force objectives. Thus, it is critical that each Service component properly plan to operate its portion of the overall patient movement system.

(2) Casualties contaminated with nuclear, biological, or chemical agents will normally be decontaminated prior to evacuation. Decontamination and processing procedures must be in place to prevent spreading of nuclear, biological and chemical agents and ensuring the appropriate protection for casualties, crew and aircraft. If an aircraft becomes contaminated as a result of transporting contaminated casualties that aircraft would have to divert to a remote site for decontamination. This will placed the aircraft out of service for an extended period of time. Therefore, contaminated personnel will not be allowed on aeromedical evacuation aircraft unless directed by Theater or Combatant Commander or Commander, USTRANSCOM.

If the decision is made to move NBC contaminated casualties using AE resources; Aircrews should maintain a high degree of situational awareness and training to ensure they are properly prepared to move casualties in these situations. AE medical and flight staff will need to be in protective posture. When in protective gear, AE crews are severely limited in their ability to assess the patient and problems can exist in trying to palpate, ausculate, or visually examine the patient

- Casualties exposed to chemical warfare agents or TIM agents must be decontaminated prior to AE. Once casualties are externally decontaminated, further AE decisions are based on actual suspected clinical diagnosis and patient condition (s). Commanders, AE elements and medical personnel should apply specific contamination control measures.

- Normally, biological warfare casualties may be evacuated using standard precautions. However, casualties suspected of having highly contagious diseases (e.g., smallpox, pneumonic plague, and viral hemorrhagic fever) will not be placed on U S Air Force aircraft unless placed in high-level containment. Ideally the USAMRIID US Army Aeromedical Isolation Team should transport these individuals under high-level containment. This team does not have the resources for mass casualty transport. If the theater situation dictates a mass casualty evacuation with individuals who have infectious diseases, then approval must be obtained from the Theater or Combatant and US Transportation Command Commanders. Evacuating contaminated patients and or potentially contaminated patients requires approval of the

destination country, overflight privileges, and approval of any country where the aircraft will land for servicing or where casualties will remain overnight. Close coordination between the supporting and supported commanders of combatant commands and the Department of State is required for such movement.

- A nuclear incident also has the potential to instantaneously produce a very large number of casualties, severely impacting the entire medical treatment and evacuation systems. The resulting casualties can be at extremely high risk and frequently may require ventilator support.

8-4. Medical Regulating/Patient Tracking

a. Medical regulating entails identifying the casualties awaiting evacuation, locating the available beds, and coordinating the transportation means for movement. Careful control of casualty evacuation to the appropriate MTF is necessary to:

(1) Effect an even distribution of cases.
(2) Ensure adequate beds are available for current and anticipated needs.
(3) Route patients requiring specialized treatment to the appropriate MTF.

b. Medical regulating is based on patient precedence and MTF specialties.

c. Patient in-transit visibility (ITV) is the process of locating and/or tracking patients through the continuum of medical care and while in the AE system. Service and cultural expectations require that a patient's location be known at all times. Information supporting patient ITV should be reported by any medical facility, staging facility, transport agency, or other agency, through their appropriate C2, to the patient movement requirements center (PMRC) for consolidation. The primary focal point for maintenance of ITV is the PMRC.

8-5. Theater Evacuation Policy

a. The Secretary of Defense establishes the theater evacuation policy with the advice of the Joint Chiefs of Staff and upon the recommendation of the theater commander. The policy establishes, in the number of days, the maximum period of noneffectiveness (hospitalization and convalescence) that patients may be held within the theater of operation (TO) for treatment. This policy does not mean that a casualty is held in the TO for the entire period of noneffectiveness. A casualty who is not expected to be ready to RTD within the number of days established in the theater evacuation policy is evacuated to the CONUS or some other safe haven. This can be done provided that the treating physician determines that such evacuation will not aggravate the casualty's disabilities or medical condition.

b. If an unplanned increase in patients occurs (due to an epidemic or increase combat casualty), a temporary reduction in the policy may be necessary. This reduction is used to adjust the volume of patients to be held in the TO MTF system. A reduction in the evacuation policy increases the number of casualties requiring out-of-theater evacuation, and it increases the

requirement for evacuation assets. This action is necessary to relieve the congestion caused by the casualty increases. A decrease in the theater evacuation policy decreases the hospitalization requirements.

c. The time period established in the theater evacuation policy starts on the date the casualty is admitted to the MTF (combat zone or communication zone). The total time a casualty is hospitalized in TO (including transit time between MTFs) for a single, uninterrupted episode of illness or injury should not exceed the number of days stated in the theater evacuation policy. The actual selection of a casualty for evacuation is based on clinical judgment as to the casualty's ability to tolerate and survive the movement to the next level of medical treatment.

8-6. Joint Patient Movement Operation

a. Patient movement is a system that involves the coordinated use of intratheater and intertheater evacuation assets in support of patient regulating decisions made by medical personnel. It is designed to coordinate the movements of patients from site of injury or onset of disease, through successive level of medical care, to a MTF that can meet the needs of the patient.

b. Global Patient Movement Requirements Center (GPMRC) is a joint activity reporting to Commander USTRANSCOM, Department of Defense's single manager for the strategic and CONUS regulation and movement of uniformed Services patients, including clinical validation, limited patient intransit visibility and evacuation requirements planning for intertheater AE, and intratheater AE for CONUS. The GPMRC communications intertheater and CONUS patient movement requirements to Service components, execute the AE mission. The GPMRC, through the Tanker Airlift Control Center, coordinate execution of intertheater AE mission and also carries out coordination with theater patient movement requirement centers (TPMRC) to integrate and resolve difficulties with TPMRC plans and schedules.

c. The TPMRC is an organization that is a functional merger of some of the functions of two existing organizations: Joint Medical Regulating Office (JMRO) and the AE Coordinating Center (AECC). The TPMRC provides medical regulating services, including clinical validation, limited patient ITV and patient movement planning within theater. The TPMRC communicates patient movement requirements with the AECC and to the Service components that are responsible for executing the mission. TPMRCs generate operational AE plans for the theater and coordinate patient regulating and movement with supporting activities, AE elements, and MTF activities to ensure seamless patient movement and ITV. The TPMRC sends requests for CONUS patient evacuation to the GPMRC.

8-7. Contingency AE Structure. (See Figure 8-2.) Deployed expeditionary aerospace forces are organized to ensure unity of command. AE forces deployed will be organized within the constructs of the Aerospace Expeditionary Task Force (AETF) and will be tailored based on the size and scope of the operation. C2 of theater AE forces in contingency operations will be defined in the warning/execution/operations order (OPORD). AE assets will be under the operational control (OPCON) of the Joint Force Commander (JFC), through the Commander, Air Force Forces (COMAFFOR)/Joint Force Air Component Commander (JFACC), with lines of

communication to the joint forces surgeon (JFS) (See Figure 8-2.). Deployed AE units will operate under the direction of the Aerospace Expeditionary Wing Commander (AEW/CC) whether co-located or geographically separated.

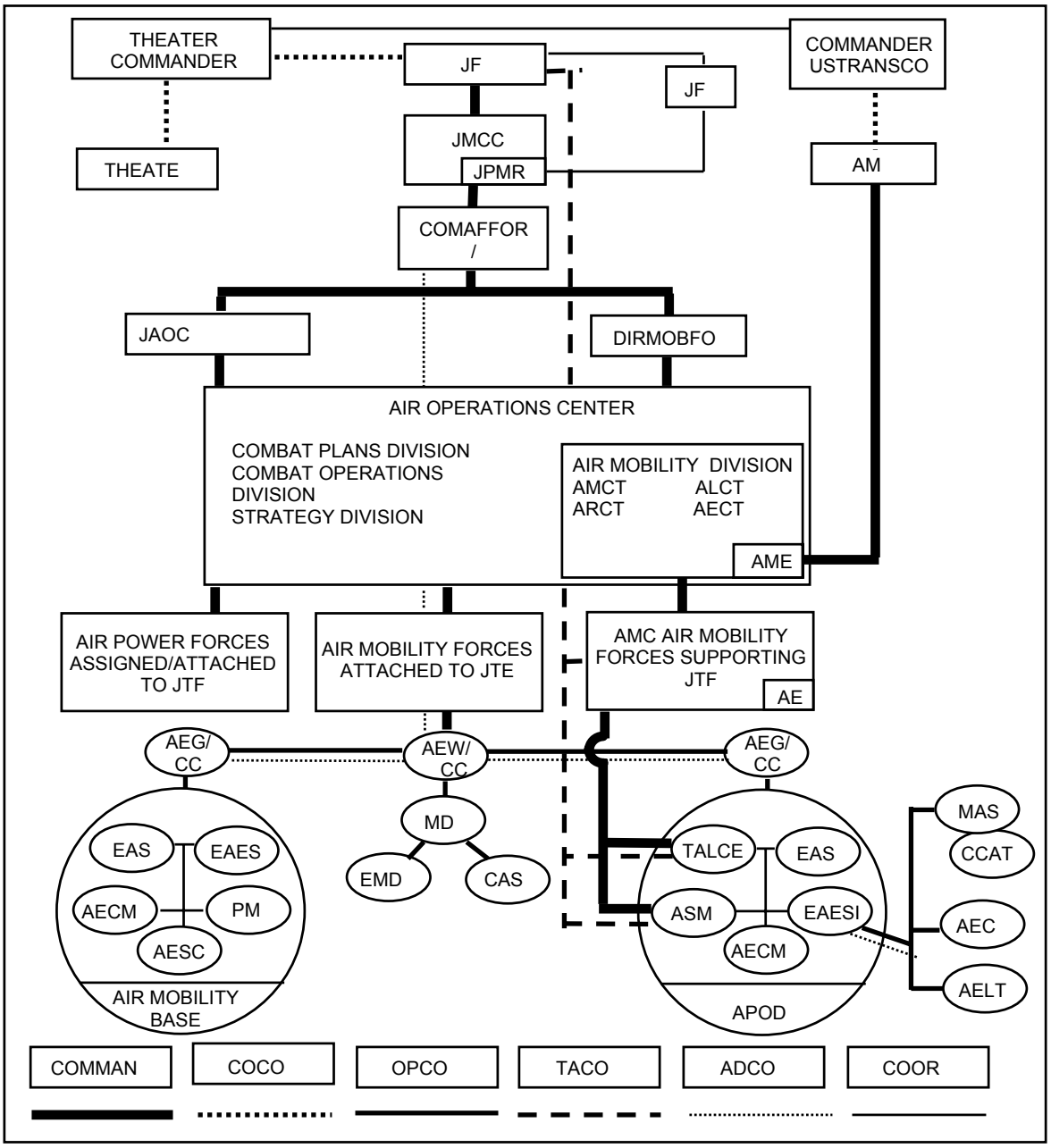


Figure 8-2. Contingency Aeromedical Evacuation Structure.

Appendix A

US Army Health Service Support

SECTION 1

NUCLEAR, BIOLOGICAL, AND CHEMICAL ASPECT OF HEALTH SERVICE SUPPORT

A-1. General

After World War II, the Soviet Union represented the principal threat to the national security interests of the US. During this period, the military capability of the Soviet Armed Forces grew enormously. Starting in the later years of the 1980s, the international security environment has undergone rapid, fundamental, and revolutionary changes. With the collapse of Soviet communism, the Soviet Union disintegrated as a viable economic and political system. The Warsaw Pact dissolved as a political and military entity. The central Soviet government was replaced by the Commonwealth of Independent States (CIS), dominated by the Russian Republic. The cohesion of Soviet strategic military capability has been fractured by—

- The dissolution of central Soviet control.
- The formation of the CIS.
- The unpredictability associated with uncertain loyalties and low morale.

The ultimate outcome of these events in terms of US national security interests is unclear. The military capabilities of CIS like Russia, Ukraine, Kazakstan, and Belarus remain formidable. The capabilities include strategic nuclear and impressive conventional, biological, and chemical warfighting capabilities.

A-2 Global Perspective

From a global perspective, the economic power and influence of developing and newly industrialized nations continue to grow. Centers of power (global or regional) cannot be measured solely in military terms. Nation states pursuing their own political, ideological, and economic interests may become engaged in direct or indirect competition and conflict with the US. More nations have acquired significant numbers of modern, lethal, combat weapon systems; developed very capable armed forces; and become more assertive in international affairs. In the absence of a single, credible, coercive threat, old rivalries and long repressed territorial ambitions will resurface, causing increased tensions in many regions. Political, economic, and social instability and religious, cultural, and economic competition will continue to erode the influence of the US over the rest of the world. This erosion will also reduce the US influence of traditional regional powers over their neighbors. This environment will encourage the continued development, or acquisition, of modern armed forces and equipment by less influential nations;

thus raising the potential for the use of NBC/RDD weapons during internal conflict and armed confrontations in developing regions of the world.

A-3. Third Dimension

A third dimension to the threat is terrorist, rogue groups, and belligerents employing a number of chemical and biological agents and the possible use of TIM to injure or kill US personnel. The actions may be isolated or may be imposed by groups of individuals. Most will have the financial backing of nations, large organizations, or groups that have the desire to cause harm and create public distrust in our government.

SECTION 2

LEVELS I, and II HEALTH SERVICE SUPPORT

A-4. General

a. The use of NBC weapons is a condition of battle and HSS personnel must prepare to operate in these environments. Added is the dimension of TIM releases/incidents in the operational area. The importance of preventive medicine (PVNTMED) measures and first aid (self-aid, buddy aid, and combat lifesaver [CLS] support) are even more critical. Heat and stress injuries related to MOPP wear are issues for the HSS leadership as well as the force he is supporting. The stress load on personnel is increased by the concerns of being exposed to TIM releases. Considering that staffing of HSS units is based upon the minimum required to provide support on a conventional battlefield, they will be challenged to provide the same level of HSS in these environments.

b. The HSS leadership must quantify the HSS capability to their commanders. The medical staff must review OPLANs and make recommendations to reduce the number of patients. Medical NBC training programs must stress the essential imperative of immediate decontamination, the need to monitor your buddy for NBC and heat or combat/operational stress injury effects, and the proper use of NBC defense prophylaxis, pretreatments, insect repellents, barrier creams, and immunizations.

c. Maintaining close proximity to the supported force has been a major tenet of HSS doctrine and a critical factor in reducing the mortality rate. Maintaining this proximity and finding a place clean enough to provide necessary care requires intense coordination with the supported force. Alternate casualty collection points, decontamination sites, medical treatment sites, and MEDEVAC routes must be established, coordinated and communicated to the lowest level practical. Communication will be much more difficult, but must be maintained. Timely reports through the HSS technical channels will allow an optimal HSS response. Replacements for HSS front line losses must be rapidly filled after NBC weapons are employed.

d. Contamination (NBC and TIMs) can significantly hinder HSS operations. To maximize the unit's survivability and HSS capabilities and to avoid such contamination, leaders must use—

(1) Contamination avoidance techniques.

(2) Alarms and detection equipment.

(3) Unit dispersion techniques.

(4) Overhead shelter, shielding material, protective cover, and buildings of opportunity. However, these shelters may not provide protection from chemical vapor or BW hazards.

(5) Collective protection shelters, if available. See Appendix A Section 12

(6) Chemical agent resistant coatings on equipment.

e. On the NBC battlefield, as on the conventional battlefield, HSS is focused on keeping soldiers in the battle. Effective and efficient PVNTMED measures, triage, emergency medical treatment (EMT), decontamination, advanced trauma management (ATM), and contamination control in the AO saves lives, assures judicious MEDEVAC, and maximizes the return to duty (RTD) rate.

A-5. Level I Health Service Support

a. Level I (unit-level) HSS may consist of a combat medic section, a MEDEVAC section, and a treatment squad. The treatment squad operates the Level I MTF. Level I HSS is supported by first aid in the form of self-aid/buddy aid and the CLS. See FM 4-02.4 for detailed information on conventional Level I HSS.

b. When operating under an NBC threat or when NBC attack is imminent, the MTF must prepare for continuation of its mission. Should an attack occur or a downwind hazard exists, the MTF must seek out a contamination free area to establish a clean treatment area, or must establish collective protection to continue the mission. Some MTFs have Chemically Biologically Protected Shelter (CBPS) Systems. When available, these systems serve as the primary shelter for the MTF; they are operated in the full chemical/biological (CB) mode when attack is imminent or has occurred. See Appendix A Section 12 for information on establishing a MTF in a CBPS system. When operating in the CB mode only patients requiring life- or limb-saving procedures are allowed entry at the MTF. Patients that have minor injuries that can be managed in the contaminated EMT area of the patient decontamination site will receive treatment in this area. After treatment, these patients will have the integrity of their MOPP restored by taping the damaged area and returned to duty. Patients with injuries that require further treatment, but who can survive evacuation to the Level II MTF will have their MOPP spot decontaminated, their injuries managed, the integrity of their MOPP restored, and be directed to an evacuation point to await transport to the Level II MTF (example, an individual

with a splinted broken arm). When patients or personnel are contaminated or are potentially contaminated, they must be decontaminated before admission into the clean treatment area (see FM 3-5 for personnel decontamination procedures and Appendix E for patient decontamination procedures).

A-6. Level II Health Service Support

a. In the brigade, Level II HSS consists of—

(1) Evacuating patients from the Level I MTF and MEDEVAC on an area support basis from within the brigade support area (BSA).

(2) Providing area support Level I medical treatment.

(3) Operating the medical company clearing station (hereafter referred to as Level II MTF]), which proves a patient holding capability for up to 40 patients for 72 hours. See FM 4-02.6 and FM 8-10-24 for detailed information on Level II conventional operations.

(4) Providing limited dental service.

(5) Providing limited PVNTMED support in the areas of medical surveillance, occupational and environmental health surveillance, food service sanitation, water quality control (including NBC contamination surveillance), and communicable disease control.

(6) Providing limited combat operational stress control (COSC); these patients are returned to duty as far forward as their condition permits.

b. In the division, HSS is the same as for the brigade, except patients may be evacuated from the Level II MTF, but not evacuated from the Level I MTF.

c. When operating under an NBC threat or when NBC attack is imminent, the Level II MTF must prepare for continuation of its mission. Should an attack occur or a downwind hazard exist the Level II MTF must seek out a contamination free area, or must establish collective protection to continue the mission. The Level II MTF in some medical companies has four CBPS Systems; they are complexed to provide space for Level II MTF operations. These systems are operated in the CB mode when attack is imminent or has occurred. See Appendix A Section 12 for information on establishing a Level II MTF in CBPS Systems. When operating in the CB mode only patients requiring life- or limb-saving procedures are allowed entry. Patients with minor injuries that can be managed in the contaminated EMT area of the patient decontamination site will receive treatment in this area. After treatment, these patients will have the integrity of their MOPP restored by taping the damaged area and returned to duty. Patients with injuries that require further treatment, but who can survive evacuation to the Level III MTF will have their MOPP spot decontaminated, their injuries managed, and be directed to an evacuation point to await transport to the Level III MTF (example, an individual with a splinted broken arm). When personnel and patients are contaminated or are potentially contaminated, they must be

decontaminated before admission into the clean treatment area (see FM 3-5 for personnel decontamination procedures and Appendix E for casualty decontamination procedures).

A-7. Forward Surgical Team

Forward surgical teams (FSTs) are either organic to divisional and nondivisional medical units or are forward deployed in support of divisional or nondivisional medical companies to provide a surgical capability. Field Manual 8-10-25 describes FST operations. However, when forward deployed and NBC contamination is imminent the FST must employ collective protection in order to continue their support mission. When operating in a contaminated area the FST CBPS Systems must be complexed with the Level II MTF CBPS. The FST cannot operate in an NBC environment without the support of the Level II MTF. They do not have the capability to decontaminate patients. All patients are decontaminated in the Level II MTF patient decontamination area. They are then processed into the EMT section of the Level II MTF; where they are triaged and routed to the FST for surgery, if required. See Appendix A Section 12

A-8. Actions Before a Nuclear, Biological, or Chemical Attack

a. Given the disruption of transportation, communications, and operations during and following an NBC attack, it should be clear that preparation is the key to survival and effectively providing HSS. Preparing a simple and complete tactical standing operational procedure (TSOP) and HSS plan that really integrates NBC is the first step. Critical training for medical personnel before an NBC attack is how to—

(1) Survive the attack individually and as a unit.

(2) Operate the Level I or Level II MTF in the environment.

(3) Effectively care for NBC patients.

b. Even minimal site preparation (nuclear hardening or CB protecting) may improve survival, greatly reduce contamination, and maintain the ability to continue to provide HSS. See the discussion below for more information on each environment. As with other military personnel, HSS personnel must keep their immunizations current; use available prophylaxis against suspect CB agents; use pretreatments for suspect chemical agents; use insect repellents, and have antidotes and essential medical supplies readily available for known or suspected NBC effects. The best defense for HSS personnel is to protect themselves, their patients, medical supplies, and equipment by applying contamination avoidance procedures. They must ensure that stored medical supplies and equipment are in protected areas or in their storage containers with covers in place. One method of having supplies and equipment protected is to keep them in their shipping containers until actually needed. When time permits and warnings are received that an NBC attack is imminent, or that a downwind hazard exists, HSS personnel should employ their CPS (see Appendix A Section 12) or seek protected areas (buildings, tents, or other **ABOVE** ground shelters for biological or chemical attack; culverts, ravines, basements, or other shielded

areas for nuclear) for themselves and their patients.

c. Other tasks include:

(1) Verifying NBC defense HSS inventories are complete.

(2) Reviewing supported units NBC plans, procedures, casualty collection points, decontamination sites, and resources available to support the HSS mission.

(3) Coordinating with the S2/G2, S3/G3 and S4/G4 of the supported unit to develop the medical courses of action; to obtain necessary materiel to support extended operations without resupply (MSR contamination or transportation support not available).

(4) Coordinating with supported units for at least eight nonmedical personnel for patient decontamination augmentation at the Level I and II MTFs.

A-9. Actions During a Nuclear, Biological, or Chemical Attack

While it is possible that the NBC attack will be discrete short events, the more likely scenario is the enemy will use NBC throughout the conflict. The warning and reporting system will provide as much notice as is possible. Using the information provided, HSS personnel will continue their mission by using the best available protected areas. If warned of a nuclear attack, they take up positions within the best available shelter; leadership will direct movement out of these positions when it is safe to do so.

A-10. Actions After a Nuclear, Biological, or Chemical Attack

All personnel must survey their equipment to determine the extent of damage and their capabilities to continue the mission. Initially, patients from nuclear detonations will be suffering thermal burns or blast injuries. Also, expect patients and HSS personnel to be disoriented. Nuclear blast and thermal injuries will immediately manifest, most radiation-induced injuries will not be observed for several hours to days. Chemical agent patients will manifest their injuries immediately upon exposure to the agent, except for blister agents. Biological agent patients may not show any signs of illness for hours to days after exposure, except for trichothecene (T_2) mycotoxins. All patients arriving at Levels I and II MTFs must be checked for NBC contamination. Patients are decontaminated before treatment (see Appendix E) to reduce the hazard to HSS personnel, unless life- or limb-threatening conditions exist. Patients requiring treatment before decontamination are treated in the EMT area of the patient decontamination station. Examples of patient conditions that may require treatment at the contaminated treatment station of the patient decontamination area—

- Massive hemorrhage.
- Respiratory distress.

- Severe shock.

A-11. Logistical Considerations

a. Health service logistics (HSL) personnel must train and prepare to operate in all battlefield situations. Operating in an NBC environment requires the issue of chemical patient treatment medical equipment set and chemical patient decontamination medical equipment set. Expect disruption of main supply route (MSR) and communications systems and plan accordingly. See FM 4-02.1 and FM 8-10-9 for details on HSL operations.

b. The medical platoon (Level I MTF) is authorized **two** chemical agent patient treatment medical equipment sets and **one** chemical agent patient decontamination medical equipment set. Each chemical agent patient treatment medical equipment set has enough supplies to treat 30 patients. Each chemical agent patient decontamination medical equipment set has enough consumable supplies to decontaminate 60 patients.

NOTE

The chlorine granules in the chemical agent patient decontamination set are used to prepare the hypochlorite solutions for use to decontaminate patients.

c. Level II, III and IV MTFs are authorized **five** chemical agent patient treatment medical equipment sets and **three** chemical agent patient decontamination medical equipment sets. These medical equipment sets are for use at the Level II division clearing station (DCS) patient decontamination station.

A-12. Personnel Considerations

During NBC actions, HSS personnel requirements increase; thus, HSS reinforcement or replacements are necessary. Plans for HSS in a NBC battlefield must include efforts to conserve available HSS personnel and ensure their best use. HSS personnel will be fully active in providing EMT or ATM care; they will provide more definitive treatment as time and resources permit. However, to provide care they must be able to work in a shirt-sleeved environment, not in MOPP Levels 3 or 4. Nonmedical personnel conduct search and rescue operations for the injured or wounded; they provide immediate first aid and decontamination. See FM 3-5, for detailed information on personnel and equipment decontamination operations. See FMs 4-02.283, 8-284, and 8-285 for detailed information on treatment of NBC patients.

A-13. Disposition and Employment of Treatment Elements

a. Select sites for the Level I and II MTFs that are located away from likely enemy target areas. Cover and concealment is extremely important; they increase protection for operating the MTF.

b. Operating a CBPS System in the CB mode at the Level I requires at least eight medical personnel. The senior NCO performs patient triage and limited EMT and minor injury care in the patient decontamination area. One trauma specialist supervises patient decontamination and manages patients during the decontamination process. Two trauma specialists work on the clean side of the hot line and manage the patients until they are placed in the clean treatment area or are sent into the CBPS for treatment. They also manage the patients that are awaiting MEDEVAC to the Level II MTF. The physician, physician assistant, and two trauma specialists provide ATM in the clean treatment area or inside the CBPS. See Appendix A Section 12 for CPS entry/exit procedures.

c. When Level II and I are receiving NBC contaminated patients, they require at least eight nonmedical personnel from supported units to perform patient decontamination procedures. These facilities are only staffed to provide patient care under conventional operational conditions. Without the augmentation support, they can either provide patient decontamination or patient care, but not both.

d. A patient decontamination station is established to handle contaminated patients (see Appendix E). The station is separated from the clean treatment area by a "hot line" and is located downwind of the clean treatment area or CPS. Personnel on both sides of the "hot line" assume a MOPP level commensurate with the threat agent employed (normally MOPP Level 4). The patient decontamination station should be established in a contamination-free area of the battlefield. However, it may be necessary to establish a patient decontamination station that is collocated with an MTF that is employing a CBPS, in a chemical vapor hazard area in order to decontaminate patients and clear the battlefield before moving the MTF to a clean area. When CPS systems are not available, the clean treatment area is located upwind 30 to 50 meters of the contaminated work area. When personnel in the clean working area are away from the hot line, they may reduce their MOPP level. Chemical monitoring equipment must be used on the clean side of the hot line to detect vapor hazards due to slight shifts in wind currents; if vapors invade the clean work area, HSS personnel must re-mask to prevent low-level CW agent exposure and minimize clinical effects (such as miosis).

A-14. Civilian Casualties

Civilian casualties may become a problem in populated or built-up areas, as they are unlikely to have protective equipment and training. The Level I and II MTFs may be required to provide assistance when civilian medical resources cannot handle the workload. However, aid to civilians will not be undertaken without command approval, or at the expense of health services provided to US personnel.

A-15. Nuclear Environment

a. The HSS mission must continue in a nuclear environment; protected shelters are essential to continue the support role. Well-constructed shelters with overhead cover and expedient shelters (reinforced concrete structures, basements, railroad tunnels, or trenches) provide good protection from nuclear attacks (see Appendix J). Armored vehicles provide some protection against both the blast and radiation effects of nuclear weapons. Patients generated in a nuclear attack will likely suffer multiple injuries (combination of blast, thermal, and radiation injuries) that will complicate medical care. Nuclear radiation patients fall into three categories:

(1) The *irradiated* patient is one who has been exposed to ionizing radiation, but is not contaminated. They are not radioactive and pose no radiation threat to medical care providers. Patients who have suffered exposure to initial nuclear radiation will fit into this category.

(2) The *externally contaminated* patient has radioactive dust and debris on his clothing, skin, or hair. This radioactive debris can cause burns if not removed quickly. This usually presents a "housekeeping" problem to the MTF, similar to the lice-infested patient arriving at a peacetime MTF. However, an accumulation of radioactive debris, from several patients admitted to the MTF, may present a threat to other personnel. The externally contaminated patient is decontaminated at the earliest time consistent with required medical care. Lifesaving care is always rendered, when necessary, before decontamination.

(3) The *internally contaminated* patient is one that has ingested or inhaled radioactive material, or radioactive material has entered the body through an open wound. The radioactive material continues to irradiate the patient internally until radioactive decay and/or biological elimination removes the radioactive isotope. Attending medical personnel are shielded, to some degree, by the patient's body. Inhalation, ingestion, or injection of quantities of radioactive material sufficient to present a threat to health care providers is highly unlikely.

b. Medical units operating in a radiation fallout environment will face three problems:

(1) The MTF may be immersed in fallout, requiring decontamination and relocation efforts.

(2) Patients may continue to be produced from continued radiation exposure.

(3) The contaminated environment hinders MEDEVAC.

c. Decontamination of most radiological contaminated patients and equipment can be accomplished with soap and water. Soap and water will not neutralize radioactive material. However, it will remove the material from the skin, hair or material surface. See Appendix E for specific casualty decontamination procedures. The waste can become a concentrated point of radiation and must be managed and monitored.

A-16. Medical Triage

Medical triage is the classification of patients according to the type and seriousness of illness or injury; this achieves the most orderly, timely, and efficient use of HSS resources. However, the triage process and classification of nuclear patients differs from conventional injuries. See FM 4-02.283 for nuclear patient triage and treatment procedures.

A-17. Biological Environment

a. A biological attack (such as the enemy use of bomblets, rockets, spray or aerosol dispersal, release of arthropod vectors, and terrorist or insurgent contamination of food and water) may be difficult to recognize. Frequently, it does not have an immediate effect on exposed personnel. All HSS personnel must monitor for BW indicators such as—

(1) Increases in disease incidence or fatality rates.

(2) Sudden presentation of an exotic disease.

(3) Other sequential epidemiological events.

b. Passive defensive measures (such as immunizations, good personal hygiene, physical conditioning, using arthropod repellents, wearing protective mask, and practicing good sanitation) will mitigate the effects of many biological agent intrusions.

c. The HSS commanders and leaders must enforce contamination control to prevent illness or injury to HSS personnel and to preserve the facility. Incoming vehicles, personnel, and patients must be surveyed for contamination. Ventilation systems in MTFs (without CPS) must be turned off if BW exposure is imminent.

d. Decontamination of most BW contaminated patients and equipment can be accomplished with soap and water. Soap and water will not kill all biological agents; however, it will remove the agent from the skin or equipment surface. See Appendix E for specific casualty decontamination procedures.

e. Treatment of BW agent patients may require observing and evaluating the individual to determine necessary medications, isolation, or management. See FM 8-284 for specific treatment procedures for BW agent patients.

f. Medical surveillance is essential. Most BW agent patients initially present common symptoms such as low-grade fever, chills, headache, malaise, and coughs. More patients than normal may be the first indication of biological attack. Daily medical treatment summaries, especially DNBI, need to be prepared and analyzed. Trends of increased numbers of patients presenting with unusual or the same symptoms are valuable indicators of enemy employment of BW agents. Daily analysis of medical summaries can provide early warnings of BW agent use, thus enabling commanders to initiate preventive measures earlier and reduce the total numbers of

troops lost due to the illness. See FM 4-02.17 for information of medical surveillance procedures. See FM 8-284 for preventive, protective, and treatment procedures.

A-18. Chemical Environment

a. Consider that all patients generated in a CW agent environment are contaminated. The vapor hazards associated with contaminated patients may require HSS personnel to remain at MOPP Level 4 for long periods. The MTF must be set up in clean areas or employ CPS. If there is liquid agent contamination, or a continued vapor hazard, the MTF should be moved and be decontaminated, mission permitting.

b. Initial triage, EMT, and decontamination are accomplished on the "dirty" side of the hot line. Life-sustaining care is rendered, as required, without regard to contamination. Normally, the senior health care sergeant performs initial triage and EMT at the Level I MTF. Secondary triage, ATM, and patient disposition are accomplished on the clean side of the hot line. When treatment must be provided in a contaminated environment outside the CPS, the level of care may be greatly reduced because medical personnel and patients are in MOPP Level 3 or 4. However, lifesaving procedures must be accomplished. See FM 8-285 for specific treatment of CW agent patients.

c. Decontamination of most chemically contaminated patients and equipment requires the use of materials that will remove and neutralize the agent. See FM 3-5 for equipment decontamination procedures and Appendix E for specific casualty decontamination procedures.

A-19. Operations in Extreme Environments

Enemy employment of NBC weapons or TIMs in the extremes of climate or terrain warrants additional consideration. Included are the peculiarities of urban terrain, mountains, snow and extreme cold, jungle, and desert operations in an NBC environment with the resultant NBC-related effects upon medical treatment and MEDEVAC. For a more detailed discussion on NBC aspects of urban terrain, mountain, snow and extreme cold, jungle, and desert operations, see FMs 3-06.11, 31-71, 90-3, 90-5, and 90-10.

a. In mountain operations, passes and gorges may tend to channel the nuclear blast and the movement of chemical and biological agents. Ridges and steep slopes may offer some shielding from thermal radiation effects. Close terrain may limit concentrations of troops and fewer targets may exist; therefore, a lower patient load may be anticipated. However, the terrain will complicate patient evacuation and may require patients to be decontaminated, treated, and held for longer periods than would be required for other operational areas.

b. The effects of extreme cold weather combined with NBC-produced injuries have not been extensively studied. However, with traumatic injuries, cold hastens the progress of shock, providing a less favorable prognosis. Thermal effects will tend to be reinforced by reflection of thermal radiation from snow and ice-covered areas. Care must be exercised when moving

chemically contaminated patients into a warm shelter. A CW agent on the patient's clothing may not be apparent. As the clothing warms to room temperature, the CW agent will vaporize (off-gas), contaminating the shelter and exposing occupants to potentially hazardous levels of the agent. A three-tent system is suggested for processing patients in extreme cold operations. The first tent (unheated) is used to strip off potentially contaminated clothing. The second (heated) is used to perform decontamination, perform EMT and detect off gassing. The third (heated) is used to provide the follow on care and patient holding.

c. In rain forests and other jungle environments, the overhead canopy will, to some extent, shield personnel from thermal radiation. However, the canopy may ignite and create forest fires and result in burn injuries. By reducing sunlight, the canopy may increase the persistency effect of CW agents near ground level. The canopy also provides a favorable environment for BW agent dispersion and survival.

d. In desert operations, troops may be widely dispersed, presenting less profitable targets. However, the lack of cover and concealment exposes troops to increased hazards. Smooth sand is a good reflector of nuclear thermal and blast effects; generating increased numbers of injuries. High temperatures will increase the discomfort and debilitating effects on personnel wearing MOPP, especially heat injuries.

A-20. Medical Evacuation in a Nuclear, Biological, and Chemical Environment

a. An NBC environment forces the unit leadership to consider to what extent he will commit MEDEVAC assets to the contaminated area. If the battalion or task force is operating in a contaminated area, most or the entire organic medical platoon MEDEVAC assets will operate there. However, efforts should be made to keep some ambulances free of contamination. For conventional MEDEVAC operations see FM 8-10-6 and FM 8-10-26.

b. We have three basic modes of evacuating patients (personnel [litter bearers], ground vehicles, and aircraft). Using litter bearers to carry the patients involves a great deal of stress. Cumbersome MOPP gear, added to climate, increased workload, and the fatigue of battle, will greatly reduce personnel effectiveness. If personnel must enter a radiologically contaminated area, an OEG must be established (see Table 1-2). Radiation exposure records are maintained by the NBC NCO and made available to the commander, staff, and medical leader. The exposure is entered into the individual's medical record. Based on the OEG, the commander and leaders will decide which MEDEVAC assets will be sent into the contaminated area. Again, every effort is made to limit the number of MEDEVAC assets that are contaminated. Medical evacuation considerations should include the following:

(1) A number of ambulances will become contaminated in the course of battle. Optimize the use of resources; use those already contaminated (medical or nonmedical) before employing uncontaminated resources.

(2) Once a vehicle or aircraft has entered a contaminated area, it is highly unlikely that it can be spared long enough to undergo thorough decontamination. However, operational

decontamination should be performed to the greatest extent possible. This will depend upon the contaminant, the tempo of the battle, and the resources available to the MEDEVAC unit. Normally, contaminated vehicles (air and ground) will be confined to dirty environments. See FM 3-5 for details on decontamination procedures.

(3) Use ground ambulances instead of air ambulances in contaminated areas; they are more plentiful, are easier to decontaminate, and are easier to replace. However, this does not preclude the use of aircraft. If an air ambulance is deployed into a contaminated area, use it for repeated MEDEVAC missions rather than sending other clean aircraft into the area.

(4) The relative positions of the contaminated area, forward line of own troops (FLOT), and threat air defense systems will determine where helicopters may be used in the MEDEVAC process. One or more helicopters may be restricted to contaminated areas; use ground vehicles to cross the line separating clean and contaminated areas. The ground ambulance proceeds to an MTF with a patient decontamination station (PDS); the patient is decontaminated and treated. If further MEDEVAC is required, a clean ground or air ambulance is used. The routes used by ground vehicles to cross between contaminated and clean areas are considered dirty routes and should not be crossed by clean vehicles, if mission permits. Consider the effects of wind and time upon the contaminants; some agents will remain for extended periods of time.

(5) Keep the helicopter rotor wash in mind when evacuating patients, especially in a contaminated environment. The intense rotor wash will disturb the contaminants and further aggravate the condition. The aircraft must be allowed to land and reduce to flat pitch before patients are brought near. This will reduce the effects of the rotor wash. Additionally, a helicopter must not land too close to a decontamination station (especially upwind) because any trace of contaminants in the rotor wash will compromise the decontamination procedure.

c. Immediate decontamination of rotor wing aircraft and ground vehicles is accomplished to minimize crew exposure. Units include decontamination procedures in their standing operating procedures (SOP). A sample aircraft decontamination station that may be tailored to a unit's needs is provided in FM 3-5.

d. Evacuation of patients must continue, even in an NBC environment. The HSS leader must recognize the constraints NBC places on operations; then plan and train to overcome these deficiencies.

e. To minimize the spread of contamination inside the MEDEVAC aircraft, plastic sheeting should be placed under the litter to catch any contaminant that drips off the patient or litter. The plastic sheeting can be removed with the patient, removing any contamination with it. When plastic sheeting is not available, placing a blanket under the litter will reduce the amount of agent that makes contact with the inside of the aircraft.

NOTE

The key to mission success is detailed preplanning. A HSS

plan must be prepared for each support mission. Ensure that the HSS plan is in concert with the tactical plan. Use the plan as a starting point and improve on it while providing HSS.

f. Medical evacuation by United States Air Force (USAF) aircraft will be severely limited until runway repairs and decontamination has occurred. Aerial flights from contaminated areas into uncontaminated airspace and destinations may be impossible for extended periods of time; some nations will not allow patients from contaminated areas to travel through or over their country. Therefore, patient holding on-site (or in theater) for an extended period of time must be anticipated.

g. Patient protection during evacuation must be maintained. Patients that have been decontaminated at the PDS at an MTF will have had their MOPP ensemble removed. The forward deployed MTFs will not have replacement MOPP ensembles for the patients. These patients must be placed in a patient protective wrap (PPW) before they are removed from the clean treatment area for evacuation (see the PPW instruction sheet/PPW label for use of the PPW). The PPW provides the same level of protection as the MOPP ensemble. The patient does not have to wear a protective mask when inside the PPW. The patient is placed inside the PPW that is on a litter. The PPW may also have a battery-operated blower that can provide a reduction of the body heat load and reduce the carbon dioxide level within the PPW. The PPW will provide protection for the patient for up to 6 hours and is a one-time use item. The blower is reusable, remove it and the attachment devices from the used PPW and return it to the patient movement items inventory. See FM 4-02.1 for a discussion on patient movement items.

WARNING

DO NOT place contaminated patients in the PPW. This will cause gas chamber effects on patients. It is for use with uncontaminated/decontaminated patients only.

SECTION 3

LEVELS III AND IV HOSPITALIZATION

A-21. General

a. Many factors must be considered when planning for Levels III and IV hospital support on the integrated battlefield. The hospital staff must be able to defend against threats by individuals or small groups (two or three) of infiltrators and survive NBC strikes or TIM incidents while continuing their mission. This threat may include the introduction of NBC or TIM in the hospital area, the water or food supplies; and the destruction of equipment and/or supplies. On the larger scale of surviving NBC strikes and continuing to support the mission, operating in a contaminated environment will present many problems for hospital personnel. The use of NBC weapons or TIM release can compromise both the quality and quantity of health care delivered by medical personnel due to the contamination at the MTF; constrain mobility and evacuation; and contaminate the logistical supply base. While providing hospital support, consider the following assumptions:

(1) Their location, close to other support assets, makes them vulnerable to NBC strikes and release/dispersion of TIMs.

- Command, control, communications, computers, and intelligence (C4I) infrastructure, logistical nodes, and base clusters are high value targets.

- Most NBC weapons are designed for wide-area coverage. Chemical and biological agents may present a hazard some distance downwind from the area of attack; also, residual radiation may extend for hundreds of kilometers (km) from ground zero.

- The large signature (size, heat, infrared) of a hospital makes it easy to find and target (the assumption is that the hospital is very near the intended targets).

- Hospitals located near road networks and airfields for access to evacuation routes increase their exposure to tactical strikes of NBC weapons and exposure to TIM releases.

- There are ever-increasing numbers of countries and individuals with the ability to manufacture and deliver NBC weapons/agents. This activity increases their use potential at all levels of conflict.

NOTE

When using existing civilian hospitals, the materials for an RDD may be at these hospitals. Exploding the material in place is very practical for a small team of terrorists.

(2) In addition to the wounding effects of NBC weapons on troops, their use will have other effects upon the patient care delivery system.

- Follow-on treatment may have to be delayed due to the need for patient and facility decontamination.

- The arrival of contaminated patients at the hospital will require hospital personnel to perform triage; administer EMT procedures in the patient decontamination area; supervise augmentation personnel performing patient decontamination; and constantly monitor the hospital for contamination. The combat support hospital [CSH]) requires at least 20 nonmedical personnel from units within the geographic area/base cluster of the hospital to perform patient decontamination under medical supervision. See Appendix E for patient decontamination procedures.

- Patients may have been triaged and decontaminated at a Level I or Level II MTF. However, all patients must be triaged and checked for contamination as they arrive at the hospital ambulance drop off point. Triage ensures patients receive life- or limb-saving care in a timely manner. If patients are arriving from a suspected NBC contaminated area, they must be decontaminated before admission into the clean treatment area of the hospital. The patient decontamination area is established on the downwind side of the hospital. When the hospital does not have collective protection, the patient decontamination point must be at least 50 yards downwind of the hospital entry point. When the hospital is located inside a base cluster, the patient decontamination area may have to be established some distance from the hospital to prevent contamination of other units in the area. Should this be the case, the patients may have to be transported by ambulance or other vehicle from the clean side (hot line) of the patient decontamination area to the receiving point of the hospital.

b. Hospitals are not kept in reserve. All personnel and equipment losses due to NBC contamination or radiation will have to be replaced.

c. There are currently two force modernization initiative hospital systems in the force structure. The Medical Force 2000 (MF2K) system consists of the CSH, the field hospital (FH), and the general hospital (GH). The Medical Reengineering Initiative (MRI) consists of only one hospital system—the CSH. The MF2K CSH is a corps asset, where as, the FH and GH are the echelon above corps hospital systems. The MRI CSH will be located in the corps and at echelons above corps. The MRI CSH will replace the FH and GH at echelons above corps. See FM 4-02.10, FM 8-10-14, and FM 8-10-15 for detailed information on these hospital systems.

A-22. Protection

a. Protection of hospital assets requires intensive use of intelligence information and careful planning. The limited mobility of hospitals makes their site selection vital to minimize collateral damage from attacks on other units.

(1) Hospitals must be located as close to the supported units as possible to provide responsive care in support of the tactical commander's plan. However, their limited mobility must be considered when selecting their locations.

(2) Protective factors (distance from other support units and interposed terrain features) must be balanced against the operational factors (accessibility and time required for patient transport).

(3) Depending on the weapon systems used, local topography, and meteorological conditions, relatively large portions of the tactical area may remain uncontaminated.

b. Many defensive measures will either impede or preclude performance of the hospital mission. Successful hospital defense against an NBC threat is dependent upon accurate, timely receipt of information via the nuclear, biological, and chemical warning and reporting system (NBCWRS). This information will allow the hospital to operate longer without the limitations and problems associated with the use of the CPS and personnel assuming MOPP Levels 3 and 4. The detailed information (provided in the NBC 5 and 6 reports respectively) on the areas affected and the types of agents used allows the hospital staff to—

- Project the number and types of patients to be expected.
- Establish a patient decontamination area.
- Request patient decontamination assistance.

(1) *Protective procedures.*

(*a*) Because most hospital sections operate in sheltered areas (tentage or hard-walled shelter), some protection is provided against vapor, liquid, and particulate (fallout) hazards. Sealing all openings can increase the temporary protection from such hazards; all entries and exits must be curtailed while operating in this mode. Liquid agents will eventually seep through the tent fabric and create a vapor hazard inside the shelter. Locating equipment, such as trucks, under trees or other cover provides similar effects. Setting up hospitals in existing structures (concrete or steel buildings) provides greater protection from hazards and eliminates many decontamination problems. However, without means to seal openings, chemical agent vapors can enter the structure. The addition of CB filtration systems with air locks, that provide overpressure, can provide maximum protection for occupants. Entry and exit procedures must be established to prevent contamination being introduced by personnel and patients entering. See Appendix F for entry/exit procedures when CB filters and air locks are in use.

(b) Without CPS systems, hospitals may operate for a limited time in a nonpersistent agent environment, but are incapable of operating in a persistent agent environment.

- Chemical/biological filters for fixed site hospital ventilation systems will be a critical item of supply. Controlled entry and exit point with sufficient space to permit placement of litter patients and/or numbers of personnel that permit purge of vapors will have to be established. All windows, doors, and other points that may have air leaks will have to be sealed (use tape and plastic sheeting) to enable the facility to have a positive overpressure to keep CB agents out.

- Liquid chemical agents can penetrate the TEMPER in about 6 hours or general purpose (GP) tentage in a shorter period of time. These agents will penetrate the wrappings on medical supplies and equipment; especially, sterilized equipment and supplies, paper-wrapped cotton sponges, and open or lightly closed medications/solutions. They can also contaminate water/food supplies. Therefore, equipment and supplies must be stored in protected areas or under protective coverings.

- Without a CPS system, treatment procedures involving open wounds or the respiratory tract in the presence of a CB agent hazard is limited. Exposing open wounds and the respiratory tract to the agent increases the effects of these agents on the patient.

- Without hardened protection, the hospital, staff, and patients are susceptible to the effects (blast, thermal, radiation, and missiling) of nuclear weapons.

- Hospital electrical and electronic medical equipment is vulnerable to the effects of the EMP produced by nuclear weapons. The EMP is not harmful to humans, animals, or plants, but is very damaging to electronic equipment.

- Hospital equipment is very difficult to decontaminate. Aging (allowing the agent to off-gas) may be the only means of decontamination.

(c) Concealment and good operations security (OPSEC) will help prevent identification of a unit.

(d) Dispersion is a defensive measure employed by tactical commanders; however, hospital operations limit the value of this technique. One technique that may be used is locating sections of the hospital, such as the motor pool, personnel billets, laundry, and logistical storage, a greater distance from the hospital complex than normal. This will increase dispersion without severely compromising the hospital mission.

(e) The MOPP ensemble does not protect against all radiation effects of nuclear weapons. However, it provides some protection against alpha and beta radiation

burns. By covering all body surfaces, especially hairy areas, MOPP greatly expedites the decontamination process.

(2) *Nuclear*

(*a*) Most protective measures for hospitals against nuclear attack require engineer and/or intensive logistic support. This support includes placing sandbag walls around tents; digging trenches for patient occupation; or constructing earthen berms (see Appendix J). Occupying existing structures, depending upon their strength and potential flammability, may be the best protection against the effects of a nuclear strike. The remainder of this section presents factors to consider when selecting the protective posture for the hospital against a nuclear attack. Leaving equipment packed and loaded until actually needed for operations will help protect materiel in an NBC environment. In any event the unit must have established an OEG, implemented radiation monitoring, and have contingency plans if these radiation levels are approached or exceeded.

(*b*) Personnel and patient protection requirements will depend upon the threat (blast, thermal, immediate radiation, or fallout effects). The MOPP ensemble will not protect against internal radiation, but will provide some protection from external radiological contamination.

- If the threat is nuclear fallout, the hospital structure provides protection; the fallout can be brushed or washed off. This allows protection while permitting patient care to continue virtually uninterrupted. A need to relocate the hospital will depend upon the degree of contamination; the amount of decontamination possible; and the projected stay before a normal move in support of operations.

- Hospital tentage alone offers little protection against blast and missiling effects. If the patients are to remain in the tents, they are placed on the floor. Place all equipment on the ground or as low as possible and secure all loose objects. In GP tents, sandbags can be piled around the base of the tent poles to add stability. The tent poles and patient beds should keep the canvas off the ground enough (if the tent collapses) to continue minimal patient care and evacuation; however, be aware of possible tent pole breakage.

- Hospital units are very susceptible to the thermal effect of a nuclear detonation. Tents will not provide protection against the thermal pulse. If the thermal effect (fire) is an impending threat, patients and personnel in tentage must move to trenches, bunkers, or other nonflammable areas.

- Protection factors that can reduce the overall radiation exposure rate for hospital personnel and patients are—

- Time. Reducing the exposure time to the radiation reduces the overall exposure proportionally (cut the time of exposure in half and the overall exposure is cut in half). EXAMPLE: An exposure time of 60 minutes to a dose rate of 100 centigray (cGy) is cut in half (30 minutes) to an exposure rate of 50 cGy.

- Distance. Increasing the distance from the radiation source reduces the exposure in an inverse square relationship (double the distance factor by 2 decreases the exposure factor by 4).

- Shielding. Placing material between personnel and patient and the radiation source decreases the dose (the reduction factor is dependent on the type of radiation and the density of the shielding material). Placement of sandbags (two feet wide) around the hospital tents and shelters provides adequate shielding for protection from gamma and x-ray radiation; the thicker the sandbag stacks the greater the protection factor. Tent material is a good shield for alpha particles and adequate shielding from beta particles. See Appendix J for field expedient shielding techniques.

(3) *Biological*. The most likely use of a biological agent (such as anthrax) is releasing the agent as an aerosol. While such agents may produce large numbers of casualties, initially patients may be seen at the MTF in small numbers, but the number of patients will rapidly increase within a few hours to days. When a trend is identified, the enemy use of a biological agent is suspected. General protective measures are the same as for any infectious disease; specific protective measures are used once the vector or method of transmission has been identified. Designating a single hospital to care for these patients (from a patient care or disease transmission standpoint) may not be necessary. However, if the agent is communicable, consolidating them all at one facility maximizes the use of limited assets and aids in limiting the spread of the disease. Protective measures against biological attack are the same as those for chemical agents when bombs, sprays, or gases are used; see (4) below. The difficulty in rapidly identifying biological agents may force the use of protective measures for longer periods of time. Faced with this situation, a careful evaluation of the mask-only posture is necessary before implementing any level of MOPP. See FM 8-284 for additional information on prevention, protection, and treatment of biological casualties.

(4) *Chemical*

(*a*) *Individual protection.* When CPS systems are not available, using the correct MOPP level is essential in hospital mission performance. The level of MOPP assumed depends upon the level of threat. An alternative approach for the hospital commander is the use of the mask-only posture. This posture is acceptable when the hazard is from vapor only (except mustard). See FM 3-4 for a description of each MOPP level and mask only procedures.

- *Hospital warning system*. The hospital must have a warning system that alerts all personnel of impending or present hazards. This system must include visual and auditory signals; the signals must operate inside and outside the hospital complex. There are numerous problems associated with warning personnel; they include—

  - The wide area covered by the hospital operations.

  - Some personnel will be asleep at all times of the day or night (two or three shifts).

• The considerable noise from mechanical support equipment; such as the power generation and environmental control equipment.

• Tentage and equipment interrupts line of sight.

• *Hospital personnel response*. When NBC alarms are activated, all personnel (including off duty personnel) report to their duty stations as soon as they are in the designated MOPP level. This allows for 100 percent personnel accounting and provides additional personnel to secure patients and materiel.

• Un*protected hospital areas*. Areas of the hospital without CPS are at their best posture with all openings secured and the ventilation systems turned off. For nonpersistent agents (vapor hazards), personnel and patients stay at the designated MOPP level until the all clear signal is given; then normal operations are resumed.

NOTE

Patients with injuries that prevent their assuming a protective posture must be placed in a PPW or immediately evacuated to a clean MTF.

(*b*) *Environmental protection*. As noted previously, hospital complexes without CPS offer some protection against liquid or fallout contamination, but little protection against vapor hazards.

• When MOPP Level 1 must be assumed, close and secure all tent flaps, vents, and doors to prevent the entrance of liquids or particles. All hospital personnel outside of shelters assume MOPP Level 4. Cover or move all equipment and supplies into shelters (tents, hard-walled shipping containers), if possible. Placement under thick foliage trees is better than left out in the open. The best policy is to keep all equipment and supplies not immediately needed covered or in closed containers.

• When MOPP Level 3 or mask-only posture is assumed shut down the hospital's ventilation system to prevent drawing vapors or fallout contamination into the hospital. This measure also provides some protection of the internal environment during the time required for the vapor to penetrate the tentage.

(*c*) *Patient protection*

• Patient protection depends upon prior planning and timely warning of the chemical threat. Each patient's protective mask must be available and serviceable. If the patient came from a contaminated area, the mask must be decontaminated and the filters changed. The mask decontamination and filter change may have to be performed by

hospital personnel. If ambulatory patients' medical conditions permit (minimal care ward), they may be able to perform this task. The hospital supply staff must ensure that mask filters are available at the supporting logistics support facility and can be requisitioned to meet this requirement. Check all masks for serviceability as soon as the mission permits, but always before they are needed. Do not wait until the warning has been received to begin checking the mask. Each area must have an established plan for operations (to include assisting patients assuming MOPP or other protective posture) in the NBC environment. Appendix A Section 11 provides additional information on patient protection.

CAUTION

Remember, personnel must assume MOPP Level 4 before beginning any decontamination process or risk becoming a casualty themselves.

- Hospital staff always mask themselves first, then assist patients in masking. On minimal care wards, most patients can put on their masks. For those who cannot, other patients can assist them after putting on their own masks. On the intermediate care wards, some patients will be able to put on their masks, but many will require assistance. Intensive care and emergency room staff will have to assist their patients in masking.

- Many patients with head and neck wounds or who are on life-support devices will be unable to wear their individual protective masks; these patients must be placed in a PPW. While the PPW has two ports for intravenous or blood infusion lines, the staff may have to adapt for other devices (Foley catheters, traction devices, and cardiac monitor) by using tape and other means to seal the gaps created in the seal around the edge of the PPW. Patients requiring assisted ventilation are at extreme risk, unless their air supply is protected. The sequence of protecting everyone is mask yourself first; assist those patients who can wear their protective masks; and then place patients in the PPW.

(*d*) *Materiel protection*. Protection of materiel, especially expendable supplies, requires covers and barriers. All materiel not required for immediate use is kept in shipping containers, medical chests, or under cover (tentage, plastic sheeting, and tarpaulin) for protection against particulate or liquid hazard. Protection against vapor hazard may require multiple barriers through which the vapor must penetrate. For example, intravenous solutions are in their individual plastic bags, in the cardboard shipping box, on a covered pallet, in a hard-walled shelter; such as a military-owned demountable container (MILVAN). This presents four barriers against the vapor hazard. These principles should be used to the maximum extent practical.

A-23. Decontamination

a. Decontamination of nuclear-contaminated personnel, equipment, and the operational site is as follows:

(1) Monitoring equipment is used to detect contamination; the contamination is then removed by brushing or scraping with brooms, brushes, or tree branches. Flushing hard surface contaminated areas with water are also effective in removing nuclear contamination. However, there remains a problem of containing and removing the contaminated water. The best method of containment is to trench the area into a sump for collection of the contamination. This will reduce the area of contamination; however, the level of concentrated radiation may be such that there is an increased hazard to personnel. The collection area must be clearly marked using the standard nuclear hazard signs.

(2) Nuclear contamination of the site may require relocating the hospital. Scraping 1 or 2 inches of topsoil from the area, or covering the area with 1 or 2 inches of uncontaminated dirt will not be practical. A need to relocate the hospital will depend upon the degree of contamination; the amount of decontamination possible and the projected stay before a normal move in support of operations. If the hospital is immersed in a high level of radioactivity, the best option may be to abandon it for 48 to 72 hours. After this period the area should be checked and if the radioactivity has decayed sufficiently the hospital may be reoccupied and continue operations or moved to a clean area. The command OEG must be followed if reoccupying or moving the facility.

b. Suspect biological agents should be removed from equipment as quickly as possible. In the absence of agent-specific guidance, clean exposed surfaces using a 5 percent hypochlorite solution or copious quantities of soap and water (preferably hot). Liberally apply the hot, soapy water and scrub all surfaces with a brush. Then rinse the surfaces with hot water. As previously discussed, the soapy water used is contaminated and must be controlled and removed to a safe area. Supertropical bleach (STB) and decontaminating solution Number 2 (DS2, US Army) are effective against most known biological agents because of their caustic nature. If anthrax (or other spore formers) is suspected, repeat the entire decontamination process again to remove the spores. Other standard biological decontamination agents are described in FM 3-5.

CAUTION

1. Keep liquid decontaminants out of equipment with electronic or electrical circuits. Unplug electrical devices before attempting to decontaminate them; prevent electric shock. Some electronic devices maintain an electric charge, even after being unplugged; use extreme care to prevent shock.

2. Soap and water only mechanically remove BW agents. The soap and water solution must be contained to prevent spreading the agent to other personnel, thus causing more casualties.

c. Decontamination of chemical contamination is as follows:

(1) Personnel use their soldier skills and their M295 Individual Equipment Decontamination Kit to decontaminate their personal equipment. The M13, decontamination apparatus, portable, is used to decontaminate vehicles, trailers, and International Organization for Standardization (ISO) shelters. This apparatus uses DS2 (a highly caustic, flammable solution that cannot be used to decontaminate tentage). The DS2 must be washed off after sufficient time has passed for decontamination (see FM 3-5 for details). Water used for NBC decontamination purposes becomes contaminated; therefore, it must be contained in sumps. Dig shallow trenches to channel the water into sumps. This will be difficult in hospital areas because relatively flat sites are needed for hospital complexing, but must be accomplished to reduce the contamination levels in the hospital area.

(2) When hospital tentage becomes contaminated, decontamination operations must be considered immediately. Spot decontamination may be effective for small areas; however, gross contamination of TEMPER and GP tentage is best decontaminated by aging. Without CPS and with persistent agent contamination that absorbs into the tentage and presents a continuing vapor hazard, the hospital stops receiving patients and evacuates all patients as quickly as possible. When large portions of the hospital are contaminated, personnel decontaminate all equipment possible and relocate to a new site, leaving the contaminated equipment to age or to be decontaminated by a specialized unit. When small portions of the hospital are contaminated, the contaminated portions are removed to another location for decontamination; hospital operations are continued, but at a lower operational level. For detailed equipment decontamination procedures, see FM 3-5.

NOTE

Liquid decontamination material must not be used on electrical or electronic components of equipment. Liquid decontaminants can damage the equipment; thus making it inoperable and not available for patient care or transport. The use of liquids to decontaminate electronic equipment could also potentially result in injury or electrocution of personnel.

(3) Each US Army hospital is issued **five** chemical agent patient treatment MES and **three** chemical agent patient decontamination MES, Chemical Agents Patient Decontamination, for use in decontaminating patients. Each hospital must decontaminate and treat its own personnel who become casualties; chemical casualties from units in its general area; or contaminated patients received from lower level MTFs. See Appendix E for casualty decontamination procedures and for establishment of a patient decontamination and treatment station.

A-24. Emergency Services

a. Providing emergency services will be complicated by several factors:

(1) Varying levels of treatment received prior to arrival at the hospital.

(2) Caring for combined conventional wounds and NBC agent effects.

(3) Managing heat-related complications associated with MOPP/PPW use.

(4) Controlling psychological effects caused by biological and chemical agents, the impact of NBC weapons, or the isolation of MOPP gear or PPWs.

(5) Having EMT personnel working at the arrival point, decontamination site, and in the hospital EMT area.

(6) Conducting triage and providing patient care while in MOPP gear.

(7) Supervising supported units' decontamination augmentation personnel. These personnel will most likely be of any military occupational specialty (MOS), except medical. They will use hospital equipment and supplies to decontaminate patients.

b. Contaminated patients must be triaged in the decontamination area that is established at the hospital. Contaminated patients **WILL NOT** be brought into the clean EMT area until decontaminated. All patients are screened for contamination. Based on the findings, the patient is routed to the contaminated triage station, or to the clean triage station. Contaminated patients are triaged, then routed to the decontamination area, or to the contaminated treatment area. Patient admission to the clean treatment area may be delayed; however, life- or limb-saving care is provided in the contaminated treatment area before decontamination.

A-25. Surgical Services

a. Surgical services will be severely limited in the NBC environment. At any level above MOPP Level 0, without a CPS system surgical services are halted except for life- or limb-saving expedient procedures. Surgery cannot be safely performed outside a CPS due to a variety of factors including—

(1) Lack of protected ventilation for patients during and after surgery.

(2) Inability to maintain a sterile field while using MOPP gear.

(3) Direct access for agents through open wounds to the circulatory and respiratory systems.

(4) Decreased dexterity and vision resulting from MOPP gear use.

(5) Inability to quickly place the patient in a PPW should the need arise.

b. Due to the relatively high number of trauma cases, hospital services may be severely constrained by NBC contamination. The hospital location and the possible need for relocation are two major planning considerations for the command staff.

c. Patient accounting and medical regulating are critical factors in the transfer of patients from a hospital without a CPS that must move out of an NBC environment. Hospitals without CPS stop receiving patients when a persistent hazard is identified; patients on hand are protected and transferred to a clean MTF.

A-26. Nursing Services

Providing nursing care in a hospital without CPS is influenced by the amount of protective gear worn by the nursing staff and the patients. The patients may be in their MOPP gear, in a PPW, or wearing only their protective mask; any of which will interfere with care. The nursing staff will wear the same level of protection as the patients.

a. Direct assessment of a patient's vital signs is extremely limited at MOPP Levels 3 or 4; however, a carotid artery pulse can be taken by palpating the neck area. The patient's respiratory rate and level of consciousness may be assessed visually. Palpitation of the blood pressure through a PPW may be possible if it is relatively strong, or at least in the normal range. The patient's temperature cannot be monitored; this is an area of concern due to the possibility of heat stress.

b. Only gross neurological signs can be assessed through the PPW or when the patient is in MOPP Levels 3 or 4. However, even this assessment is complicated by the presence of miosis and by the health care providers mask. Urinary output and cardiac monitoring is continued uninterrupted for patients wearing a mask only and for patients in the PPW.

c. Oral hygiene and bathing are postponed until a safe environment is available (MOPP Level 2 or less). All toileting will occur within the hospital complex using ISO contained latrines, chemical toilets, bedpans, urinals, buckets, or containers with plastic liners. Waste from improvised containers must be placed in containers with covers or in plastic bags and sealed to control odors and prevent spread of infectious material within the facility.

d. At MOPP Levels 3 and 4, feeding must be postponed. A nutritional assessment is needed to determine how long each patient can tolerate a fasting state when MOPP Level 3 or Level 4 remains in effect for over 24 hours.

e. Intravenous (IV) medications are mixed in a clean area and then transported in a protective wrap (multilayers of plastic, medical chest, or layered cardboard) to the user.

However, IV solutions, blood, and injections can be given to patients on an unprotected ward. Normally, oral medications are only given at MOPP Level 2 or lower.

f. Treatment procedures that have the potential of contaminating the patient (pulmonary or circulatory systems) are conducted only at MOPP Level 2 or below. However, EMT procedures may have to be performed in the contaminated treatment area, or the patient decontamination area.

g. Continuous oxygen therapy requires a collective protection environment or a CB filter supported respirator.

h. Delivery of nursing care at MOPP Level 3 or Level 4 is limited due to the sensory restrictions of MOPP gear. Time is taken to reassure the patients on a personal basis, as much as possible, and by routinely monitoring the ward environment. Communications are difficult and identities are masked. Maintain the identity of personnel by using handwritten nametags for staff and patients (including patients in PPW).

i. As with all procedures, the time required for record keeping rises markedly at MOPP Level 3 or Level 4. Contaminated paperwork cannot be evacuated with the patient. Transcribe essential information onto uncontaminated documents for evacuation with the patient. A record of patient exposure time to a contaminated area is prepared to assess the cumulative risk to the patient.

SECTION 4

PREVENTIVE MEDICINE SERVICES

A-27. General

On the integrated battlefield, PVNTMED services will be in greater demand than at any other time, especially under BW conditions. Preventive medicine personnel will be called upon to assist the commander in determining the health hazards associated with nuclear fallout; the safety of drinking water in an NBC environment; as well as determining when to use prophylaxis, pretreatments, immunizations, and other PVNTMED measures (PMM) associated with NBC warfare. Preventive medicine personnel must be aware of the medical threat in the AO. They must continually update their medical surveillance activities to identify disease trends (endemic and epidemic), potential disease vectors, and the susceptibility of troops to these diseases. Under NBC conditions, diseases may manifest that exist in the area, but were not being transmitted to personnel. However, due to the reduced health status of personnel from exposures to or from stress-related NBC conditions, the troops begin to suffer their effects. The appearances of diseases or arthropods not known to exist in the AO are indicators that BW

agents have been used. For details on PVNTMED operations, see FM 4-02.17.

A-28. Disease Incidence Following the Use of Nuclear, Biological, and Chemical Weapons

a. Determining Factors. Factors of prime importance in determining the nature and severity of the disease effects are—

- Immunization status of personnel.
- Population density.
- Degree of industrialization in the operational area.
- Availability of food supplies.
- Availability of water.
- Climate.

Finally, the manner and situation in which nuclear weapons are used are of importance. A single weapon detonated in a socially stable area will have far less serious effects than a detonation in an area where combat has already disrupted the social stability. At Hiroshima and Nagasaki, Japan (excellent examples of the first type of situation), the survivors who could get away were able to obtain food, shelter, and care from surrounding intact areas. With prolonged combat operations, such intact areas would not be available, resulting in no food, shelter, or care for survivors. There will be a breakdown in social order and there will be a lack of effective medical support; including PVNTMED functions and facilities.

b. Disease Incidence. Without PVNTMED capabilities, increased incidence and morbidity from diseases will follow. Some diseases will predominate in incidence, depending upon the geographical areas involved and the endemic diseases present.

(1) In urban areas in temperate climates, several diseases are epidemic threats. These epidemic threats may include—

- Dysentery (due to a variety of pathogens).
- Rickettsial diseases, particularly typhus and scrub typhus.
- Hepatitis.
- Tuberculosis.
- Sexually transmitted diseases.
- Malaria and cholera (in many parts of the world).

(2) There are several reasons for the increased risk of disease including, but not limited to—

- Crowding of surviving populations with limited sanitary facilities, such as was seen in Europe at the end of World War II.

- A lack of prophylaxis and immunizations with resultant increases in the susceptible faction of a given population.

- A lack of pest management.

- The effect of irradiation on susceptibility to infection. With the high levels of fallout covering wide areas, a large number of people will sustain sublethal whole-body doses of irradiation. The interaction of irradiation with infections is not clear; but it may be the result of latent infections manifesting and decreased resistance to infection. The result is an increased incidence of disease.

- The ecological imbalance and host-parasite relationship following the use of nuclear weapons. Each class and order of animals has marked differences in sensitivity to irradiation. Arthropods, for example, are much more resistant than are vertebrates. The normal balance between arthropods and birds that prey upon them in a given area may be severely upset, producing a marked overgrowth of the arthropods. If the arthropods include vectors of disease there would be a serious increase in disease hazards. If there is an increase in arthropods that destroy vegetation there would be a serious destruction of food crops.

- The introduction of a BW agent in an AO in which the disease organism is endemic or epidemic can increase the risk level for exposed personnel.

A-29. Preventive Medicine Section

The PVNTMED sections of the brigade, divisional, and nondivisional medical companies perform analysis on water sources and supplies to determine the presence or absence of NBC/TIM contamination; see Appendix H for additional information. Based upon their findings, the water is released for consumption, or is restricted from use until it is treated (usually by water production personnel using the reverse osmosis water purification unit [ROWPU]). They also collect water samples for suspect biological agent contamination for supporting medical laboratory analysis (see Appendix H). They conduct medical surveillance activities, to include occupational and environmental health threat surveillance. They conduct limited entomological surveys to determine the existence of disease-vectoring arthropods in the AO. They inspect food service facilities to determine the extent, if any, of NBC contamination. They evaluate the unit's—

- Immunization status.

- Use of prophylaxis for specific diseases (such as antimalarial tablets) (see FM 4-

02.33), for nuclear radiation exposure (such as granisetron for nausea and vomiting) (see FM 4-02.283), and for BW agents (such as Ciprofloxacin for postexposure chemoprophylaxis for Anthrax) (see FM 8-284).

- Use of nerve agent pyridostigmine pretreatment tablets (see FM 8-285), if warranted.

- Application of personal hygiene and field sanitation procedures (FM 21-10/MCRP 4-11.1D).

Based upon their findings, they provide recommendations for corrective actions to the commanders. They assist in training US Army unit field sanitation teams (FM 4-25.12); they are not members of the unit field sanitation team. They conduct medical surveillance activities for their command (FM 4-02.17).

A-30. Preventive Medicine Detachment

The PVNTMED detachment provides PVNTMED services on an area support basis to units within their assigned AO. These services include, but are not limited to—

- Conducting water surveillance, including NBC contamination. Collecting water samples suspected of NBC/TIM contamination for analysis by supporting medical laboratory (see Appendix H).

- Performing food service sanitary inspections.

- Conducting medical surveillance and providing epidemiological consultation.

- Conducting pest (arthropod and rodent) surveys and surveillance.

- Conducting arthropod control operations. The aerial spraying missions are dependent upon availability of helicopter support.

- Conducting occupational and industrial hygiene surveys.
- Advising commanders on the application of PMM.

- Training the supported units' field sanitation teams.

SECTION 5

VETERINARY SERVICES

A-31. General

The US Army Veterinary Service is the Executive Agent for veterinary services to all Services within the DOD. They ensure that food and bottled water supplies are safe and provide veterinary medical and surgical care for government-owned animals throughout the AO. On the integrated battlefield,
their role is particularly important; the potential for food supplies becoming contaminated with NBC agents is high. For detailed information on provision of veterinary services see FM 8-10-18.

A-32. Food Protection

Food may become contaminated from enemy employment of NBC weapons/agents or from terroristic contamination of food procurement facilities and food supplies. The NBC agents may be introduced during production or in the storage area of the procurement facility; while the product is in transit; at the military storage facility; or at the unit food service facility. Regardless of where the agent is used, the effect is the same; personnel will become ill or die if they consume the contaminated food. To ensure food safety, veterinary personnel inspect and monitor food from its procurement until it is issued to the consumer. Throughout the AO, all Services (Army, Navy, Marine, and Air Force) logistics and food service personnel must take precautions to protect subsistence from contamination.

A-33. Food Decontamination

Veterinary personnel are involved in the detection and monitoring of NBC contaminated rations; before use, they must inspect all food suspected of being contaminated with NBC agents. Appendix K provides guidance on food decontamination procedures. Veterinary personnel provide advice on the decontamination of food to unit personnel owning the food, or personnel performing the food decontamination. Depending on the type of contamination and packaging, the food may be—

- Consumed without being decontaminated.
- Decontaminated and then consumed.
- Destroyed.

Some items may be held to allow time for natural decay of nuclear or chemical contamination

before consumption. The commander, with advice from veterinary personnel, makes the decision on the disposition of the food. However, veterinary personnel make the final determination of food safety.

A-34. Animal Care

Veterinary personnel are concerned with the protection of government-owned animals and animals being procured for consumption. Animals must be protected from NBC contamination, whenever possible. Animals should be moved into enclosures to protect them as much as possible from contamination. Protective equipment is not available for military working dogs; however, protection of the animal's feet and body must be considered. When military working dogs must cross a contaminated area, protect their feet by using butyl rubber material to improvise booties. Since CPS systems are not available, animal treatment facilities must be established in contamination free areas. Veterinary treatment personnel must remain in MOPP Level 4 when caring for NBC animal casualties until the animals have been decontaminated. The treatment of military working dog NBC casualties is outlined in FM 8-10-18.

SECTION 6

LABORATORY SERVICES

A-35. General

Laboratory services must continue their support role even under NBC conditions. For the provision of clinical and diagnostic support, the facility must be located in a contamination-free area or be inside collective protection. Designated laboratories within the theater will analyze NBC samples/specimens (including in theater field confirmation identification of biological agents by evaluating specimens from symptomatic patients and animals and environmental samples collected from the AO). See Appendix H for procedures in collecting biological samples/specimens, handling/packaging, maintaining chain of custody, transporting samples/specimens, and analysis.

A-36. Level II

Laboratory support at this level is extremely limited; it consists of laboratory procedures in direct support of MTF and FST activities. Laboratory personnel prepare collected suspect NBC specimens for submission to the supporting laboratory for analysis; the specimens are forwarded to supporting medical laboratories (Appendix H).

A-37. Level III

Laboratory support in a CSH is intended for providing clinical laboratory support and is primarily in support of acute surgical cases, blood services, and statim (STAT) services required for intensive care operations. Only extremely limited microbiology services (parasitological exams and gram stains) are provided. In a mature theater, the microbiology services may be augmented to include limited cultures and sensitivity testing. Patients with documented or suspected exposure to NBC weapons/agents will be medically evaluated, specimens will be collected, packaged, and have chain of custody established. The specimens will be forwarded through technical channels to the supporting medical laboratory (such as the theater Army medical laboratory [TAML]) for analysis. See Appendix H for specimen collection, packaging, chain of custody, and processing requirements.

A38. Level IV

a. Clinical Laboratories. The clinical laboratories in the combat support, field, and general hospitals have the ability to perform a general, but limited, array of analytical procedures in hematology, urinalysis, chemistry, microbiology, serology, and blood bank. Patient specimens of suspected biological or chemical agent exposures are forwarded through technical channels to the supporting medical laboratory. See Appendix H for sample/specimen collection,

packaging, chain of custody, processing, and transporting requirements.

b. Field Laboratories.

(1) *Theater Army Medical Laboratory.* The TAML is the specialized echelons above corps (EAC) laboratory that provides clinical and nonclinical medical laboratory support. When equipped and staffed, the TAML provides in-theater field confirmation identification of NBC samples or specimens. Using sophisticated equipment and methods, the TAML has the capability to detect and identify NBC agents in a variety of specimens/samples (such as human, air, soil, water, animals, vegetation, and food). Direct support from continental United States (CONUS)-based laboratories aids the TAML with identification of NBC agents. Command decision on use of protective/preventive measures and patient care may be based on the TAML findings. Proper collection, packaging, and rapid shipment of specimens by MTFs and samples from other sources will ensure effective, timely, and accurate laboratory analyses.

(2) *Area Medical Laboratory.* The area medical laboratory (AML) is the specialized laboratory within the theater that provides nonclinical medical laboratory support. The AML can be deployed in the corps or to EAC for support missions. When fielded, the AML will replace the TAML in the force structure. The AML provides in-theater field confirmation identification of NBC samples or specimens. Using sophisticated equipment and methods, the AML has the capability to detect and identify NBC agents in a variety of specimens/samples (such as human, air, soil, water, animals, vegetation, and food). Direct support from CONUS-based laboratories aids the AML with identification of NBC agents. Command decision on use of protective/preventive measures and patient care may be based on the AML findings. Proper collection, packaging, and rapid shipment of specimens by MTFs and samples from other sources will ensure effective, timely, and accurate laboratory analyses.

A39. Level V (Continental United States)

Designated Level V medical laboratories perform analyses to provide definitive identification of suspect biological agents for the President and Secretary of Defense purposes. The definitive identification of suspect biological agents also aids commanders in the AO in maintaining the health of their command.

A-40. Field Samples

Chemical corps personnel collect environmental, air, soil, and vegetation samples. Preventive medicine personnel collect samples from drinking water sources and supplies. Veterinary personnel collect samples from food supplies and medical specimens from animals. All other units collect soil, vegetation, and small animal samples for laboratory analysis. Samples are subjected to initial screening with rapid test kits and in-theater confirmatory identification at the supporting medical laboratory. The President and Secretary of Defense required definitive identification is performed at the designated Level V medical laboratory. Comprehensive databases will be maintained to provide historical testing results and will aid in the AO

commander's decisions to conduct operations in an NBC environment. See Appendix H for specific procedures for sample collection, packaging, transporting, maintaining chain of custody, and analysis.

SECTION 7

DENTAL SERVICES

A-41. General

Dental service support is provided in the AO at Levels II, III, and IV. Because of their location close to main supply routes and other support assets, dental units are vulnerable to an NBC strike. Nuclear, biological, and chemical operations have an impact at all levels; thus, dental units must be prepared to survive on the integrated battlefield. Defense against NBC weapons must be included in the dental unit's TSOP. Individual and collective tasks must be intensely trained on a regular basis; survival depends on the ability of personnel to use basic survival skills against an NBC attack. For details on provision of dental services, see FM 4-02.19.

A-42. Mission in a Nuclear, Biological, or Chemical Environment

The overall mission of dental units to provide dental services is greatly affected in the aftermath of an NBC attack. First, the unit must survive the attack and rapidly recover from its effects. Secondly, in the event of mass casualties, the dental patient care effort must be redirected from dental treatment to the alternate wartime role of augmenting the adjacent MTF. Dental units do not possess CPS; therefore, providing dental services in an NBC environment will be limited to the treatment of maxillofacial emergencies requiring immediate attention. This care will be provided at an MTF with a CPS.

A-43. Dental Treatment Operations

As a general rule, in the aftermath of an NBC attack, dental treatment operations cease until deliberate decontamination of the unit and its equipment has been accomplished. Only maxillofacial injuries of an immediate life-threatening nature should be considered for treatment. After an attack, the resources of the dental treatment facility (DTF) are redirected toward support of any mass casualty situation that may have been generated at an adjacent MTF, or toward decontamination and relocation to a noncontaminated area.

A-44. Patient Treatment Considerations

The only category of dental treatment appropriate in an NBC environment is emergency; and then, only those emergencies of an extreme nature which demand immediate attention. The most likely condition requiring such attention would be maxillofacial trauma and would most likely be treated at an MTF rather than a DTF. Although the likelihood of a requirement to treat dental patients in an NBC environment is extremely low, DTFs must have a plan in the event that such patients do present.

a. Patient Decontamination. Decontamination of patients, dental patients included, is an absolute requirement before admission into a clean MTF. Contaminated patients are triaged and decontaminated before treatment (except for life- or limb-saving care). Both triage and decontamination should be accomplished as far forward as possible. Specific details on patient decontamination are in Appendix E. It is important to note that medical or dental personnel do not perform normally patient decontamination. Initial decontamination at the basic skill level is accomplished at the casualty's unit. Detailed patient decontamination is accomplished by the patient decontamination teams (made up of nonmedical personnel from the supported units) that are supervised by medical personnel at the MTF.

b. Patient Decontamination at Dental Treatment Facilities. Neither dental units nor their DTFs are equipped for patient decontamination. Any contaminated patients arriving at a DTF requiring urgent attention must be directed or evacuated to the nearest MTF with a patient decontamination capability.

A-45. Patient Protection

Dental treatment facilities must also consider the need to protect patients in their care in the event of an NBC attack, or when the threat of an attack is high. Special consideration must be made for maxillofacial patients whose condition prevents them from wearing their protective mask.

a. Immediate Response. In the event of an attack or when the alarm sounds, dental treatment providers immediately cease work and mask. The patients should do likewise. Only after putting on their own masks, do the dental treatment providers assist the patient, if necessary, by removing materials that impede the patient's masking. Only those materials that impede masking or may compromise the airway (such as rubber dam frames or impressions) are removed, the rest are left in place until the all clear is sounded. Special attention must be given to patients who may have been medicated into a less than fully conscious state, or are otherwise incapacitated.

b. Mission-Oriented Protective Posture Considerations. The MOPP level should be taken into account when determining the category and extent of dental treatment to be provided. Patients, including those seated in the dental chair, should be at the MOPP level prescribed for the DTF by its parent headquarters. Dental treatment at MOPP Levels 3 and 4 is, of course, impossible because of the requirement to wear the protective mask; however, treatment is still possible at MOPP Levels 0, 1, and 2. Treatment at MOPP Level 2 should be limited only to emergency care requiring urgent attention. At MOPP Level 1, most types of dental emergencies can be accommodated; however, only minimal essential treatment should be undertaken in order to reduce risk of the patient being caught in a compromised state. At MOPP Level 0, the provision of dental treatment generally is not limited. However, the degree of the NBC threat forecast for the area should be considered before undertaking extensive treatment.

c. Maxillofacial Injuries. Patients with maxillofacial injuries that prevent proper fit and seal of the individual protective mask must be placed in a PPW. Though patients with these

types of injuries are most likely to be found only in MTF channels, DTFs should nevertheless be prepared in the event a patient presents to the DTF. Since the DTF does not have any PPWs; these patients should be immediately evacuated to the adjacent MTF for treatment.

SECTION 8

COMBAT OPERATIONAL STRESS CONTROL

A-46. General

When operating under the threat of or under actual NBC conditions, soldiers will be at a high risk of suffering combat operational stress-related conditions. The invisible, pervasive nature of these weapons creates a higher degree of uncertainty and ambiguity, presenting fertile opportunities for false alarms, mass panic, and other maladaptive stress reactions. Therefore, commanders and leaders must take actions to prevent and reduce the numbers of combat operational stress cases in this environment. The symptoms and physical signs caused by excessive stress are similar to some signs of true NBC agent injury. In World War I, inexperienced units initially evacuated two stress cases for every one true chemical casualty. Some minor chemical casualties also had major stress symptoms. Therefore, far forward triage is essential to prevent over evacuation and loss of the individual to the unit. For details on provision of COSC see FM 8-51 and FM 22-51.

A-47. Leadership Actions

a. *Keep Personnel Informed of the Situation.* Keep information flowing, dispel myths, and control rumors by—

(1) Discussing the situation and its possible long-term implications honestly.

(2) Maintaining the perspective that the best chance for mission accomplishment is assured when the unit and the Army stays mission focused.

b. *Train Soldiers to Survive.* Use training procedures that—

- Tell the lessons of history on NBC weapons employment. Show that the enemy's use of NBC weapons/agents will not give him enough advantage to justify the risk to his forces.

- Increase the chance of surviving and winning should the enemy use NBC weapons/agents.

- Emphasize the buddy system as a means of keeping watch for each other. Personnel must always seek buddy aid before taking additional antidotes. This will reduce the numbers of individuals using their antidotes when not needed; and prevent the increased heat stress caused by the effects of atropine on the body's cooling capabilities.

c. *Put Nuclear, Biological, and Chemical Defense in Realistic Perspective.* Continuously strive to maintain a realistic perspective in the unit by—

(1) Comparing the risks of the threat with the increased risk of facing the conventional threat in varying levels of MOPP. The decision to initiate a MOPP level should be like deciding how much cover is needed to protect a unit from conventional weapons.

(2) Choosing the lowest MOPP level that protects the unit, yet permits accomplishment of the mission. Do not try to be 100 percent safe from chemical attack if it means that there is—

- Only a small chance of mission accomplishment.
- A high probability of being killed by the enemy.
- A high personnel loss due to heat injury.

d. *Train in the Protective Mask.* Train in the protective mask often. It takes repeated wear and time to acclimate and get over the claustrophobic feeling of wearing the mask. The training can be conducted during a variety of activities.

(1) Have personnel wear the mask often in garrison or during lulls in other activities, even at desk jobs. If on average, one person in five wears the mask, on a rotational basis, at any given time, everyone will quickly become accustomed to wearing it.

(2) Periodic prolonged wear (8 hours or more) helps soldiers gain confidence and realize that they can tolerate the discomfort.

(3) Have personnel wear the mask while performing combat-related (mission essential) tasks.

e. *Train in Mission-Oriented Protective Posture Level 4.* Training in MOPP Level 4 (or simulated MOPP 4, which is to overdress while wearing the protective mask, over boots, and gloves) will increase personnel confidence in their ability to wear the ensemble.

f. *Ensure Sleep Plans are Safely Practiced.* Have everyone practice wearing the mask while sleeping. Ensure personnel only sleep in safe places; do not allow personnel to sleep under or near vehicles or other motorized machinery. Require ground guides for all vehicles in the unit bivouac area. Ensure that each individual get at least 4 hours of uninterrupted sleep during every 24-hour period, mission permitting (See FM 21-10).

A-48. Individual Responsibilities

a. Follow Orders. By following orders, individuals can increase their ability to cope with and prevent combat operational stress-related conditions. Coping with the stresses of an NBC environment requires extra individual action. Concentrate on the positive aspects of survival, not the negatives of illness or death.

b. Train. Use every opportunity to wear the protective mask or the entire MOPP ensemble during training, when permitted. You build self-confidence and endurance by frequently training with your protective mask, or at MOPP Level 4. Perform refresher training in basic NBC survival skills.

c. Use Buddy System. Use the buddy system to increase your ability to survive. Service members looking out for each other give a sense of security that relieves stress. Looking out for each other improves every individual's ability to perform his duties.

A-49. Mental Health Personnel Responsibilities

a. *Staffing for Combat Operational Stress Control.* The following activities or units provide combat operational stress control:

(1) Brigade mental health section.

(2) Division mental health section.

(3) Area support medical battalion mental health section.

(4) Neuropsychiatry ward and consultation service of each CSH, field hospital, and general hospital.

(5) Medical detachment, COSC.

(6) Medical company, COSC.

b. *Conduct Preventive Activities*. In an NBC environment, prevention is the most economical means of controlling combat operational stress reactions. Mental health personnel must begin consultation services before NBC weapons/agents have been employed.

c. *Control Stress Reactions.* Individuals with combat operational stress reactions require prompt intervention. The evaluation of over-stressed personnel is difficult but not impossible when both the soldier and the evaluator are in MOPP. The primary method of mental health evaluation is the interview and mental status examination. For details on controlling stress reactions, see FM 8-51.

SECTION 9

HEALTH SERVICES LOGISTIC

A-50. General

As in all combat situations, the protection of medical supplies and equipment on the integrated battlefield is a must. Without medical supplies and equipment, HSS will be greatly diminished. Thus, the flow of supplies must continue to forward units as they are requested, including during NBC operations. For detailed information on providing health service logistics see FM 4-02.1 and FM 8-10-9.

A-51. Protecting Supplies in Storage

Protecting supplies can be accomplished by placing them under tents, using plastic wraps, or providing storage warehouses with CB filtered-conditioned (heated or cooled) air systems. Wrapping supplies in two layers of plastic material provides protection from most agents for a short period of time; the thicker the plastic material, the longer the protection. Effectiveness of protective procedures can be checked by placing M9 tape on supplies and between layers of the covering. Protection from the thermal and blast effects of nuclear detonations requires much more elaborate measures. Placing the supplies in trenches, inside earthen berms, behind stonewalls, or in other field expedient facilities will enhance the protective posture of supplies from the nuclear effects. Even when taking these protective measures, a quantity of supplies will become contaminated and must be replaced. Plans should be in place for replacement of lost items.

A-52. Protecting Supplies During Shipment

During shipment, supplies are protected by placement inside MILVANs, in covered enclosed vehicles, or by wrapping them in several layers of plastic, in tarpaulins, or in other protective material. To monitor exposure of supplies to chemical agents during shipment, place M9 detector paper between the wrappings. If exposure is limited to the outer layer, simple removal of this layer may be all that is required to eliminate the contamination. Decontamination is much easier when the supplies and equipment have been protected by multilayers of over-wraps.

A-53. Organizational Maintenance

Maintenance on vehicles, equipment, and medical equipment will become much more complex under NBC conditions. Most chemical agents are soluble in organic solvents such as gasoline, motor oils, and lubricants. The agent may be removed from the equipment by these solvents, but exposure to the contaminated solvents will produce the same effects as exposure to the agent on the equipment. The agents may seep down around the threads of bolts, in cracks and crevices of

the equipment, and inside the cabinets or enclosures of equipment. These potential contamination sources produce an increased hazard to maintenance personnel. Decontamination of some items, especially medical equipment, may be a problem for maintenance personnel. The use of standard decontamination agents will cause damage beyond repair to most medical equipment and electronic equipment. In some instances, removal of chemical agents will require aging (off-gassing) of the agent. Turning the equipment on and running it, or just exposing the equipment to warm air will speed the off-gassing process. Maintenance personnel must perform all procedures in MOPP Level 4 until decontamination is completed. Radiation will penetrate the metal structures of vehicles and other equipment; radioactive material will be absorbed into the lubricants and fuels. Decontamination of this type of contamination is very difficult, if not impossible. Personnel must use radiation detection equipment to determine the extent of contamination and decontaminate the items as much as possible. Dusting or washing with water can remove any fallout on the surface of vehicles and nonelectrical/electronic components of equipment. Removal of radioactivity absorbed into metals or mixed in lubricants and fuels is beyond the capabilities of unit personnel. See FM 3-5 for decontamination procedures.

SECTION 10

HOMELAND SECURITY RESPONSE

A-54. Chemical, Biological, Radiological, Nuclear, and High-Yield Explosive Response

Although, homeland security is not a specific military mission, commanders must plan for and be prepared to support a lead federal agency (such as the Federal Bureau of Investigation or Federal Emergency Management Agency) in response to chemical, biological, radiological, nuclear, and high- yield explosive (CBRNE) event. When the CBRNE event occurs on a military installation, the Weapons of Mass Destruction-Incident Support Team (WMD-IST) is the lead federal agency in charge of responding and establishes an incident command center (ICC). The installation medical authority (IMA) provides the HSS initial response to the event site. Request for assistance from deployable HSS organizations and staffs are initiated by the IMA through military channels. The incident commander will submit a request for HSS assistance to a CBRNE event off the military installation through the appropriate federal channels. The President will direct any DOD response in support of a lead federal agency to a CBRNE event. The Presidential direction to assist will be passed down through military channels to the appropriate HSS organization for response. The HSS response may be in the form of special medical augmentation teams response (SMART) support from US Army Medical Command resources or HSS (table of organization and equipment [TOE]) units may be directed to respond. Normally, responding TOE units will provide HSS to nonmedical military responders. However, the HSS mission may be to provide support to the lead federal agency or civilian public health organizations, emergency medical services (ambulance crews), or hospitals. The HSS response will include, but not be limited to—

- Providing medical care to casualties at the incident casualty decontamination site and supervising the casualty decontamination process to ensure that no further injury is caused to the casualty.

- Providing en route care for casualties from the incident site to an MTF or designated location for further care. Normally, TOE MEDEVAC assets are not used, but HSS personnel provide the en route care on locally provided transport vehicles.

- Providing guidance to local responders in the management of CBRNE casualties. The guidance may be on the correct use of antidotes, chemoprophylaxis, prevention of contamination spread in the MTF, patient decontamination at the MTF, and other related medical management procedures.

- Identifying suspect chemical, biological, or radiological materials used in the event.

- Providing guidance on application of standard precautions for CBRNE,

especially preventive measures to prevent spread of contagious agents.

- Managing, triaging, and treating mass casualties.

A-55. Capabilities of Response Elements

For detailed information on capabilities of SMARTs see FM 4-02 and FM 8-42. For detailed information on capabilities and functions of TOE HSS units see FM 4-02- and 8-series publications.

SECTION 11

DETECTION AND TREATMENT OF NUCLEAR, BIOLOGICAL, AND CHEMICAL CONTAMINATION IN WATER

A-56. General

Water supplies in areas with NBC contamination and in surface water supplied by runoff from such areas will most likely be contaminated. The contamination of water, whether intentional or inadvertent, may reach concentrations that will produce casualties. By special methods of analysis, the presence of contamination can be determined. Treatment of contaminated water requires chemicals and equipment that are only available to quartermaster water purification units; individuals or units should not attempt to treat their water. Decontamination of water is only undertaken when uncontaminated sources are not available; then ONLY with the approval of the medical authority (PVNTMED or surgeon).

A-57. Detection of Contamination in Water

a. Detection of nuclear contamination in water is accomplished by using the AN/PDR77, AN PDR/27 or AN VDR/2 radiacmeters.

CAUTION

DO NOT allow the probe to come into contact with the water source; allow at least one inch of air space between the probe and water surface.

b. Detection of BW agents in water is accomplished by the use of field biological water test kits and specially designed collection and detection kits. The specialty kits will be provided as needed, and will be available to PVNTMED and supporting medical laboratory personnel. When required for the President and Secretary of Defense purpose, samples must be collected and prepared for shipment to the supporting medical laboratory. A chain of custody document must be prepared by the collector and maintained as the sample(s) is being transported to the supporting medical laboratory and throughout its transit to the CONUS laboratory. See Appendix A Section 12 for details on suspect BW sample collection, packaging, chain of custody, and handling.

c. The Chemical Agent Water Testing Kit, M272, provides a rapid field test to detect chemical agent contamination in water. The test must be conducted before the water is treated with chlorine; the chlorine will affect the accuracy of the test for chemical agents.

A-58. Procedures on Discovery of Contamination in Water

When contamination is discovered the following actions are taken:

a. Mark the water source, using the standard NBC contamination markers, and ensure that personnel do not consume the water until approved.

b. Notify the commander that the water source is contaminated and unfit for drinking, food preparation, and personal hygiene.

c. Notify the supporting water production unit, such as the quartermaster water production and distribution unit of the contaminated water source.

d. The commander establishes safeguards to prevent personnel from using the contaminated water supply.

e. An alternative source of uncontaminated water is sought and used. The primary source for obtaining water is from quartermaster-operated water production and distribution points. Other sources are considered only when quartermaster-operated facilities are not available. Alternative sources that may be considered include—

- Ground water sources that are least likely to be contaminated.
- Local fixed facility water supplies. However, these supplies must be tested before use. If NBC contamination is found do not use.
- Using another location to obtain an uncontaminated water source, when the tactical situation permits.

f. Contaminated water must not be used until quartermaster water production and distribution units or other equally capable water purification units have treated it and approved for use by the medical authority.

A-59. Treatment of Contaminated Water

Contaminated water requires additional equipment and supplies to remove the contamination. Quartermaster water purification and distribution units are equipped to perform these duties. See FM 10-52 for details.

SECTION 12

EMPLOYMENT OF CHEMICAL AND BIOLOGICAL COLLECTIVE PROTECTION SHELTER SYSTEMS BY MEDICAL UNITS

A-60. General

To continue the HSS mission under CB conditions, MTFs must search out contamination free areas or employ the chemically protected (CP) deployable medical systems (DEPMEDS) systems. Levels I and II MTFs may be able to locate contamination free areas; however, due to the mobility limitations of hospitals, they must always be prepared to operate under CB conditions if the area is under attack. Systems that can be employed as an MTF (Levels I, II, III, and IV) are described in this appendix.

A-61. Types of Collective Protection Shelter Systems

a. The CBPS system is employed at the level I MTF, level II MTF, and FST. The CBPS is attached to the hard-walled box on the rear of a high mobility multi-purpose wheeled vehicle (HMMWV). The level I MTF will have one CBPS system per treatment team; the level II MTF will have four CBPS systems; the FST will have three CBPS systems. Also, systems will be issued to other selected medical treatment teams. When employed at the level II MTF, the patient holding team will also require GP tents to hold their required number of patients (see Appendix A Section 3). Patients held inside the CBPS will be those that have been decontaminated and admitted into the system for treatment and are recovering from the treatment procedures and are awaiting evacuation. Any patients held in the GP tent must remain in MOPP Level 4 (the GP tent will not have collective protection); these patients are those that are expected to RTD within 72 hours.

NOTES

1. Normally, patients will not be held at the DCS under NBC conditions unless evacuation cannot be accomplished. They should be RTD or evacuated to a clean MTF, as soon as the mission permits.

2. The CBPS can also be employed as the DCS in the conventional mode. Employment in either mode still requires GP tentage for patient holding to meet total patient holding requirements.

b. The DEPMEDS-equipped patient care areas of the US Army Force XXI hospital and the hospital unit base (HUB) of the Medical Force 2000 (MF2K) will employ the CP

DEPMEDS. It will not protect personnel or patients from the thermal, blast, and initial radiation effects of nuclear weapons; however, it will provide some protection against fallout effects. Areas of the hospital that are not included in the chemically protected (CP) DEPMEDS are MF2K general hospital unit medical (HUM), MF2K field hospital unit holding (HUH), MF2K combat support and general hospital unit surgical (HUS), minimum care wards, administrative areas, food service, supply (including Class VIII), and staff quarters. The system includes—

- Chemically/biologically protected liners for tent, expandable, modular, personnel (TEMPER) and passageways.

- CB-filtered and conditioned (heated or cooled) air (field deployable environmental control unit [FDECU] or H80 Army Standard Heater).

- Chemically/biologically protected ambulatory, litter, and supply air locks.

- Chemically/biologically protected latrines.

- Chemically/biologically protected seals for ISO shelters.

- Chemically/biologically protected water supply system.

c. The M20 simplified collective protection system is another system that is available. It consists of a chemically protected room liner, a CB filter blower, and an ambulatory air lock. However, it does not have a litter air lock making it unsuitable for litter patient care. The M20 may be used to protect medical staffs at the level I MTF, FST, and hospitals, patients held in the GP tents at the level II MTF and in the minimum care wards and staff quarters of the hospitals. Thus providing additional CB protection for staffs and patients.

Section 12. An EMPLOYMENT OF THE CHEMICALLY BIOLOGICALLY PROTECTED SHELTER SYSTEM

A-62. Establish a Level I MTF in a Chemically Biologically Protected Shelter

To establish a level I MTF in a CBPS, use one CBPS per treatment team for conventional operations in a split team mode. When operating in a squad configuration and in the conventional mode, the two CBPS systems may be complexed to provide more workspace. However, keep in mind that the treatment squad is not staffed to operate the two systems in the CB mode. Therefore, when the two systems are complexed and the treatment squad must convert and operate in the CB mode, they may want to close the complexing door and only use one system. When initially setting up the CBPS for operations in the CB mode, only one CBPS is setup; see Note 2 below. Set up the system as described in technical manual TM 10-5410-228-10. To be operational as a level I MTF, set up medical supplies and equipment as required or as designated in the TSOP. A PDS consisting of a contaminated ambulance point, contaminated triage point, a patient decontamination area, and a contaminated treatment area is established on

the downwind (prevailing wind) side of the CBPS. An overhead cover of plastic sheeting (approximately 20 feet wide by 50 feet long) is set up over the PDS, the hot line, and the clean treatment/waiting area; the cover overlaps the air locks. The clean treatment/waiting area should have an area at least 20 feet wide by 15 feet long to allow space for placing patients into the litter air lock without crossing the hot line. A second area covered with 20 x 25 feet of plastic sheeting (the evacuation holding area) is set up beside the shelter on the opposite side from the generator. The clean treatment area is separated from the decontamination area by a hot line with a shuffle pit. Only clean (decontaminated) patients or personnel are allowed to cross the hot line into the clean treatment area, or are admitted into the CBPS. Figure A-1 presents one layout of a level I MTF using the CBPS. See TM 10-5410-228-10 for complete details on setting up, operating, and maintaining the CBPS. Each CBPS provides 300 square feet of work area.

NOTES

1. The overhead cover is not needed when the wind speed exceeds 10 knots per hour. The plastic will not stay in place.

2. Although each treatment team of the level I MTF has a CBPS; only one system is set up when operating in the CB mode. This is due to the lack of authorized personnel to operate all systems at one time in the CB mode. **Eight medical** personnel are required to operate the level I MTF (employing one CBPS) in the CB mode. At least eight nonmedical personnel are required to perform patient decontamination **under medical supervision.** Also, only setting up one system in the CB mode provides the level I MTF the ability to retain its flexibility in order to maintain its support mission of being where it is needed and when it is needed. The CBPS can be used as the treatment shelter in the conventional mode as well. When the treatment squad is operating in the split-team mode, each team will have a CBPS for use as its treatment shelter. When operating one system in the CB mode, the other system provides a replacement in the event the one in use in the CB mode is damaged beyond repair. This ensures continued HSS to the command.

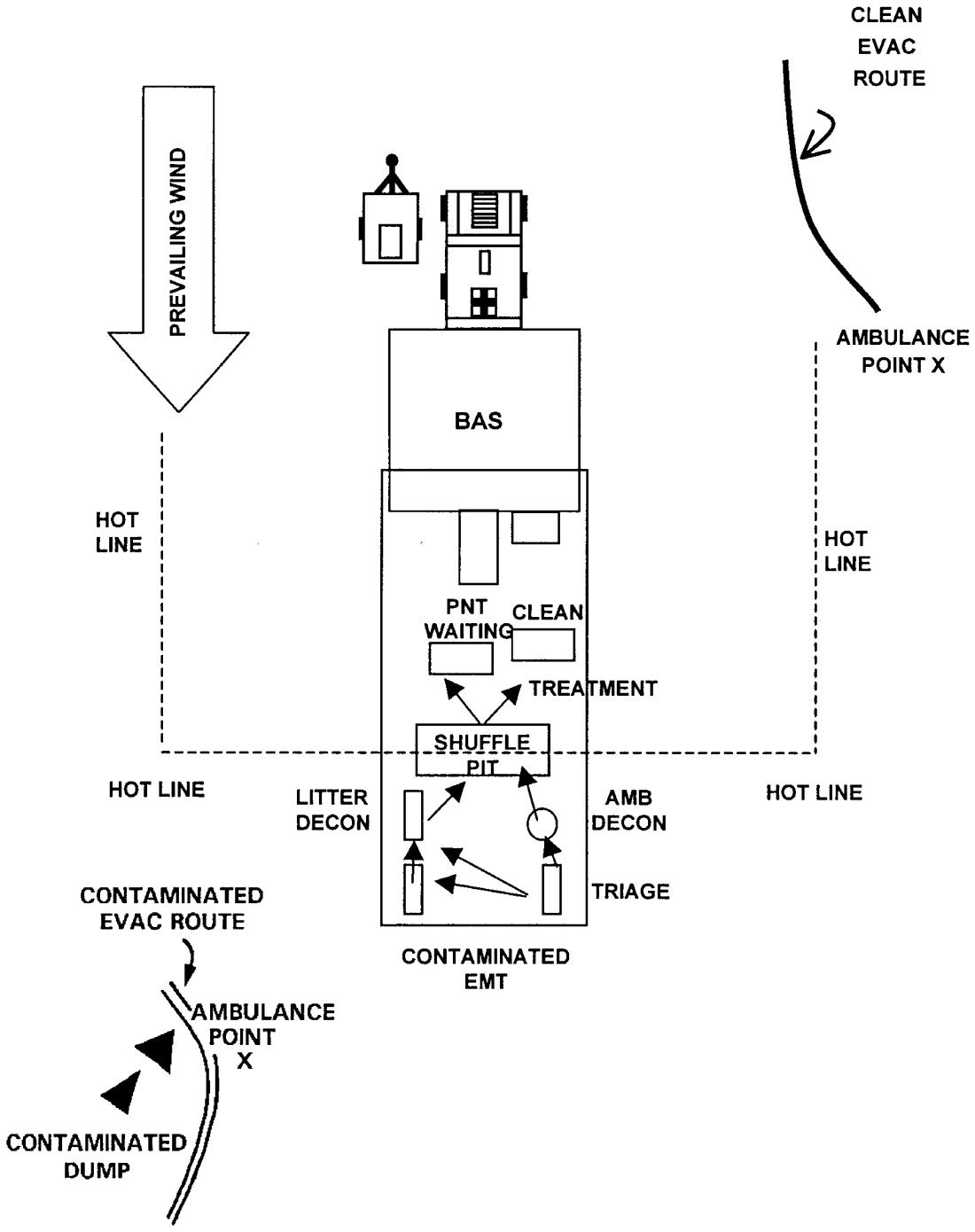


Figure A-1. Battalion aid station using the chemically biologically protected shelter.

A-63. Level II MTF in a Chemically Biologically Protected Shelter

To establish a level II MTF using the CBPS, set up four shelters as described in the TM. To be operational, medical supplies and equipment are set up as outlined in the unit TSOP. The four shelters are complexed as shown in Figure A-2. With four CBPS systems set up and operational, a total of 1,200 square feet of work area is available. The contaminated triage, decontamination, and contaminated treatment areas are separated from the clean treatment/waiting area by a hot line with a shuffle pit. Overhead covering is provided as described for the level I MTF. Patients are admitted through the EMT litter or ambulatory air lock. Patients are released through the patient holding air locks. These aids in controlling entry and exits; thus preventing the introduction of contamination into the systems. At least eight nonmedical personnel from supported units are required to perform patient decontamination under medical supervision at the level II MTF.

NOTE

In the event that the overpressure system fails on a system that is in use with entry/exit air locks, move to the available shelter with an entry/exit air lock in the same direction for use as the entry/exit until the failed system can be restored. Example 1: At the level II MTF the EMT system fails, move to the ATM shelter to receive patients until the EMT system has been restored. Example 2: At the level II MTF the patient hold system fails, move exits to the dental/lab/x-ray shelter until the patient hold system can be restored. Example 3: At the FST the postoperative system fails, use the preoperative shelter until the postoperative system can be restored. These options will allow patient care operations to continue until the failed systems can be restored.

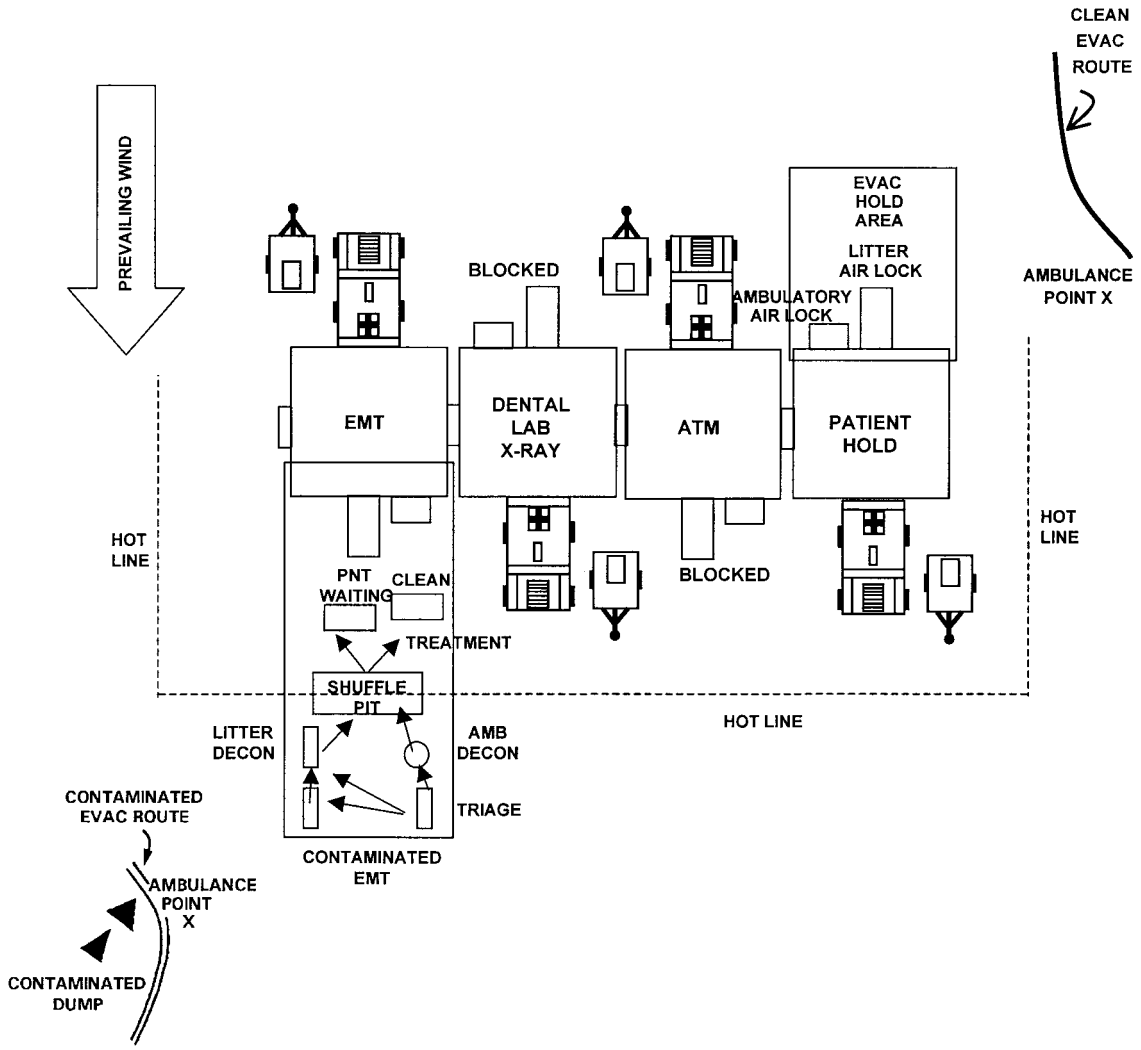


Figure A-2. Chemically biologically protected shelter configuration as a division clearing station.

A-64. Forward Surgical Team in a Chemically Biologically Protected Shelter

To establish a FST using the CBPSs, follow the procedures for the level II MTF except set up three CBPSs. All equipment is set up inside the CBPS as required by your unit TSOP. With three CBPSs set up and operational, a total of 900 square feet of work area is available (Figure A-3). When the FST is forward in support of a medical company and operating in the CB mode, the FST systems are connected to the level II MTF of the supported medical company. Figure A-4 shows the FST and level II MTF connected. When operating in the CB mode with the medical company, all patients are received through the EMT air lock of the level II MTF. The patients are triaged in the level II MTF and, based upon their injuries, they are routed to the level II MTF treatment area or to the FST for surgical care. Patients released from the FST for evacuation are placed in a PPW and processed through the litter air lock in the FST recovery section. Patient decontamination is performed at the PDS operated by the level II MTF. The FST cannot operate in a CB environment without being complexed with the level II MTF. They

do not have any patient decontamination capabilities.

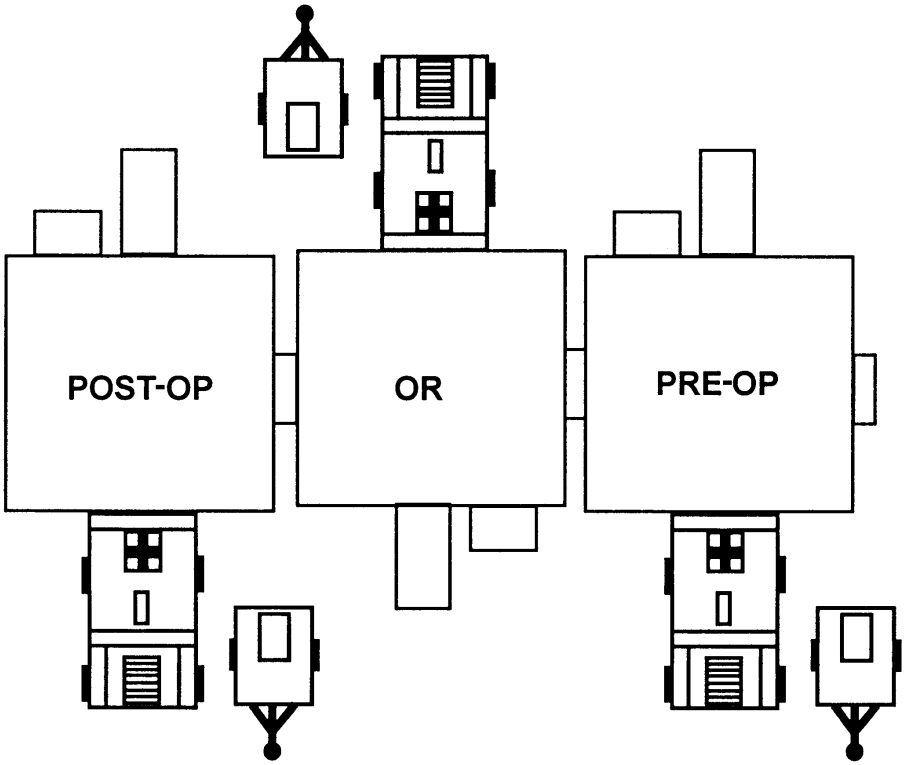


Figure A-3. Forward surgical team configuration for operations in conventional mode.

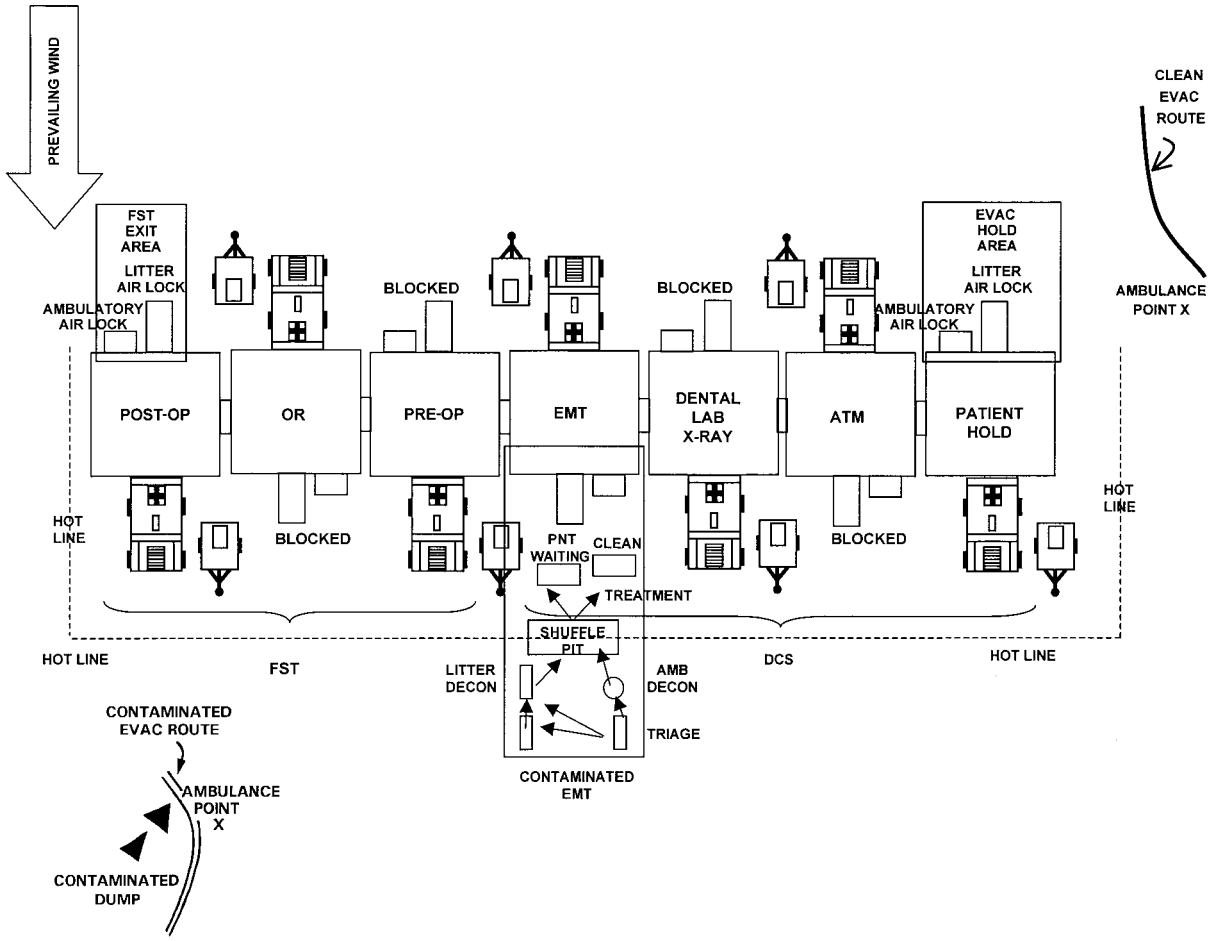


Figure A-4. Forward surgical team and division clearing station configuration for operations in a nuclear, biological, chemical environment.

Section 12.B EMPLOYMENT OF THE CHEMICALLY PROTECTED DEPLOYABLE MEDICAL SYSTEMS AND SIMPLIFIED COLLECTIVE PROTECTION SYSTEMS

A-65. Collective Protection in a Deployable Medical System-Equipped Hospital

a. When the threat of NBC action is anticipated in the AO, the CP DEPMEDS components must be set up as the hospital is being established. The system cannot be set up in a hospital that has already been established; to do so requires the hospital to be closed, all TEMPERs be struck, and erected with the M28 liners installed during the erection process. To establish CPS in a DEPMEDS-equipped hospital, follow the procedures as described in TM 10-5410-283-14&P. Training Circular 8-13 provides instructions on establishing a US Army DEPMEDS-equipped hospital (without CPS). Figure A-5 presents one layout of the DEPMEDS-equipped patient care area of a MF2K CSH HUB employing the CP DEPMEDS with an internal water supply system. Figure A-6 presents a layout of the patient care area of the

DEPMEDS-equipped portion of an 84-bed MRI hospital. Figure A-7 presents a layout of the patient care area of the DEPMEDS-equipped portion of a 164-bed MRI hospital.

b. When employing CP DEPMEDS, provisions for waste disposal and protected water and food supplies within the system are established. Additionally, Class VIII supplies must be protected from contamination. Supplies not in use or needed in the protected operational areas are stored in medical chests, shipping containers, or wrapped in layers of plastic that are inside covered areas, such as closed MILVANs or tents. When contamination is present, only open these storage areas for operational area emergency resupply. Use plastic sheeting or other leak-proof material to provide an additional barrier between the supplies and the contamination. Wrap supplies in plastic or other barrier material for movement from the storage area to the resupply air lock of the CP DEPMEDS.

- A water supply system with distribution hoses is established inside the CP DEPMEDS areas (Figure A-5). Pumps continuously circulate the water from the storage tank through the hose system back to the storage tank. The continuous circulation ensures that the chlorine residual is maintained in the water supply. Personnel in areas that are not included in the continuous flow system must draw water from the system and carry it to their work areas in 5-gallon water cans or other containers. Water resupply is accomplished by passing a hose through the utility port at the end of the TEMPER and M28 liner for a connection to the water transport vehicle. The ends of both hoses must be decontaminated with a 5 percent chlorine solution before connecting them together. The vehicle must have a tank or water supply container that is NBC protected to ensure that the water supplied is free of NBC contamination.

- Rations, as determined by the hospital commander, should be available within the protected area for personnel and patients. Under emergency conditions the commander can authorize feeding patients MRE rations for limited periods of time (up to 72 hours), if they are able to chew and swallow. However, attempts must be made to ensure the required types of rations for patient feeding are available in the CPS. The rations can be stored in any available space; however, the rations must be protected from exposure to possible contaminants, especially liquids. Ration control measures are established to ensure that the rations are only consumed as provided for in the hospital TSOP.
- Two CB protected latrine systems are included in the CP DEPMEDS. The latrines contain bedpan wash areas. The waste from the latrines is collected in an outside receiving container. The waste is removed from the container and disposed of as outlined in the unit TSOP.

- Solid waste (including medical) must be placed in plastic bags. Seal the top of the bags to prevent spillage, odors, or spread of infections/disease. **NEVER** overfill the bags; always leave enough room in the bag to make a good seal. Place the sealed bags in the supply air lock. Inside personnel close the inner door to the air lock. Outside personnel check to ensure that the inner air lock door is closed before opening the outside door. Remove the bags and take them to the designated waste collection/disposal site. Disposal may be by burial on site or by transport to a designated disposal facility. Transport may be by organic vehicles or contractor support vehicles. The specific technique for disposal will be outlined in the unit TSOP.

- All liquid waste produced within the CP DEPMEDS is collected through a piped liquid waste system to a central collection container. The waste container for the latrines may be used to collect the liquid waste from the operational areas of the CP DEPMEDS. The container is emptied and the waste disposed of as outlined in the unit TSOP.

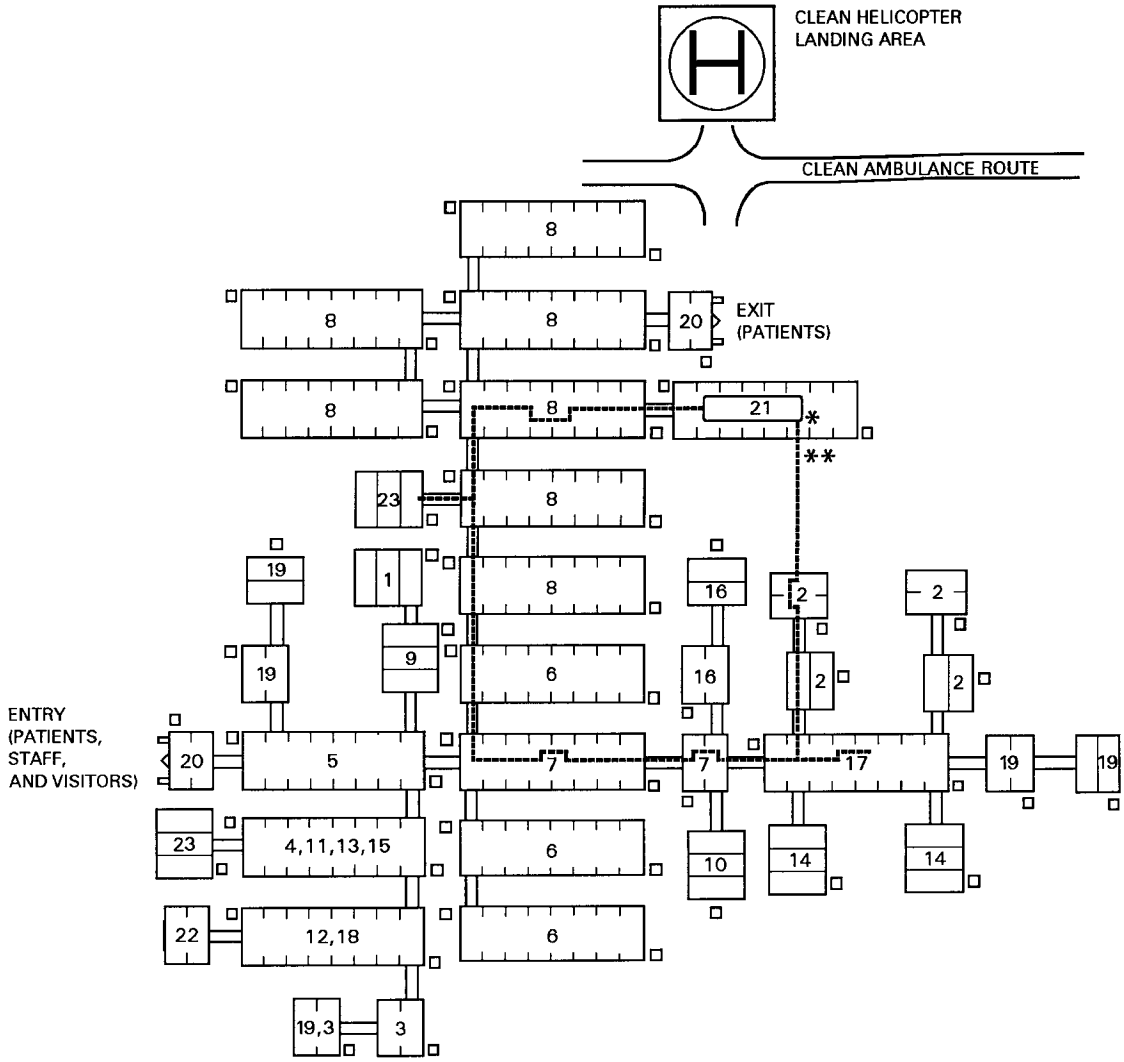


Figure A-5. Sample layout of a medical force 2000 combat support hospital unit base employing chemically protected deployable medical system with internal water distribution system.

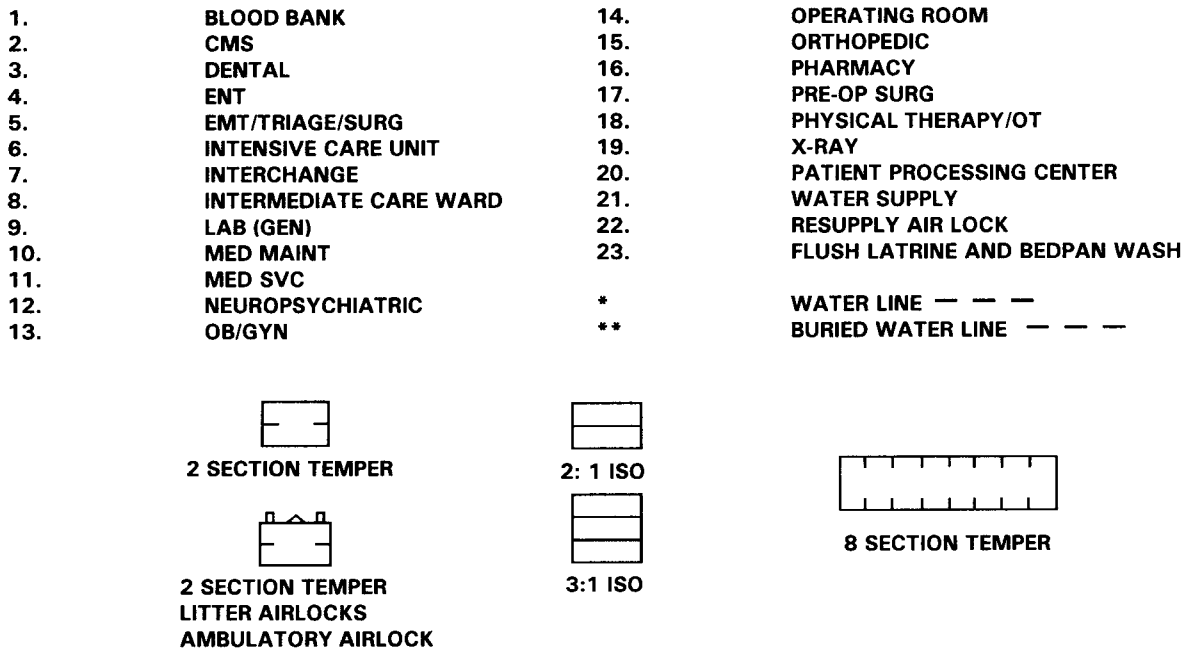


Figure A-5. Sample layout of a medical force 2000 combat support hospital unit base employing chemically protected deployable medical system. (*Continued*)

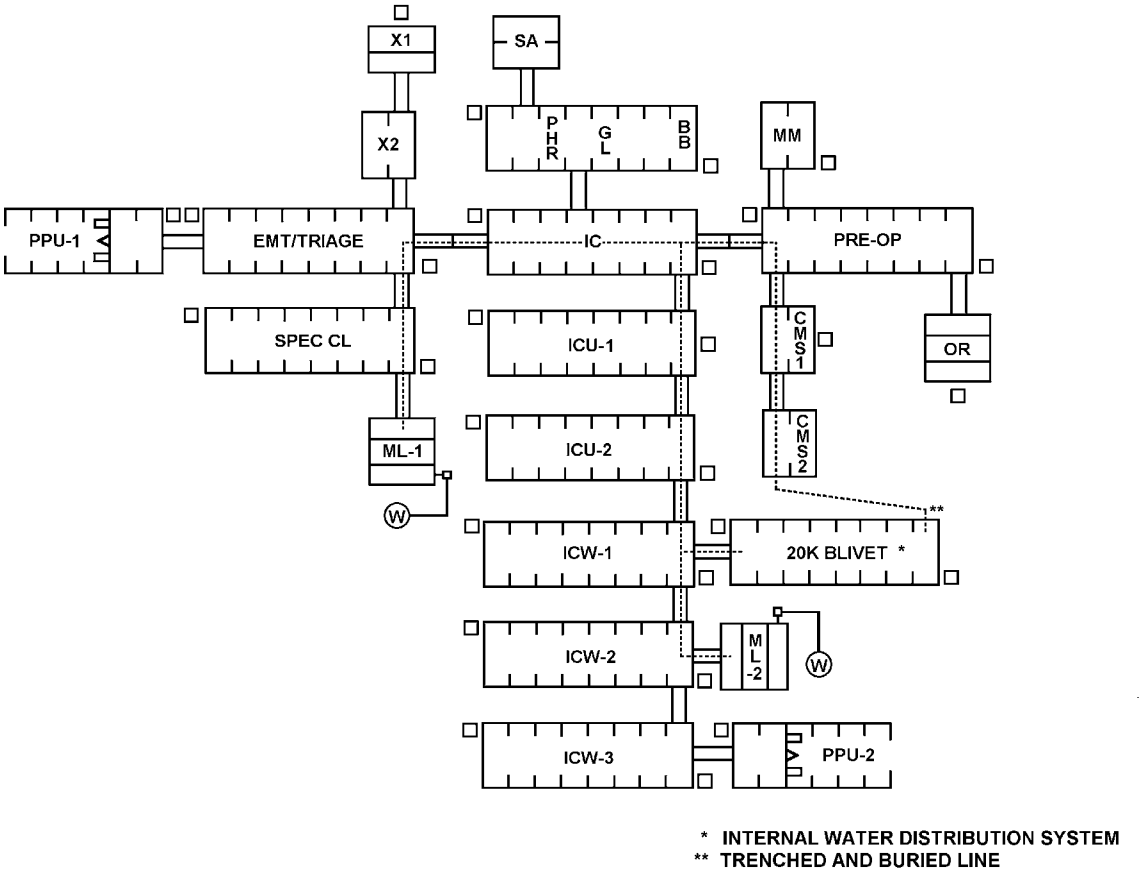


Figure A-6.A Sample layout of an 84-bed medical reengineering initiative hospital employing chemically protected deployable medical system with internal water distribution system

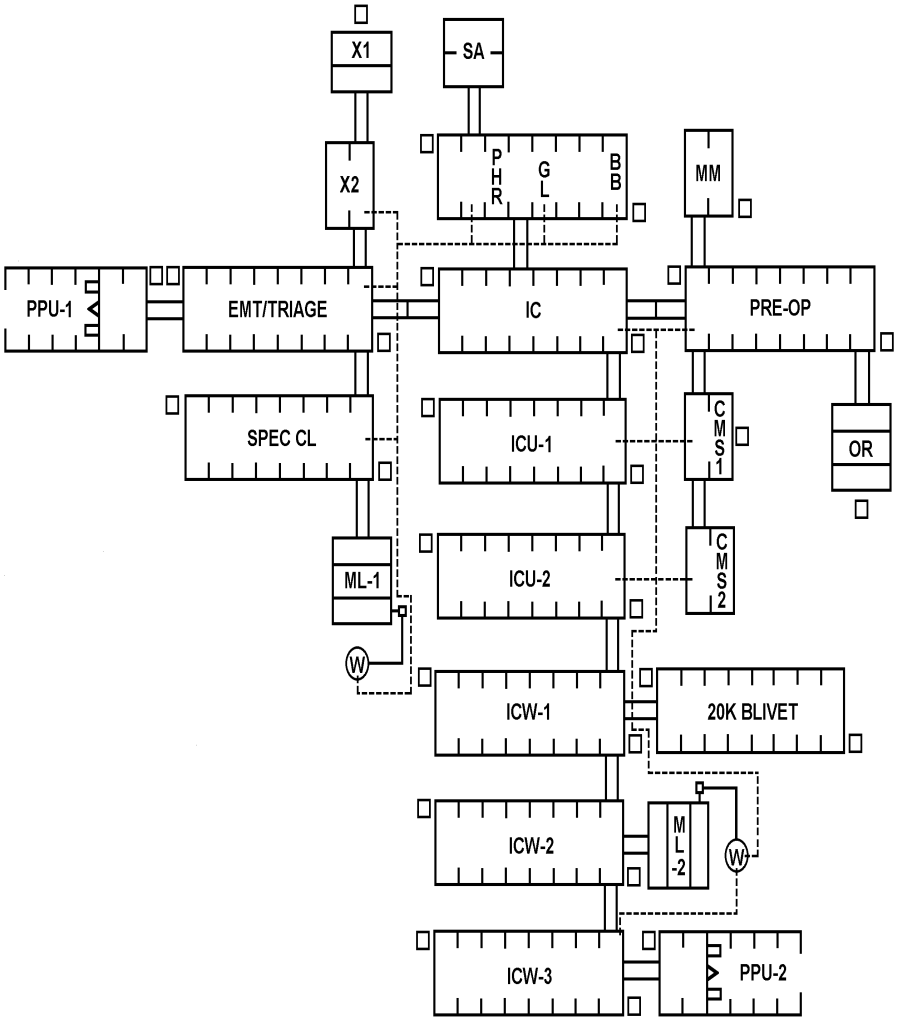


Figure A-6.B Sample layout of an 84-bed medical reengineering initiative hospital employing chemically protective deployable medical system with external waste water collection.

PLACEHOLDER

Figure A-6.C Legend for 84-bed medical reengineering initiative hospital

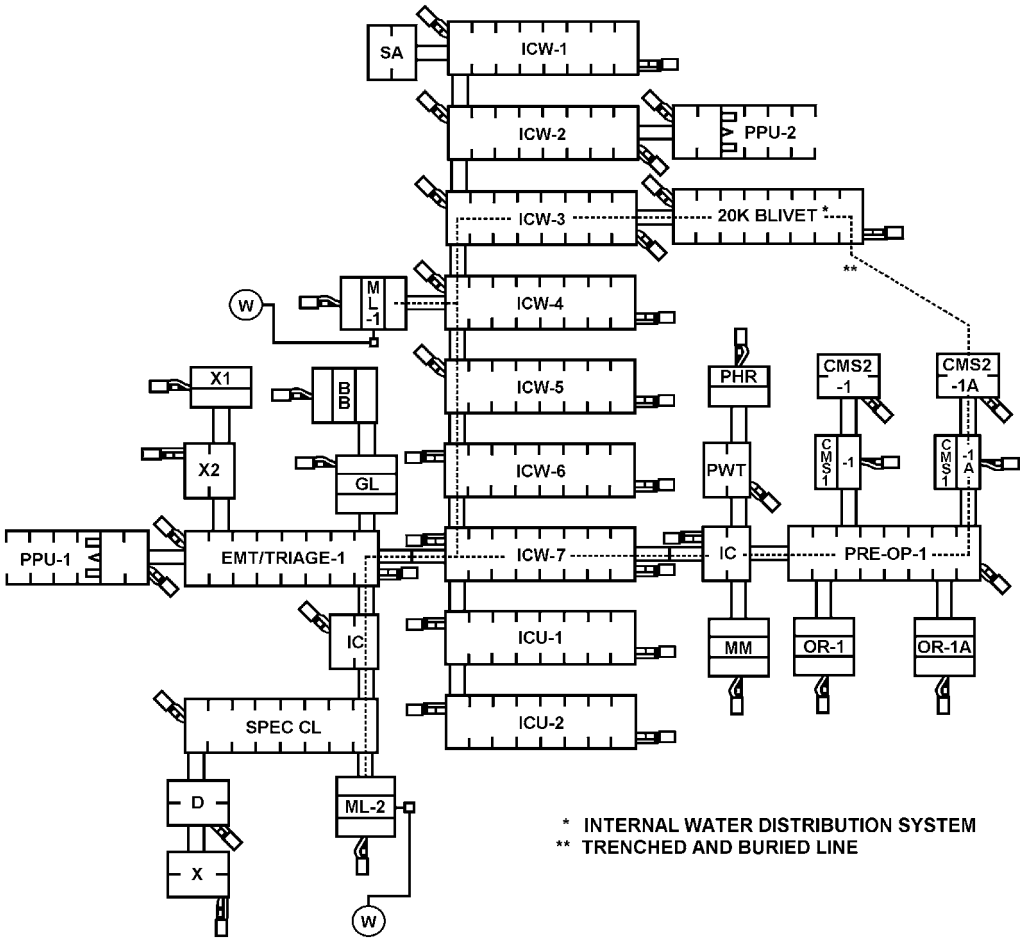


Figure A-7.A Sample layout of a 164-bed medical reengineering hospital employing chemically protected deployable medical system with internal water distribution system

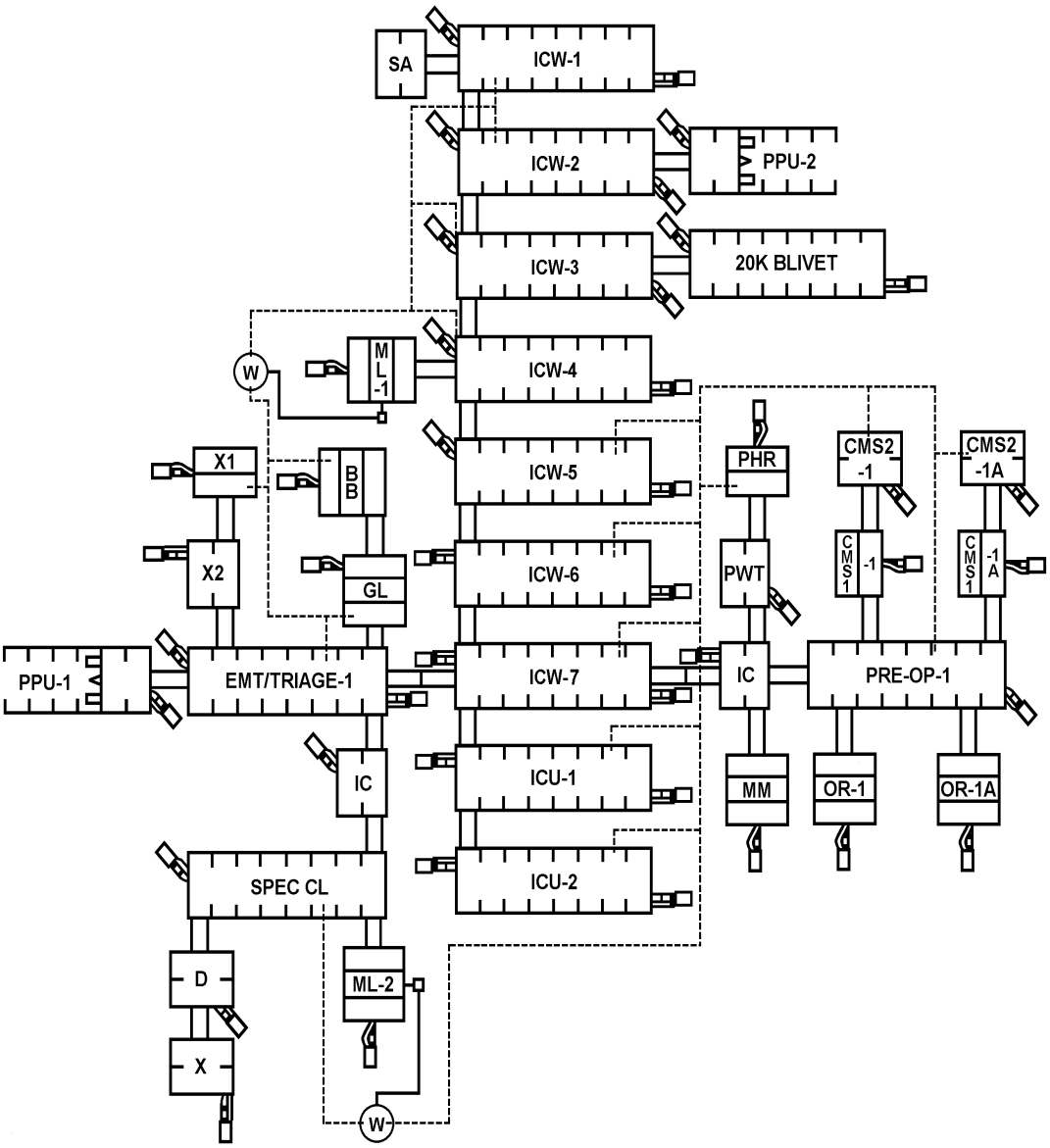


Figure A-7.B Sample layout of a 164-bed medical reengineering initiative hospital employing chemically protected deployable medical system with external waste water collection.

PLACEHOLDER

Figure A-7.C Legend for 164-bed medical reengineering initiative hospital.

A-66. Chemically/Biologically Protecting the International Organization for Standardization Shelter

To chemically/biologically protect the ISO shelters, seal all seams and openings of the ISO to prevent the entry of CB agents. The seals connecting the various sides and floor of the shelter may be a CB protected material; thus providing a seal to the shelter. When the seals are not of a CB protected material, the seams must be taped to provide a CB protected barrier over the soft seals. Any openings not being used for introduction of support power lines, water lines or waste water lines must be sealed to prevent entry of CB agents. All access panels must be securely closed to prevent entry of vapors.

A-67. Chemically/Biologically Protecting the Vestibules

The vestibules connect TEMPERs to TEMPERs, ISOs to ISOs, and ISOs and TEMPERs. To harden the vestibules, install the CB liners inside and fasten the ends to the liners of the TEMPER or to the doors of the ISOs. Vestibule liner connectors are provided for use at the entry of each ISO.

A-68. Chemically/Biologically Protecting Air Handler Equipment

a. The FDECU is chemically/biologically protected. The system can be operated without the CB filters. When required to operate in the CB mode, the fresh air intake on the FDECU is closed and the CB filter blower is turned on drawing fresh air through the filters to support the FDECU and to provide clean air for the CPS. Additionally, recirculation filters are placed within the shelter system to remove any agent that may have entered through any of the entry/exit areas or through breaches in the shelter system.

b. When heaters are required, they must be chemically/biologically protected to prevent entry of contamination. The CB filter units are connected to the fresh air intake side of the heater and the heated air discharge side of the heater is connected to the air supply of the TEMPER/ISO.

A-69. Establish Collective Protection Shelter Using the M20 Simplified Collective Protection System

The M20 is used to establish a CPS within a room of opportunity, or inside a tent; however, the available space will be limited by tent poles and other components of the tent. Currently this system only provides ambient temperature air. See the TM and manufacturer's publication provided with the system and system components for details.

NOTE

The M20 does not have a litter air lock. Only staff or ambulatory patients can enter. See the TM provided with the system for setup procedures.

A-70. Casualty Decontamination

Patients admitted into the MTF must be contamination free. Therefore, a casualty decontamination area must be established near the MTF. The casualty decontamination area should be provided with an overhead cover as described for the CBPS system, except that it does not overlap the entry to the hospital. Also, consideration must be given to the location of other operations at the hospital site when establishing the casualty decontamination area. However, the area must be close enough to the entry/exit of the CPS to protect the patients from the environment and reduce their exposure to recontamination. Keep in mind that under NBC conditions personnel outside of the CPS are at MOPP Level 4 (except decontaminated patients; they have their mask on), thus increasing the stress load and reducing their overall performance capabilities. The entry/exit area must have overhead cover to protect patients awaiting access to the CPS. See Appendix E for setting up a casualty decontamination area and for decontamination procedures.

Section 12.C OPERATIONS, ENTRY, AND EXIT GUIDELINES

A-71. Operations

These operations, entry, and exit guidelines may be used to prepare a unit SOP for the operation of CPS systems in your unit.

a. When using these guidelines, the following should be considered:

- Location of the shelter (flat, hilly, rocky ground).
- General climate of the AO (high and low temperature variations during operation).

b. Information on setting up, striking, and operating the CPS is contained in the equipment publications. Where applicable, special procedures are provided in these publications for setting up in both clean and CB vapor hazard areas. However, the CP DEPMEDS is **NOT** set up in a CB vapor hazard area. The commander will determine which procedures to use.

c. During operations, periodic checks are made of the atmosphere within the shelter. These checks are made by using available chemical agent detection equipment and material to determine if chemical agent penetration has occurred. Should chemical agent penetration occur, all personnel must mask; then ensure that patients are protected until the agent has been purged

from the shelter.

A-72. Decontamination of Entrance Area

a. Normally, the MTF will not operate in a CB vapor hazard environment. However, if the MTF must remain in an area on a temporary basis and liquid agent contamination is present, the immediate area around the entrance must be decontaminated.

b. To decontaminate the area around the entrance, use one or more of the following methods:

- Turn over about 2 inches of soil.
- Remove the top 1-inch layer of soil containing the liquid agent. Use the CAM or M8 detector paper to check the area after the topsoil is removed to ensure complete agent removal.
- Add several inches of clean soil or sand.
- Mix STB into the top 1/2 to 1 inch of soil.
- Use DS2 on contaminated hard-surfaced areas or frozen ground.

A-73. Procedures Prior to Entry

All personnel (staff and patients) must be decontaminated before they are permitted entry into the CPS.

- Use chemical detection equipment to check for the presence of contamination on individuals and their equipment; also check for presence of contamination on individual weapons if they are allowed in the CPS. Normally, weapons will not be allowed in the patient care areas, but will be stored outside near the entry/exit. Thorough decontamination is critical in preventing contamination transfer into the CPS.
- When a chemical agent is detected, follow the procedures in Appendix E for casualty decontamination and FM 3-5 for other personnel decontamination before entering the CPS. All contaminated clothing and equipment are placed in the contaminated dump. Weapons should not have been evacuated with patients. However, if weapons are evacuated with the patient, they are decontaminated and held by the MTF (administrative personnel or hospital supply) for disposition instructions.
- Decontamination must be thorough; procedures must be strictly followed. Failure to do so can contaminate the interior of the MTF and injure medical treatment personnel; thus reducing their mission support capabilities.

WARNINGS

1. ALWAYS PURGE THE AIR LOCK BEFORE OPENING THE INNER DOOR, IF THE OUTER DOOR HAS BEEN OPENED.

2. WHEN OPERATING IN A TOXIC ENVIRONMENT, NEVER OPEN THE OUTER AND INNER DOORS OF THE AIR LOCKS AT THE SAME TIME.

A-74. Entry/Exit for the Collective Protection Shelter System

a. Ambulatory Personnel.

(1) *Entry procedures.*

(*a*) Ambulatory patients and others remove their MOPP (except their mask), BDUs, and boots outside the air lock. This procedure reduces the amount of possible contamination entering the air lock.

(*b*) A check is made to ensure that the ambulatory air lock is empty and the inner door is closed.

(*c*) The individual enters the air lock and closes the outer door.

(*d*) The air lock is purged for 3 minutes. At the end of the purge cycle, the individual checks for contamination. If contaminated, the individual must return to the outside and decontaminate his skin; then return to the air lock and repeat the purge cycle and contamination check. If no contamination is detected, the protective mask is removed and placed in a plastic bag. The plastic bag is sealed and labeled. The individual opens the inner air lock door and enters the CPS; the plastic bag is carried into the shelter with the individual.

(2) *Exit procedures.*

(*a*) A check is made to ensure that the ambulatory air lock is empty and the outer door is closed.

(*b*) The individual enters the air lock and closes the inner door.

(*c*) The individual puts on his protective mask; then exits through the outer door.

(*d*) The individual puts on his BDU and boots then assumes the established MOPP level before departing the immediate area of the exit door.

WARNING

DO NOT OPEN THE OUTER DOOR UNTIL THE PROTECTIVE MASK HAS BEEN PUT ON.

NOTES

1. Ambulatory patients that enter the CBPS become litter patients and are placed in PPW when released because the MTF does not have replacement MOPP ensembles for patient issue.

2. Exits must be spaced so that at least a 3 minute purge of the air lock is accomplished before the inside door is opened. Only open the doors long enough to permit passage.

b. Litter Patients.

(1) *Entry procedures.*

(*a*) An outside aidman notifies an inside aidman that a litter patient is ready for admission.

(*b*) The inside aidman ensures that the inner litter air lock door is closed. The outside aidmen open the outer air lock door and place the litter on the litter rails; they push the patient into the air lock headfirst; then they close the outer door. After a purge time of 3 minutes, an aidman inside the CPS opens the inner door and checks the patient to ensure that he is contamination free. Placing the CAM nozzle near absorptive surfaces, such as the patient's hair, checks the patient. If no contamination is found, the aidman removes the patient's mask and places it in a plastic bag. The inside aidmen remove the patient from the air lock and position him on treatment litter stands, or move him to the treatment area as directed by supervisory personnel.

(*c*) Patients received at the treatment facility in the PPW are checked for contamination; if they are contamination free, they may be processed through the litter air lock in the PPW. The inside aidmen ensure that the inner litter air lock door is closed. The outside aidmen open the outer air lock door and place the litter on the litter rails and push the patient into the litter air lock headfirst, then close the outer door. Purge the air lock for 3 minutes. After the purge time, an aidman inside of the CPS opens the inner air lock door and uses the CAM to check the patient to ensure that he is free of contamination. If no contamination is found, the inside aidmen remove the patient from the air lock. (If the patient is wearing a protective mask, the mask is removed and placed in a plastic bag before the patient is moved from the air lock.) As the patient is removed from the air lock, the PPW is opened and rolled inside out so that any

desorbing vapors are adsorbed by the charcoal layer. The inside aidmen remove the patient from the air lock and position him on litter stands. The patient is transferred to a clean litter; then moved to the treatment area as directed by supervisory personnel. The receiving litter and PPW is returned to the outside; dispose of the PPW in the contaminated waste dump. Decontaminate the litter and return it to the litter pool.

NOTE

Should contamination be found when monitoring the air lock in (*b*) or (*c*) above, repeat the purge cycle, then retest for contamination. All vapor hazards must be eliminated before the patient is moved into the CPS. Repeating the purge cycle may NOT be possible if the patient is in need of immediate lifesaving care. The patient may have to be returned to the outside treatment area for immediate care.

(2) *Exit procedures.*

(*a*) The litter patient is placed in a PPW. A battery operated blower unit with a CB filter is attached to the PPW to provide fresh air to the patient; thus reducing the heat load on the patient and the carbon dioxide buildup inside the PPW.

(*b*) An inside aidman notifies an outside aidman that the patient is ready to exit the shelter. An outside aidman ensures that the outer air lock door is closed. The patient is placed in the litter air lock feet first. The inner air lock door is closed. The outside aidmen open the outer door and remove the patient.

(*c*) Hospital staff, visitors, or ambulatory patients exit through the ambulatory air lock. Before entering the air lock, each individual must ensure that the outer air lock door is closed. The individual enters the air lock and closes the inner door; puts on his protective mask and exits through the outer door. The individual puts on his BDU and boots, and then assumes the established MOPP level before departing the immediate area of the exit door.

WARNING

1. DO NOT OPEN THE OUTER DOOR UNTIL THE INNER DOOR HAS BEEN CLOSED.

2. DO NOT ALLOW PATIENTS IN PPW TO REMAIN IN DIRECT SUNLIGHT FOR MORE THAN 5-10 MINS. REMAINING IN DIRECT SUNLIGHT CAN CAUSE SEVERE HEAT LOAD ON PARIENTS.

NOTE

Exits must be spaced at least 3 minutes apart to allow for a complete purge cycle of the air lock.

A-75. Resupply of Protected Areas

Resupply of protected areas is accomplished by placing contamination-free supplies or equipment on a litter and passing it through the litter air lock, or processing it through the supply air lock. The litter air lock must be purged for 3 minutes. The supplies must be checked for contamination before they are removed and placed within the CPS. The supply air lock must be purged for the stated time as outlined in the supporting technical manual; usually 45 minutes. Again the supplies must be checked for contamination before they are removed and placed within the CPS.

Appendix B
US Air Force Health Service Support

Section I

INTRODUCTION

B-1 Overview.

a. This appendix provides command and control as well as planning and logistical considerations for the Deployed Medical Commander (DMC). Air Force Medical Service NBC operations are organized in terms of force health protection concepts, casualty prevention, and casualty care. Casualty prevention operations are further categorized under the NBC passive defense concepts of contamination avoidance, protection, and contamination control. Casualty care operations include patient decontamination, triage, clinical care of NBC casualties, patient movement on the airbase, aeromedical evacuation, and restriction of movement/quarantine

b. Air Force Health Service Support (HSS) in a Nuclear, Biological, and Chemical (NBC) environment reflects the Air Force ground support operational environment. Air bases are lucrative targets for attack. Air force deployed medical facilities may be located near active airfields that are likely targets for military or terrorist NBC attack. Air Force Medical Service assets support the passive defense (PD) component of AF operational counter NBC doctrine (refer to AFDD 2-1.8, *Counter Nuclear, Biological, Chemical Operations*), as well as the tactical surveillance and identification components of the cross-cutting element of command, control, communication, computers, intelligence, surveillance and reconnaissance (C4ISR).

c. A chemical or nuclear attack may create mass casualties with both NBC and conventional injuries. This has the potential to significantly degrade operational tempo. Efficient management of NBC casualties minimizes combat capability degradation.

d. Routine disease surveillance information may be the sentinel indication of biological agent use. Early disease recognition enables effective intervention. A biological warfare attack may create a disease mass casualty situation in the Air and Space Expeditionary Task Force (AETF). The DMC has the core knowledge and competency for many biological warfare passive defense actions. The Air Force Medical Service fields deployable and forward-deployed assets that employ biotechnology to rapidly and accurately identify specific pathogens of military concern. This capability, coupled with health surveillance systems built on advanced information technology and management architecture – such as the Global Expeditionary medical System (GEMS) – can provide early recognition of a covert biological warfare attack and rapid identification of agents, vastly improving commander situational awareness and enabling early and appropriate intervention.

e. Medical assets and information can save lives and maximize combat effectiveness by providing critical components of the air base passive defense, conducting tactical NBC surveillance and identification missions, and by properly treating, stabilizing, and processing

NBC casualties.

f. The DMC has a need-to-know and must be cognizant of operational intelligence pertaining to the NBC threat. The DMC and key staff must have appropriate security clearances for access to this information. The DMC and his/her key NBC staff must be integrated into the AETF battle staff and NBC cell, as tactically and situational appropriate.

g. These publications give the AF operational level guidance:

- FDD 2-1.8, *Counter Nuclear, Biological, and Chemical Operations*
- AFDD 2-4.2, *Health Services*

h. These publications address how to organize air bases to prepare and respond to NBC events:

- AFI 10-245, *Anti-terrorism*
- AFI 10-2501 *Full Spectrum Threat Response Operations*
- AFMAN 10-2602 *Nuclear, Biological, Chemical, and Conventional (NBCC) Defense Operations and Standards*
- AFMAN 23-110, Volume 5, Chapter 15, *USAF Supply Manual, Medical Logistics*
- AFMAN 32-4017, *Civil Engineer Readiness Technician's Manual for Nuclear, Biological, and Chemical Defense*
- AFPAM 32-4019, *Chemical-Biological Warfare Commander's Guide*
- AFI 41-106, *Medical Readiness Planning and Training*
- AFTTP 3-42. 3, *Health Service Support in NBC Environments*
- AFH 32-4014, Vol 2, *USAF Operations in a Chemical and Biological Warfare Environment, CB Hazards*
- AFMAN (I) 44-149 *Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries*
- AFMAN (I) 44-156 *Treatment of Biological Warfare Agent Casualties*
- *AFMAN (I) 44-161, Treatment of Nuclear and Radiological casualties*
- *Medical Management of Chemical Casualties Handbook* published by the US Army Medical Research Institute of Chemical Defense (USAMRICD)
- *Medical Management of Biological Casualties Handbook* published by the US Army Medical Research Institute of Infectious Diseases (USAMRIID)AFH 32-4014, Vol 2, *USAF Operations in a Chemical and Biological Warfare Environment, CB Hazards*AFMAN (I) 44-149 *Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries*AFMAN (I) 44-156 *Treatment of Biological Warfare Agent Casualties*AFMAN (I) 44-161, *Treatment of Nuclear and Radiological Casualties*FM 8-500, *Hazardous Materials Injuries, A Handbook for Pre-Hospital Care, Fourth Edition*

B-2. Threat. Adversarial use of NBC weapons creates an asymmetric threat that will challenge the execution of air operations. There is an array of NBC agents, and agent dispersal weapons that produce different medical effects. The use of each has its own implications. The DMC or senior medical officer (SMO) must have access to operational and tactical intelligence

information, estimates, and resources impacting their specific area of operations in order to effectively carry out their responsibilities and adjust medical posture based upon the threat presented. It is imperative that all medical personnel know the command and control structure when an NBC attack occurs, in order to most effectively support force health protection. Refer to chapter 1 of this manual, AFMAN 10-2602 Nuclear*, Biological, Chemical, and Conventional (NBCC) Defense Operations and Standards*, or AFH 32-4014, Vol 2, *USAF Operations in a Chemical and Biological (CB) Warfare Environment, CB Hazards*, for more detailed information on agents of concern.

B-3. Air Force Deployable Teams Related to the Medical NBC. The Air Force deploys various teams to provide a comprehensive medical NBC defense capability at a bed-down location in a threat environment. Each team is designated by a unit type code (UTC) that delineates its manpower and equipment set. These are deployed based on the operational requirements. Those UTCs that have a surveillance/assessment capability may support the deployed AETF, while others with a patient directed focus, such as the Wartime Medical Decontamination Team, primarily support the deployed Air Force medical unit. Some examples of Air Force medical UTCs that play a role in the NBC arena include,

a. Medical NBC (MNBC) team. Provides increased wing survivability through NBC surveillance, detection, and abatement. Advises wing Survival Recovery Center (SRC) on NBC threats, decontamination options, personnel protective equipment capabilities, and NBC health risk to deployed personnel. Provides field NBC detection through the augmentation of the base NBC defense cell. It is composed of three persons.

b. Biological Augmentation Team (BAT). Provides presumptive identification of biological agents and pathogens of operational concern. The BAT is a two man, rapidly deployable, laboratory team. It may be deployed with the Expeditionary Medical Support (EMEDS) medical facility or individually, depending on mission needs. Team members analyze samples and interpret results using advanced microbiological diagnostic capabilities. BAT diagnostic tools can identify both naturally occurring and induced pathogens in clinical samples and other environmental media. The BAT provides a preventative capability; and provides diagnostic data to support early warning of pathogen exposures as well as assessment of extent and type of microbial contamination in various substances (food, air, water, or soil).

c. Infectious Disease Team. Provides infectious disease support and equipment to a 25-bed or larger EMEDS facility. This is a 15 member team that consists of one infectious disease physician, a clinical nurse trained in infection control, six clinical nurses, six medical technicians, and one public health technician. The team identifies, controls, and provides treatment for infectious diseases in the deployed theater. It provides public health surveillance and specialized care for patients with biological warfare, nosocomial, and disease and nonbattle injury (DNBI) infections transmissible to other patients and personnel. It identifies, confirms, and reports the use of biological warfare agents. It provides consultation to preventive medicine teams. It can operate an overseas six-bed isolation area.

d. Infectious Disease Augmentation Team. Provides two personnel who provide manpower to augment infectious disease and infection control support in the theater. It normally deploys

after the infectious disease team. The team augments an EMEDS with more than 100 beds or where there is a significant threat of biological warfare or at a location where there are a large number of infectious disease casualties.

e. Preventive and Aerospace Medicine Team (PAM). Designed to prevent DNBI. DNBIs have historically had a significant impact on mission accomplishment in wartime/contingency operations. The entire team consists of nine personnel and associated equipment, and is composed of three UTCs. The advance echelon (ADVON) team deploys with the lead Wing ADVON team when supporting an Air Expeditionary Force (AEF) or the Air Expeditionary Wing (AEW). The team is designed to travel light and be extremely mobile so it can perform it's preventive medicine mission in a timely manner to meet the needs of the entire AEF population at the bed-down location. Therefore, the team will require expeditionary combat support (ECS), including access to transportation to accomplish its mission successfully.

f. Wartime Medical Decontamination Team (WMDT). The primary mission of the WMDT is to provide capability to remove or neutralize Nuclear, Biological and/or Chemical (NBC) agents on wartime casualties immediately prior to being admitted to the medical treatment facility (MTF). Standardized WMDTs and equipment assemblages can be deployed, assigned, or pre-positioned to support and enable EMEDS MTFs to safely and effectively treat contaminated casualties without contaminating medical personnel, equipment, or facilities. WMDTs have a secondary mission to provide technical guidance on food decontamination. For more information see appendix E of this manual.

g. Theater Epidemiology Team (TET). Provides theater level support to the Air Force component command surgeon or joint task force surgeon. It is collocated with the theater surgeon or appropriate headquarters element. The team provides threat assessments of environmental and occupational factors, evaluates infectious disease risks and disease/DNBI rates from all sources, and recommends interventions to minimize degradation of combat strength. It coordinates with other medical and line force protection teams and with federal and international agencies.

h. Air Force Radiation Assessment Team (AFRAT). The AFRAT Nuclear Incident response Force (NIRF), and the Radioanalytical Assessment Team (RAT) are globally responsive specialty asset teams that provide specialized field radiological monitoring and consequence management support to the assigned theater medical authority. The team measures, analyzes, and interprets radiological measurements in and around the affected area. Team capabilities include radiological dose rate measurements, air concentrations, ground deposition, and plume modeling. They provide expert guidance on the type and degree of radiological hazard that force face deployed forces.

US Air Force Health Service Support

SECTION II

COMMAND, CONTROL, AND COMMUNICATIONS

B-4. Command and Control. Command and control of Air Force medical assets is vested in the line of the Air Force (LAF). The information in this chapter is consistent with AFDD 2, *Organization and Employment of Aerospace Power.*

B-5. Operational Command Relationships.

a.. The air and space expeditionary task force (AETF) is the designated US Air Force organization to fulfill the joint task force (JTF) and joint forces air component commander (JFACC) campaign objectives. Within the AETF organizational structure, expeditionary wings, groups, and squadrons are established to provide administrative control (ADCON) of air force forces.

b. An AETF encompasses all US Air Force forces assigned or attached to the JTF and includes other forces dedicated to the JTF mission provided via reachback. The command element includes the AETF commander (the Commander Air Force Forces COMAFFOR), a staff, and a command and control (C2) function. The joint force commander (JFC) should delegate operational control (OPCON) of assigned/attached US Air Force forces to the COMAFFOR. The COMAFFOR typically does not delegate OPCON to subordinate commanders.

c. The supported air component will establish command relationships within an AETF in the tasking orders. Medical force packages deployed into the theater of operations should be activated by special order as an expeditionary medical squadron or group, unless attached to a larger medical unit (a small logistics team may be attached to an expeditionary medical operations squadron [EMOS]). Deployed medical forces should be under the operational control of the COMAFFOR and attached to an expeditionary wing or group for (ADCON)

B-6. Operational Communications.

a. The Annex K and Annex Q of the operation plan (OPLAN) detail the communications architecture between echelons of command and between supported and supporting units, and provide security procedures and frequencies. In cases where no OPLAN is published, the tasking order should provide communications detail or it is determined in pre-deployment planning between the DMC and the supported Air Force forces (AFFOR) Surgeon (SG) for medical communications (between DMC and the patient movement requirements center [PMRC], AFFOR SG, etc.), and within the deploying aerospace expeditionary force (AEF) for internal communications. It is critical to ensure that communications assets and systems are compatible with systems used in the theater of operations.

b. Usually at air expeditionary wing (AEW) level, an A-staff is established to provide ADCON support to attached forces. A-1 is Personnel, A-2 is Intelligence, A-3 is Operations, A-4 is Logistics, A-5 is Plans, and A-6 is Communications. Upon beddown, it is important for the DMC to establish a support relationship with the A-staff. The medical logistics noncommissioned officer (NCO) needs to know how to access the A-4 shop for logistics support. The medical communications NCO needs access to the A-6 shop for communications and systems support. However, the AEW's A-staff likely has no medical representative to provide medical-unique support. Therefore, upon beddown it is critical for the DMC to reestablish communication with the AFFOR Surgeon's staff for medical-unique logistics support, medical intelligence, and functional guidance. This relationship should already exist from communications during pre-deployment planning.

c. In a high-threat NBC area, the communications architecture includes lines of communication among deployed combat units, medical units tasked with medical care, and specialized units providing NBC detection and warning functions, either in direct support to deployed unit, or in general support to several units or the theater. The DMC must understand this NBC-related communications architecture to effectively gain NBC threat intelligence and associated guidance, and to upchannel information and data for analysis by specialized teams tasked with NBC surveillance functions. Section 3, "Planning Considerations", addresses specialized NBC teams and their lines of communication.

US Air Force Health Service Support

SECTION III

PLANNING CONSIDERATIONS

B-7. Operational Planning. The Air Force theater medical system operates within the AETF and JTF structures to support Commander of Combatant Command's objectives. When the threat of NBC use is high, a robust expeditionary NBC structure is required to support the mission. To assist operational planners and the AFFOR Surgeon as they develop contingency concepts of operations (CONOPS) in support of joint force commander (JFC) deliberate and crisis action plans, this section offers the following planning guidance for employment of AFMS assets in NBC environments. Planners must review and understand the mission capability statements (MISCAPS) and CONOPS of the various AFMS's unit type codes (UTCs) to fully understand how best to employ them.

B-8. Commander Air Force Forces (COMAFFOR). COMAFFOR medical assets both NBC specialty and general casualty care are available to provide health service support in the theater of operations. Using his/her operational knowledge and experience, the COMAFFOR must balance available lift and time against the NBC and conventional threats to lay down medical assets at theater and wing levels to maximize health service support. Medical UTCs are modularized and employed incrementally using a tiered approach with a tailored response based upon mission requirements, medical threat, and population at risk (PAR). Increasing NBC and other medical threats should be considered when evaluating the proper order of buildup of capabilities. In operations where the planner cannot lay down a more robust medical NBC capability, they should use a hub and spoke concept and utilize opportune transportation to support far forward locations. This approach increases response time and NBC risk at each location and must be balanced against lift constraints and NBC threat in the theater and at each operating location. For more information on this concept refer to AFTTP 3-42.3, *HSS in and NBC Environment*.

B-9. Medical UTC Laydown. Successful NBC attacks may produce mass casualty events. When the AFFOR theater medical concept of operations is developed, planners must consider the risk of NBC attack and the increased burden on medical infrastructure. The medical laydown and CONOPS for NBC environments should be seamless and consistent with non-NBC CONOPS to the extent possible. The same building block approach should be used, where medical NBC-specific assets are laid over conventional medical assets. The flow of these assets into the theater must be driven by the mission needs of the JFC and relative medical threats. The operational planner should understand the capabilities and limiting factors of the UTCs when planning health service support (HSS) throughout the theater of operations in NBC environments (refer to UTC CONOPS, MISCAPS, and Allowance Standards). Medical UTCs without collective protection (CP) will be unable to treat casualties in chemical contaminated environments and may suffer operational degradation in radiological or biological environments.

B-10. Casualty Estimates. The joint tool approved for calculating medical requirements is the medical analysis tool (MAT). MAT does not include the capability to generate medical

requirements for NBC casualties. The Joint Readiness Clinical Advisory Board (JRCAB) is developing Task, Time, and Theater files for use in the MAT for various NBC casualty profiles. These files can be used to determine Class VIII equipment and supply requirements. The Services are responsible for generating casualty estimates and tracking casualty rates for contingency operations. In the Air Force, this is the responsibility of the planning and operations communities.

B-11. Tactical Planning.

a. *Predeployment Planning Considerations and Responsibilities (In-Garrison).* The intent of this section is to serve as a reminder to the DMC to ensure his forces are prepared to deploy, quickly reach initial operational capability (IOC), and conduct their mission. The deploying medical commander is responsible for preparing medical forces to deploy and providing force health protection guidance to the deploying wing commander for use in the development of wing deployment plans.

(1) Medical Deployment Plans. Review all plans pertinent to providing operational support (i.e. Commanders Combatant Commands operational plans, OPLAN Annex Q, deliberate plans from the beddown base, NBC passive defense plans)

(2) Acquiring Civil Engineering (CE) Support. Medical and CE personnel must work together to provide the base with a fully integrated NBC defense capability. The DMC should coordinate with CE Readiness when integrating NBC considerations into beddown plan to prevent duplication of effort.

(3) Wing Deployment Plans. The DMC uses NBC threat assessments to formulate force health protection recommendations to the deploying wing commander. Some force health protection actions may be clearly specified in the JFC's tasking order. Considerations include prophylaxis and vaccinations, medical screening criteria, and medical threat briefings to establish individual risk management procedures.

b. Deployment Considerations and Responsibilities. Upon reaching beddown, the DMC should refine the existing Medical Contingency Response Plan (MCRP) to reflect the current mission, NBC threat and location. The DMC should also provide medical representatives to the wing's battlestaff, survival recovery center (SRC), and NBC cell. Prepare to refine MRCP based on changes occurring in the wing's plan. Some significant issues to review and update are;

(1) DMC actions upon beddown of deployed medical assets and capabilities.
(2) Review casualty prevention responsibilities.
(3) Review casualty care responsibilities.
(4) Review decontamination capabilities and water supply for decontamination.
(5) Review resupplies issues to include adequate supplies of antidotes, anticonvulsants, bandages, mask filters and individual protective equipment (IPE) for HSS staff and anticipated casualties, and patient protective wraps (PPW) for anticipated casualties.

c. **Post deployment Considerations and Responsibilities.** During the period of redeployment several actions should be conducted. Post deployment health assessments (DD Form 2796) are to be completed. Emphasis on actual or perceived environmental exposures to NBC agents should be highlighted and surveillance data stored in GEMS and Command Core. It is important to continue medical treatment and documentation of casualties. Clean up of NBC waste from medical decontamination sites will need to be addressed during decontamination operations and at their termination. And finally, all lessons learned should be submitted IAW Service requirements and the Joint Uniform Lessons Learned System (JULLS).

US Air Force Health Service Support

SECTION IV

CASUALTY PREVENTION

B-12. Overview.

a. Casualty prevention is a NBC passive defense force multiplier focusing on threats posed by enemy forces and complex endemic and environmental health threats. Failure to counter these threats jeopardizes mission accomplishment. Casualty prevention concentrates on countering two types of threats: health threat and enemy threat. The health threat is composed of a complex set of environmental and operational factors that combine to produce disease and nonbattle injury (DNBI), which, historically, creates the largest number of military casualties. The enemy threat usually produces smaller numbers of more serious casualties. The enemy threat depends on the enemy' s willingness and ability to use conventional and nonconventional weapons systems; munitions; and nuclear, biological, and chemical agents (NBC). Failure to counter either threat jeopardizes mission accomplishment and ultimately impacts achieving operational objectives. Medical readiness provides the means to mitigate these threats.

b. Information provided by ongoing health surveillance and DNBI reporting is critical to counter NBC operations and are used as passive defenses and tactical surveillance for casualty prevention. Passive defense protects personnel from the effects of an NBC attack and improves the capability of personnel to survive and sustain operations in an NBC environment. Passive defense includes force health protection measures, a process that begins before deployment, and encompasses the entire deployment scenario. There are three passive defense measures; contamination avoidance, protection, and contamination control. Preparations for operations in potential NBC environments begin early in pre-deployment and include threat assessments, medical screening, pre-exposure immunizations, pre-treatments, prophylaxis, quantitative fit testing (QNFT) and risk-based training on the ability to survive and operate (ATSO) in NBC environments, training for HSS personnel in the use of protective equipment, and training of medical personnel in the specifics of NBC casualty care.

c. Casualty prevention seeks to provide the line commander the best available health-based risk assessment of the tactical situation improving his/her situational awareness and enabling the warfighter. It becomes imperative that passive defenses be aggressively pursued and institutionalized throughout the deployment process, and at the deployed site and medical

operations to maximize combat effectiveness. By using chemoprophylaxis early on, as indicated through health surveillance, we can secure and sustain an affected force.

B-13. Predeployment Actions.

General: The capability to defend against NBC attacks and sustain combat operations in NBC environments requires forewarning and properly trained and equipped forces throughout the theater. Casualty prevention initiatives using passive defense measures are planned for early in the predeployment planning process. The DMC must ensure that the following actions are addressed during the predeployment phase:

a. Medical Estimate of Situation. The Public Health Officer or Public Health NCO or the designated Medical Intelligence Officer, in conjunction with the medical NBC defense officer and the NBC casualty management officer, will do the medical estimate.

b. Casualty Prevention Measures: These actions must be done prior to deployment.

(1) Immunizations
(2) Chemoprophylaxis
(2) Medical Threat Briefing
(3) Medical NBC Defense Officer Briefing
(4) Predeployment Medical Questionnaire
(5) Train all personnel in NBC related self-aid an buddy care, to include spot decon and the administration of nerve agent antidotes
(6) Train all medical personnel in NBC casualty triage and treatment
(7) Train wartime medical decontamination team (WMDT) personnel in triage, emergency treatment in an NBC environment, and how to thoroughly decontaminate NBC contaminated casualties

B-14. Deployment Actions.

General: The deployment phase consists of pre-attack, trans-attack and post-attack postures. The DMC/SMO should be knowledgeable with the various capabilities of UTCs that are assigned and available to the deployed location as well as the reachback capability of medical assets assigned to support the theater. The DMC/SMO should use all resources available to provide protective measures for all assigned personnel and casualties. Detailed information on all phases of Air Force HSS deployment is found in AFTTP 3-42.3 *Health Service Support in NBC Environments*.

a. Pre-attack Phase Casualty Prevention Measures consists of the following areas:

(1) Site Selection
(2) Health Surveillance and DNBI Reporting
(3) Vulnerability Assessments and Surveillance Plans
(4) In–processing Deployment Service Members
(5) Field Sanitation and Hygiene

(6) Collective Protection
(7) Individual Protective Equipment (IPE)
(8) Medical Sector NBC Detection and Contamination Control Plan
(9) Establish a set up of decontamination operations and hazardous materials waste areas
(10) Coordination of logistics for adequate resupply of PPW, replacement mask filters, IPE, antidotes, anticonvulsants, and water supplies for medical decontamination
(11) Continued training of medical and WMDT personnel in NBC casualty management
(12) Preparation of hardened facilities, depending on the threat condition

b. Trans-attack Casualty Prevention Measures:

(1) Alarm Conditions
(2) Donning of IPE
(3) Understanding MOPP Level
(4) Operation of collective protection systems
(5) Knowing ATSO principles for an environment

c. Post-attack Casualty Prevention Measures:

(1) Surveillance for health risks and exposure symptoms requiring treatment
(2) Detection of agent (s)
(3) Identification to determine the specific NBC agent employed
(4) Contamination Avoidance
(5) Protection
(6) Contamination control/decontamination of personnel, equipment, supplies, and foodstores as indicated
(7) Triage/treatment of NBC and conventional casualties
(8) Coordination of casualty disposition/evacuation
(9) Disposition of contaminated equipment and supplies

B-15. Post Deployment Actions

General: Continue surveillance and active collection of repository data.

a. Postdeployment health assessment (DD FORM 2796) for exposures documentation

b. Provider's responsibilities to redeploying personnel

c. Forwarding surveillance data to DOD as specified in Joint Policy Memorandum on Deployed Occupational Health and Environmental Health Surveillance

d. Disposition of contaminated equipment and supplies

US Air Force Health Service Support

SECTION V

CASUALTY MANAGEMENT

B-16. Overview: Casualty management comprises a continuum of essential care to stabilize a casualty in theater. This begins by providing health care for DNBI and combat casualty as quickly and as close to the injury location as possible. The AFMS uses deployable tailored unit type codes (UTCs) with a EMEDS basic primary support unit and the aeromedical evacuation system to accomplish en route care in a theater of operation in a NBC environment. This modular incremental approach provides the DMC the flexibility to tailor a health support package to provide casualty management, combat stress management, patient decontamination, patient movement, and patient evacuation in a NBC environment.

B-17. Casualty Management in a NBC Environment. The DMC is responsible for establishing a health support system in a NBC environment that will provide prevention; stabilization, aeromedical evacuation (AE) preparation, sustainment and specialty care to support the deployed force. The medical facility's patient care services should provide, protection from exposure to NBC agents, decontamination, basic life-and limb-saving care, treatment from initial resuscitation through definitive care or evacuation, evacuation, track and follow-up medical care of personnel exposed to NBC contamination, and provide prophylactic measures.

a. Casualty management starts with initial triage of suspected contaminated casualties and includes: medical decontamination, and patient treatment. The arena of patient treatment involves treatment issues surrounding exposure to agents found in events such as: chemical events, biological events, radiation exposure, and toxic industrial material (TIM) events.

(1) Chemical events can involve nerve, blister, cyanide, pulmonary, incapacitating, riot-control agents, and TIM. Detailed information on chemical agents is found in chapter 1 of this manual. Detailed treatment information for chemical casualties is found in *AFJMAN 44-149, Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries; FM8-500 hazardous Materials Injuries, and Medical Management of Chemical Casualties Handbook.*

(2) Biological agents such as anthrax, plague, tularemia, Q-fever, and smallpox cause casualties. Some agents require decontamination to remove spores, such as anthrax, others are highly infectious at times during the disease process, such as smallpox and plague. Specific information on biological agents can be found in chapter 1 of this manual. Information on the treatment of biological agent casualties can be found in AFMAN (I) 44-156, *Treatment of Biological Warfare Agent Casualties* and *The Medical Management of Biological Casualties Handbook.*

(3) A conventional nuclear incident has the potential to instantaneously produce a very large number of casualties, severely burdening the entire medical evacuation and treatment system. Radiation exposure events may create casualties with burns or sickness from radiation exposure. Patients may have radioactive contamination on their clothing or body that will

require decontamination to remove radioactive particles. Detailed information on radiation injuries can be found in chapter 1 of this manual. Specific treatment information for the treatment of radiological casualties is found in *AFMAN (I) 44-161, Treatment of Nuclear and Radiological casualties and The Medical Management of Radiological Casualties Handbook.*

b. Quarantine or isolation of casualties may be warranted in some cases, particularly with infectious biological agent exposure. If these situations exist, than quarantine and isolation procedures should be followed. Refer *to chapters 7 and 8 of this manual, AFMAN (I) 44-156, Treatment of Biological Warfare Agent Casualties, AFTTP 3-42.3, Health Service Support In Nuclear, Biological, And Chemical Environments, and current Air Force directives on isolation procedures* for additional information.

c. Medical treatment is provided through five levels of care. The first two levels of care are normally provided at a deployment location. The objective of this system is the efficient management of casualty flow from the site of injury, to the deployed medical facility, and to the next level of care. Treatment, beyond self-aid and buddy care, is the responsibility of medical personnel. Casualties become medical patients when they enter a medical diagnosis and treatment sequence. Level III care includes clinical capabilities normally found in a facility that is typically located in a reduced-level enemy threat environment. The facility is staffed and equipped to provide resuscitation, initial wound surgery, and post-operative treatment. It does not normally have the crisis aspects of initial resuscitative care and can precede with greater preparation and deliberation. Level IV care provides the surgical capabilities found in Level III care and provides rehabilitative and recovery therapy for those who can return to duty within the theater evacuation policy. This level of care may only be available in mature theaters. Level V care is definitive, convalescent, restorative, and rehabilitative. It is provided by military CINC-approved safe havens and by Department of Veterans Affairs and civilians hospitals with in the CONUS. Refer *to AFTTP 3-42.3, Health Service Support In NBC Environments* for additional information on deployable UTCs used at each level of care.

d. Patient Movement and Management of Human Remains in NBC environment are concerns of casualty management.

(1) Patient movements can involve the use of personnel, vehicles, or aircraft to transfer a casualty from initial point of injury to definitive care. The NBC environment forces the DMC/SMO to consider what assets will be committed to the evacuation of casualties from and to a contaminated area. Precautions should be taken as to the number of vehicles to be use, routes to be taken, equipments and supplies to have on hand, landing zone, limited use of fixed wing aircraft, the disturbance of ground from helicopter rotorwash, clearances from foreign nations allowing contaminated aircraft into their airspace, and authorization needed to transport contaminated patients on US Air Force aircraft. Refer to chapter 8 of this manual and AFTTP 3-42.5, *Aeromedical Evacuation* and current guidelines for the theater of operations for additional information.

(2) Although the management of human remains is a Services responsibility, the medical community advises Services in order to protect health and prevent the spread of disease and

NBC contamination. For more information, *reference JP 4-06, JTTP for Mortuary Affairs in Joint Operations; AFTTP 3-42.3, Health Service Support In Nuclear, Biological, And Chemical Environments* and current CONOPS on these matters.

B-18. NBC Mass Casualty can drastically task Casualty Management Operations.

With the employment of NBC weapons/agents a mass casualty situation can present itself at any time and at any level of care. A major concern during BW mass casualty events, versus nuclear or chemical warfare events, is that HSS personnel are more susceptible to becoming a casualty from the BW agents. DMC/SMO must insure that existing HSS assets are reinforced, in spite of this concern, to insure adequate personnel, as well as equipment, is in place in a short period of time to maintain the needed level of care. Treatment at far forward MTF's is limited to life or limb-saving care. Casualties that can survive evacuation to the next level of care are not treated at the forward facility. This provides time for treating those casualties that cannot survive the evacuation time. It is important that all patients be decontaminated before they are admitted into a clean MTF. Management of patients suffering from the effects of BW agents may include the need for isolation. Barrier nursing for patients suspected of suffering from exposure to BW agents will reduce the possibility of spreading the disease to health care providers and other patients. Specimens must be collected and submitted to the designated supporting laboratory for identification. Refer to chapters 7 and 8, and Appendix H, of this manual as well as *AFTTP 3-42.3, Health Service Support In Nuclear, Biological, And Chemical Environments*, and current CONOPS for additional information.

US Air Force Health Service Support

SECTION VI

AIR FORCE TASK LIST

B-19. Air Force Tasks Pertaining to HSS in an NBC Environment

a. Appendix C of Air Force Doctrine Document 1-1 (AFDD1-1) includes a comprehensive framework for expressing all Air Force tasks (AFT); however, it is not a comprehensive list of every task performed by the Air Force. Air Force organizations are authorized and encouraged to add to or modify these tasks as needed to express their mission specific activity.

b. Commanders can also refer to Air Force Medical Service CONOPS for the most current Air Force CONOPS guidance related to operations in an NBC environment. This will also assist in the development of Mission Essential Task Lists (METLs) as outlined in AFDD1-1.

c. The following sampling of AFTs are pertinent to HSS operations in an NBC threat environment. This list is not comprehensive. The narrative under the ATFs is provided to serve as a guide to initiate ideas to develop METLs that include HSS NBC concerns.

AFT 3.1.1.1.2 Perform Surveillance.
Carry out procedures for the collection of NBC data obtained from sampling and HSS systems such as GEMS to evaluate disease trends, incorporating information from decontamination teams and MTFs in the area of operations to determine NBC agent type.

AFT 5.1.4 Plan Airlift Functions.
Appropriate timing of the deployment of HSS and WMDT assets in theater to meet a possible NBC threat. Coordinate HSS medical evacuation scenarios where there are NBC casualties with infectious diseases or other NBC contaminants. Coordinate with TRANSCOM for staging and movement of NBC contaminated casualties as well as timed movement of HSS assets into and out of the theater of operations.

AFT 5.4 Provide Air Expeditionary Force (AEF) Capabilities
Insure adequate predeployment training is performed to include self-aid and buddy care related to NBC, IPE wear and mask fit tested, inoculation, and training to enhance knowledge of NBC threat. Predeployment medical assessments for AETF assets conducted. Medical staff trained in the treatment of the NBC casualty. Wartime Medical Decontamination Team (WMDT) personnel are trained adequately. Equipment and supplies needed for the adequate care of the NBC casualty are available and ready for deployment. Equipment sets are inventoried and complete. Decontamination equipment is complete. HSS assets know how to access reachback resources for information and assets to treat NBC casualties. HSS assets that provide NBC surveillance are adequately trained and equipped.

AFT 5.4.1 Perform AEF Functions
HSS deployable assets rehearsed and equipment ready for immediate deployment. Programs in place to measure readiness of personnel and equipment/supply assets. Programs in place to maintain HSS at home facility with reduced staffing.

AFT 5.4.2 Educate and Train AEF Forces
Training cadre for medically related NBC issues identified at unit level. Units using training tools supplied by Air Force / Army / Navy related to NBC protection/casualty management. Trainers familiar with how to access training tools that are currently developed by all services. Adequate predeployment training performed to include self-aid and buddy care related to NBC, IPE wear and mask fit tested, inoculation, and training to enhance knowledge of NBC threat. Medical staff trained in the treatment of the NBC casualties. WMDT personnel trained adequately in triage, life saving treatment, and casualty/foodstuff decontamination procedures. WMDT teams trained using their real world equipment sets. Adequate and appropriate equipment/supplies available for training to manage NBC casualties. Trainers identified to teach others about NBC issues. HSS assets know how to access reachback resources for information and assets to treat NBC casualties once deployed. HSS assets who provide NBC surveillance are adequately trained and equipped.

AFT 5.4.3 Equip AEF Forces
Equipment and supplies needed for the adequate care of the NBC casualty are available and ready for deployment. NBC related equipment sets are inventoried and complete. Decontamination equipment is complete. HSS assets that provide NBC surveillance are adequately equipped. Supplies and equipment is adequate for training to insure WMDT and medical personnel are trained to manage NBC mass casualty situations. WMDT decontamination equipment is in good working order or procedures are in place to insure prompt repair/replacement so that equipment package is deployment ready at all times.

AFT 5.4.4 Plan AEF Functions
Examine individual readiness of personnel assigned to deployable UTCs, equipment, and supply requirements related to NBC. Coordinate planning with other AEF agencies to insure HSS can operate in an NBC contaminated environment. Procedures in place to insure that HSS information collected, relating to NBC, is shared with other AEF agencies and that HSS is active in the AEF planning process. Systems in place to assess HSS readiness related to NBC issues. Coordination with civil engineering for decontamination site lay down to insure correct drainage, water resupply approaches cleared, power hook up and contaminated waste disposal. Coordination for water resupply for decontamination operations.

AFT 6.1 Provide the Capability to Ready the Force
HSS assets organized, trained, equipped, for all situations where NBC casualties will be received. HSS trained/equipped to work in both noncontaminated and contaminated environment with minimal equipment assets. WMDT trained to decontaminate patients without water resources. HSS assets trained and equipped to operate for a sustained period in an NBC contaminated environment or in an environment that is receiving contaminated casualties. HSS assets trained to work in a situation with minimal infrastructure and in a forward area.

AFT 6.1.1.8 Provide Repairables and Consumables.
Procedures appropriately assess NBC supply needs for HSS to include decontamination supplies, water for decontamination, and medical care consumables such as additional bandages, splints, and airways to replace contaminated items. Adequate supplies of mask filters and filters for chemically protected AETF facilities on hand to provide for sustained operations in an NBC contaminated environment. Adequate supplies of antidotes and antiseizure medications available for the treatment of NBC casualties. Systems in place to provide ongoing assessment of these items and restocking as needed. AFT6.1.1.9 Perform Maintenance
HSS maintenance providers are familiar with repair of WMDT decontamination equipment or ready access to those who can repair. Reachback system established for prompt replacement of nonrepairable items.

AFT 6.1.1.13 Train a Quality Force.
HSS personnel proficient in NBC training. Medical staff proficient in caring for NBC casualties. Medical staff assigned to UTCs adequately trained to care for NBC casualties in accordance with guidelines of AFTTP 3-42.3, HSS in an NBC Environment.

AFT 6.1.1.20 Support Joint Training.
HSS personnel familiar with procedures/practices of other services related to NBC issues. Programs in place to encourage joint HSS training related to NBC.

AFT 6.1.1.22 Perform Organizational Performance Assessments.
Evaluate effectiveness of care for NBC casualties, WMDT decontamination operations. Develop quantifiable measures for efficiency of decontamination/treatment operations.

AFT 6.1.1.22.3 Perform Task Assurance Assessments.
Programs in place to measure an organization's ability to meet their HSS NBC related tasks as derived from their METL.

AFT 6.1.2 Educate and Train Forces to Ready the Force..
Requirements driven, high quality programs related to NBC issues are developed incorporated at unit. HSS personnel receive NBC related training to treat NBC casualties. WMDT trained to perform decontamination with and without decontamination equipment package. Utilization of existing, preprepared, Department of Defense NBC medical management training resources.

AFT 6.2 Provide the Capability to Protect the Force
HSS assets prepared to carry out force protection measures related to the NBC threat to include NBC surveillance, NBC detection, and HSS operational plans and procedures related to NBC for the protection of the AEF in all locations, under normal and adverse conditions. HSS involvement with monitoring of AEF food and water supplies for NBC contamination

AFT 6.2.1 Protect the Force
Policies in place to maintain the health of HSS personnel protect supplies and personnel from NBC contamination, and to protect water and food sources from NBC contamination or sabotage. HSS tracking of disease. Engineering controls, procedural controls, to protect AEF

and medical assets from NBC threat. MTF physical security. AFT 6.2.1.1 Conduct Occupational Health, Safety, and Community Health Programs
Provide occupational and community health surveillance to ensure healthful and safe working and living conditions. Procedures/policies to conduct surveillance for NBC agents in the environment. Sampling, analysis, monitoring, and training to ensure survivability. Engineering controls, procedural controls, or personal protective equipment if warranted by exposure levels to protect AEF and medical assets from NBC threat.

AFT 6.2.1.2 Perform Force Protection
HSS coordination to insure active security programs designed to protect against sabotage / attack using NBC agents. Accomplished through planned and integrated application of combating terrorism, physical security, operations security, personal protective services, as supported by intelligence, counterintelligence, and other security programs. This task includes defensive, active, and offensive force protection operations and countermeasures designed to minimize the effects of or recovery from hostile activities or natural occurrences. The application of force protection includes all actions intended to deter, detect, and defeat hostile acts against United States Air Force treasures of airpower. This can include a combination of conventional and NBC threats.

AFT 6.2.1.4 Utilize and Maintain Forces to Protect the Force
Consider readiness of HSS WMDT if there are requirements from AEF and MTF for these personnel to help provide security to protect the force in an NBC threat environment.

AFT 6.3.1 Prepare the Operational Environment.
Appropriate use of trained bioenvironmental and public health UTC to assess potential HSS laydown area. Consideration of NBC threat. Consider area needed for set up of WMDT decontamination operations to include contamination runoff, storage area for contaminated waste, area for water bladders, routing of water resupply trucks, triage areas, distance from supported MTF. Consideration of relative wind direction in NBC threat environment to place MTF upwind of decontamination area. HSS close coordination with civil engineering assets to provide hardening of MTF facilities if an NBC artillery/rocket attack threat is expected should also be part of this planning.

AFT 6.3.1.1.2 Determine Local Contracting Capability.
Determine the availability of commercial support capability and propensity for support in the event of NBC contamination of the HSS facility. Determine if adequate water supplies are available for NBC decontamination operations. Find out if these contracted services can these be supplied in an NBC contaminated environment and, if not, develop alternative plans.

AFT 6.3.1.1.3 Determine Facilities Availability.
Determine the areas' facilities suitability and availability if area in in NBC attack. Suitability of facilities as hardened protection against NBC threat. Capability of facilities to be modified to provide protection in the event of an NBC attack or area contamination.

AFT 6.3.1.2.2 Tailor Force Packages.
HSS force packages properly prioritized with adequate decontamination capability to meet an NBC threat if the force is deployed to an operational area that has a high likelihood of an NBC attack. Decontamination teams staged early enough in the time-phased deployment. Adequate medical personnel packages in place to treat casualties from an NBC attack. WMDT staffing adequate to sustain decontamination operations for long periods of time considering anticipated NBC casualties, weather, and other factors.

AFT 6.3.1.4.4 Determine Resupply Routes and Channels
Consider resupply of atropine, anti seizure medications in high nerve agent threat area. Resupply of protective mask filters and protective garments, resupply of bandages that will need to be replaced due to chemical contamination, resupply of NBC surveying supplies.

AFT 6.6.1 Sustain the Force
Provisions for replacement of HSS staff affected by NBC attack. Ability of HSS assets to operate in contaminated environment.

AFT 6.6.1.4 Perform Medical Support Activities
Management of NBC casualties in area of operation for short and long durations, management of infectious patients not ready for air evacuation, maintain medical care in an NBC contaminated environment.

AFT 6.6.1.9 Provide Services Support.
HSS coordination with services support for Management of NBC contaminated waste. Coordination between HSS and mortuary affairs in NBC environment.

AFT 6.6.1.9.1 Provide Food Service Support.
HSS assist in management / decontamination of NBC contaminated food supplies.

AFT 6.6.1.11 Provide Water
Provide adequate amounts of safe drinking water. Coordination of water for WMDT decontamination. Determine potability of source and adequacy of treatment through sampling for NBC components. Routinely monitor distribution system for indicators of contamination. Recommend emergency treatment or alternative sources, as needed. Ensure bottled water is from approved source. Supply of water in NBC contaminated environment.

AFT 6.7 Provide the Capability to Recover the Force.

Consider HSS health survey process for redeploying AEF forces. Units must perform needed decontamination of equipment and supplies, dispose of contaminated items and contaminated waste. Sustained health follow up related to NBC issues after deployment in a contaminated area.

Appendix C

US Navy Health Service Support

C-1. Introduction

The purpose of the Navy Health Service Support (HSS) appendix is to address each of the NBC threat categories (chemical, biological and radiological) as it impacts on providing HSS in the littoral battle space to include OCONUS ashore facilities. It is not intended as a comprehensive guide for CONUS shore facilities.

a. Naval HSS, in the context of the overarching Force Health Protection strategy, encompasses the three main pillars of Casualty Management, Casualty Prevention and Healthy Fit Force. The goal in planning operational health service support in an NBC environment is to ensure that the use or threat of use of nuclear, biological or chemical weapons against a naval force will be a non-decisive factor in the outcome of any operation. Prudent medical planning dictates the need for operational commanders to assess risk to mission capability from the use or threatened use of CBRN weapons. Obviously, the preferred tactic to avoid becoming contaminated by NBC agents is by maneuvering around the affected area when operationally feasible. However, units must plan (i.e. train, equip and organize) for the possibility of being attacked and/or operating in a contaminated battle space. Therefore, units must be capable of providing sufficient protection (individual and/or collective) to remain mission capable. Units must also be prepared to operate with some degree of contamination for as long as possible before commencing decontamination procedures.

b. CBRN attack on Naval medical capabilities.
This appendix applies to all Navy activities afloat and the Navy shore establishment for medical operations in a high threat or potentially contaminated environment. Sustainment of mission capability shall be accomplished through the development and employment of defensive methods and equipment utilizing the following elements:

(1) Operational Intelligence
(2) Operational Doctrine, Tactics and Training Procedures
(3) Detection, Identification, Warning, Reporting and Monitoring Procedures
(4) Contamination Avoidance
(5) Individual Protective Equipment
(6) Collective Protective Equipment
(7) Contamination Control/Decontamination Capabilities
(8) Casualty Handling, Medical Treatment and Prophylaxis

c. Naval medical capabilities can be affected in a number of different situations:

(1) Fixed shore MTFs and forward-deployed HSS assets may not be specific targets but could become contaminated as a result of attacks on supported forces.

(2) Attacks on ships will force the medical operation to function in a contaminated environment.

(3) In an amphibious environment, attacks on landing forces may create casualties on the ship by CB-agent drifting from shore or result in CB casualties being evacuated to the ship.

(4) Reception of contaminated casualties will degrade theater medical capabilities

d. The presence of chemical or biological agents or radiological fallout, or just the threat of exposure to one of these hazard environments forces Navy activities, whether afloat or ashore, into a protective posture that could eventually degrade its capability to accomplish its mission. The key to minimizing the impact of these measures is to use only defensive equipment and countermeasures that are appropriate in each type of hazard environment. Employing protective measures that are unnecessary or exceed the appropriate level of mission oriented protective posture should be avoided as much as possible.

C-2. Naval HSS

a. Levels of Care

Of the five levels of naval health service support, levels I and II are provided by the Navy and Marine Corps operating forces which is supported in their table of organization and manning documents. Levels III and IV are provided by Navy component resources to care for casualties generated by combat. Level V HSS is CONUS MTF based care. Figure 8-1 illustrates the levels of care and casualty evacuation flow for all Services.

(1) The concept of care to be delivered at each level of the HSS system is structured and resourced according to the following medical planning factors:

- Urgency of the patient's needs.
- Requirements for mobility of medical personnel and facilities.
- Capabilities, equipment, and supplies of HSS personnel.
- The workload at each level of care, relative to its treatment capacity.

Casualties are evacuated rearward through the HSS system in accordance with the following protocol:

- To reach a treatment facility capable of initiating the level of medical or surgical intervention appropriate to the type of illness or injury,
- Sufficient time is available to perform necessary procedures, and
- The required bed capacity to care for the patient until further clinical disposition is made.

Levels of Care and Associated CBRN Protection Capability. The depth and sophistication of CBRN Defense capabilities will vary according to the type of HSS platform. CBRN defense within the Navy consist of the following capabilities:

- Individual Protection [IPE] (Gas mask, suit, gloves, boots, vaccination and personal protective medications)
- Collective Protection Systems [CPS](tent shelters for field hospitals)
- Limited decontamination capability
- Chemical Agent Monitors
- Restriction of Movement protocol
- BW Detection and identification technology
- Established Medical Surveillance and Reporting Systems

a) Level I Care

Level I HSS consists of self-aid and buddy aid in the afloat or Fleet Marine Force operational environment. CBRN defense capability at Level I care consists primarily of IPE.

b) Level II Care

Level II HSS consists of initial resuscitative care in the form of surgical and medical resuscitation. This care saves life and/or limb and stabilizes patients for evacuation to Level III. CBRN defense capability at Level II may consist of two or more methods depending on the type of HSS platform. For example, a forward deployed medical battalion or surgical company may be staffed with IPE equipped hospital corpsmen with limited decontamination capability and be supported by a Forward Deployed Preventive Medicine Unit (FD-PMU). Some Level II afloat platforms (i.e. LHA/LHD or CV/CVN) may also be outfitted with a collective protective system, which controls contamination, and laboratory BW detection capability. Navy ships, in general, are also designed to defend against a chemical or biological attack by setting Material Condition ZEBRA or Material Condition William or Circle WILLIAM which essentially renders the ship airtight against contaminating agents outside the skin of the ship.

c) Level III Care

Level III care provides a higher level of surgical and medical resuscitative capability. For example, the Hospital Ship (T-AH) and Fleet Hospital (FH) or Expeditionary Medical Facility (EMF) - will have greater capabilities, particularly in laboratory and radiology support. Although neither platform has a required operational capability to perform HSS in a contaminated environment, both are staffed with medical personnel who have been trained and equipped in NBC survival; and both platforms have the capability to decontaminate incoming NBC casualties for a limited period of time. Specially designed tent shelters can be adapted to the fleet hospital to provide collective protection.

d) Level IV Care

Level IV Care is provided in an OCONUS MTF primarily for the purpose of providing intermediate care of returning casualties. This level of care is adapted to the precise condition of the patient; it is normally provided by a fully staffed hospital delivering the care necessary to

complete the patient's recovery. CBRN defensive capability is, in many cases, provided in conjunction with the Base Activity or Responsible Line Commander. CBRN defense for the OCONUS MTF is an integral part of its overall disaster response plan.

e) Level V Care

Level V care is usually CONUS. This care is necessary for the patient's long-term return to health, not necessarily to duty. CBRN defensive capability is, in many cases, provided in conjunction with the Responsible Line Commander. Stand-alone MTFs may have a more self-sustaining CBRN defense program with the capability to perform decontamination as part of its overall disaster response plan.

(2) Ship-to-shore interface

Ship-to-shore interface – Impact of retrograde movement of NBC casualties on the littoral battlefield.

(3) Additional CBRN Defense Assets in support of naval components

a) Forward Deployable Preventive Medicine Unit

The Forward Deployable Preventive Medicine Units' (FDPMU) primary mission is to enhance Force Health Protection by rapidly assessing, preventing, and controlling actual health threats in a theater of operations by characterizing the health threats and focusing the efforts of other organic Preventive Medicine assets to reduce or mitigate health hazards. FDPMU capabilities include identifying and evaluating environmental health hazards (including chemical, biological, radiological, physical agents, disease vector, endemic diseases, and occupational and environmental health threats), assessing the risk of adverse health outcomes, monitoring the health of deployed forces, and advising the operational commander concerning significant risks and recommending preventive medicine interventions needed to protect the health of the force. The FDPMU provides flexible and sustainable force health protection support to the forward deployed elements of the Navy, Marine Corps, Army, and Air Force as well as Joint Task Force Commanders and is assigned to a JTF or component surgeon.

b) Mobile Medical Augmentation Readiness Team

The mission of a Mobile Medical Augmentation Readiness Team (MMART) is to provide rapid short-term (less than 180 days) flexible medical augmentation for peacetime operations.

MMARTs will augment deploying medical units supporting military operations. They can also augment shore-based MTFs or family support centers most commonly with a special psychiatric rapid intervention teams. MMARTs are also commonly used to support humanitarian relief and preventive medicine efforts.

- The Special Psychiatric Rapid Intervention Team (SPRINT) provides short-term mental health and emotional support immediately after a crisis. The team may also provide educational and consultative services to local supporting agencies.

- FDPMU assesses, prevents, and controls potential and actual health threats in support of operating forces and disaster relief. The team manages situations where casualties are exposed to chemical, biological, or radiological (CBR) agents, identifies risk and recommends means of prevention for communicable disease or sanitation problems. They may also be involved in control of pests, rodents, and vector-borne diseases.

(BUMEDINST 6440.5A and BUMEDINST 6440.6 define MMART training requirements.)

c) Fleet Surgical Teams

- Fleet Surgical teams are operationally assigned to the large-deck amphibious assault ships (LHA/LHD) in support of the Amphibious Readiness Group (ARG) with an embarked Marine Air Ground Task Force (MAGTF).

b. Casualty Prevention

Implementation of a comprehensive range of preventive medicine services is critical to preventing casualties from environmental, occupational, operational, nuclear, biological, and chemical warfare threats. Injuries and casualties attributed to this total threat from the environment are referred to as disease and non-battle injuries (DNBIs). DNBI casualties have historically accounted for the vast majority of battlefield admissions more so than actual injuries due to combat.

Prevention of DNBIs is a critical force commander commitment to preserving the highest levels of overall combat readiness. Achievement of this objective for naval forces requires a preventive medicine program focused on the prevention and control of DNBIs.

Effective DNBI prevention requires individual members and commanders to control or eliminate environmental health threats. Preventive medicine personnel are responsible for identifying the potential threats, developing courses of action and advising commanders of the risks and threat countermeasures. Commanders are ultimately responsible for the utilization and implementation of this advice in the overall conduct of their unit's mission.

Unit and augmented Preventive Medicine personnel must focus on the following key objective areas in the execution of an effective DNBI prevention program:

1) Identifying Preventable Threats and Implementing Countermeasures

a) Preventive medicine must be engaged in all phases of unit training and deployment preparations in order to insure that preventable threats are identified as early as possible and that subsequent countermeasures are developed for implementation.

b) Commanders must insure that preventive medicine personnel are resourced with the appropriate equipment and supplies to execute their duties in a timely and efficient manner.

c) Highly deployable, light, rugged and user-friendly sampling and analysis equipment will maximize the ability of preventive medicine personnel to perform immediate exposure assessments.

d) Access to deployable computer systems and automated information support systems will also be critical for the rapid detection and on-the-spot evaluation of potential environmental health threats.

2) Infectious Disease Prevention

a) Infectious diseases are typically the greatest DNBI threat facing commanders. Identification of the potential infectious disease threat requires that preventive medicine personnel utilize all intelligence resources available to assess this threat prior to deployment.

b) Infectious diseases should be prioritized and monitored according to the threat they pose to the deploying unit and potential impact on mission achievement. Effective countermeasure development and subsequent implementation requires vigilant oversight by preventive medicine personnel.

c) Constant monitoring and evaluation of DNBI rates will be vital to tracking disease threat trends that may be impacting a units combat readiness and ensure timely implementation of real-time countermeasures to reduce or eliminate the identified threat.

d) Vital countermeasure areas to be addressed will include food and water vulnerability, waste disposal, and various personal protection measures (i.e. immunizations, chemo prophylaxis, insect repellents, etc)

e) Post deployment assessments and evaluations of service members are essential in screening for infectious diseases that were potentially acquired during deployment.

3) Environmental and Occupational Health Casualty Prevention

a) Assessing the potential for exposure to chemical, biological and physical stressors is critical to determining the overall environmental and occupational health threat that service members face in the deployed environment. The collection and analysis of various types of environmental samples will assist in characterizing this potential health threat.

b) Accessing various intelligence sources prior to deployment is critical to evaluating the nature and magnitude of this potential health threat. Accessing operational plans prior to deployment will also greatly enhance this evaluation of potential environmental hazards.

c) Preventive medicine personnel engaged in these assessments will follow standardized assessment and sampling procedures such as those prescribed in the “Environmental

Health Site Assessment" methodology developed by the Navy Environmental Health Center.

d) Preventive medicine personnel will use on-site sample analysis and exposure determination to the greatest extent possible so that commanders can be immediately informed of potential health threats and possible countermeasures. This capability will enable the commander to make on-the-spot rapid risk management decisions to protect the health of his personnel.

e) Critical to the assessment of any environmental exposure in the deployment setting is the understanding that low-level exposures can result in health effects that are not immediately observable or known. Accurate data reporting will be vital to tracking personnel and evaluating the potential for latent health effects.

f) Post deployment assessments and evaluations of service members are essential in screening for and/or tracking the potential – for latent health effects from exposures acquired during deployment.

4) Non-Battle Injury Prevention

a) Identification of injury threats likely to impact unit mission objectives will be critical to sustaining overall readiness.

b) Preventive medicine personnel can assist the commander in identifying these threats and developing countermeasures for mitigating their impact. Specific areas that require attention include motor vehicle accidents, heat and cold injury, fatigue and stress related illness, and physical over training. In addition, personnel with pre-existing conditions should be screened and evaluated prior to deployment in order to lessen the potential DNBI impact on the unit's readiness.

5) Risk Communication

a) Risk communication is a critical in implementing an effective DNBI prevention program. Having the expertise and capability to clearly communicate risks to deployed service members and commanders is integral to the overall prevention effort.

b) Preventive medicine personnel must be trained in operational risk communication methods so that threats and countermeasures can be effectively briefed to commanders and service members. Prioritization of the risk threat and its impact upon unit readiness will be critical to the decision making required of the commander.

6) Health Surveillance

a) Preventive medicine personnel will be vital to the effective implementation of a health surveillance program. Providing timely and accurate assessments of disease and injury

trends will require the establishment of standardized surveillance and reporting protocols.

b) Preventive medicine personnel will be looked to for establishing and coordinating health surveillance among deployed units. Preventive medicine personnel provide the commander with an in-theater analysis and assessment capability that is critical to sustaining the overall medical readiness of deployed forces.

c) Units without preventive medicine personnel with the appropriate knowledge and skills to execute an effective health surveillance program can request to be augmented by special preventive medicine teams such as the Forward Deployed Preventive Medicine Unit.

c. Casualty Management

Ships are equipped with battle dressing stations (BDS) for emergency handling of personnel casualties. Most ships are configured with multiple BDSs to provide more dispersed medical treatment capabilities and to facilitate more rapid delivery of advanced treatment to casualties during battle. Medical department personnel should supervise each BDS. In addition to BDSs, first aid supply boxes are distributed throughout the ship to support immediate on station care.

The DC organization has substantial responsibility in the handling of serious personnel casualties. The DC organization shall be capable of locating seriously injured or incapacitated personnel and coordinating their safe egress or extrication. The DCA is responsible for defining safe routes of passage for transporting injured personnel. Stretcher-bearers are personnel capable of administering advanced first aid and carefully transporting nonambulatory personnel through constrained passages within and around the ship. Each ship will assign a minimum of four stretcher-bearers to support each active battle dressing station. Stretcher-bearer personnel may be provided from DCRS personnel or from outside the DC organization. Ships should have as many personnel trained to function as stretcher-bearers as deemed necessary to handle mass casualties.

d. Patient Movement

Tactical assets to move NBC casualties are extremely limited in the littoral battlefield. Therefore, whenever possible the movement of NBC casualties must be limited to those patients who pose no contagious threat to air crew or landing craft crew or casualty receiving platform.

e. Logistics

Successful medical logistics is having the right item, the right quantity, at the right place, at the right time, and at the right price. These principles hold true whether the item is part of surge or sustainment packages and whether the item is equipment, durable-consumable, or consumable supply.

(1) Class VIIIA is the class of supply assigned to medical and dental materiel. Class VIIIB refers to human blood products. Class VIIIA will be the focus of discussion in this section.

(2) The previous sections of this Appendix discussed options to detect, prepare, prevent, protect, respond, and recover from the effects of Chemical, Biological, Radiological, and Nuclear (CBRN) agents. In the majority of the offered strategies, high-quality Class VIIIA management is central to their success.

(3) The previous sections of this Appendix discussed options to detect, prepare, prevent, protect, respond, and recover from the effects of Chemical, Biological, Radiological, and Nuclear (CBRN) agents. In the majority of the offered strategies, high-quality Class VIIIA management is central to their success. Successful medical logistics is having the right item, the right quantity, at the right place, at the right time, and at the right price. These principles hold true whether the item is part of surge or sustainment packages and whether the item is equipment, durable-consumable, or consumable supply.

Force Health Protection (FHP) Materiel.

The known FHP materiel slated to detect, prepare, prevent, protect, respond, and recover are not in any type of AMAL configuration. Currently, TYCOMs have opted not to include this type of materiel into the family of platform AMALs because of underlying excessive cost. While the SLEP provides savings and cost avoidance in acquisition and maintenance of Medical Chemical Defense Materiel (MCDM), there would be significant cost in initial outfitting, stock rotation, and inventory management processes of FHP CBRN materiel if configured into an AMAL. Most TYCOMs project MCDM requirements and inventory loads for their forces by following the Bureau of Medicine and Surgery directive (BUMEDINST 3400.1 series) and using the cross decking of asset policy between platforms.

Afloat Supply Chain Management.

Knowledge of the supply chain provides the owner and manager of CBRN allowance(s) the basic tool in ensuring the consistent and timely availability of this materiel for the Combatant Commander and Navy operating forces.

Assumptions.

- That the Navy operational platforms carry their peacetime and wartime AMAL configured endurance load to support the OPNAV-prescribed ROC and POE.
- That Navy operational platform carries their TYCOM-directed MCDM endurance load.

Total Asset Visibility. When the supply chain has been compromised, either by enemy forces or incident beyond anyone's control, the Senior Medical Officer of the deployed task force will determine the best placement, best distribution, and best utilization of CBRN FHP materiel. This is achievable through the total asset visibility tools resident in the Supply department or through the task force daily situation summary.

f. Mortuary Affairs

Joint Chiefs of Staff Joint Pub 4-06 Page 1-2 :3. Mortuary Affairs Policy (released 2000) "Policy states that the remains of all members of the Armed Forces of the United States will be returned for permanent disposition according to the direction of the person authorized to direct disposition of remains (PADD). (CJCS Memorandum of Policy 16, "Joint Mortuary Affairs Policy.") In war and operations other than war, geographic combatant commanders will determine if and when operational constraints necessitate a transition to a program of temporary interment in the area of responsibility. When military necessity or other factors prevent evacuation of the remains of US military and civilian personnel, friendly, third country, or enemy dead, the remains will be temporarily interred according to established procedures. The geographic combatant commander makes this decision. All interments performed within the scope of such a program are temporary, except for at sea disposition. Disinterment may commence when evacuation of the remains is operationally acceptable. Cremation is not considered to be an option. The recovery, evacuation, tentative identification, and final disposition of deceased military and civilian personnel under the jurisdiction of the Armed Forces of the United States are command responsibilities. For humanitarian, health, and morale reasons, this policy may be extended to the local populace fatalities.

The DOD Directive 1300.22 (Feb 2000) states on page 4: "4.4. Every effort will be made to identify remains and account for unrecovered remains of U.S. military personnel, Government employees, Government contractors, their dependents and others as described in paragraphs 4.9. and 4.10., who die in military operations, training accidents, and other multiple fatality incidents. 4.5. Temporary interment is a last resort to protect unit health, safety and sanitation. Temporary interment should be only considered after all other courses of actions have been explored. Authority for temporary interment in a theater resides with the geographic Commander of the Combatant Command as outlined in reference (c: Joint Pub 4-06 above). Burial at sea may be authorized by the ship's Captain only when preservation capability is unavailable aboard ship or when transfer to shore is not timely or is operationally inadvisable. The geographic Commander of the Combatant Command should approve temporary interments when remains are contaminated from a nuclear, biological and chemical event and decontamination is not possible without endangering other personnel. Remains will be disinterred as soon as possible based upon operational and safety requirements."

C-3. Afloat Issues

a. Threat Afloat

Unique issues arise for Health Service Support in a CBRN environment. This section will discuss the CBRN afloat issues using the stages of prepare, prevent, detect, protect, respond, and recover. In general, defense against CBRN threats, regardless of type, will take place in the following chronological phases:

1. **Preparation** – planning for an attack will be paramount. Potential threats in the AOR, intelligence reports, training personnel to respond to an attack, testing protective systems, amassing protective supplies and equipment appropriate to the potential threat, etc.

2. **Prevention** – actions taken to mitigate the effects of an expected attack. This could include such things as the use of chemoprophylaxis for BW and CW agents, issuing and proper donning of MOPP gear, etc.
3. **Detection** – which includes the use of state-of-the-art technology and/or medical surveillance to determine that an attack has occurred and what specific agent(s) has or have been employed.
4. **Protection** – may include any actions that could be taken to minimize the effectiveness of an attack, such as maneuvering the ship away from the contaminated area and use of collective and individual protection measures such as donning MOPP gear, setting "Circle William," or activation of the water washdown system.
5. **Response** – point when countermeasures are employed to minimize the effects of an attack based on information gathered during the detection phase. This could include use of specific treatments for infectious diseases or antidotes for CW agents. The more specific the countermeasures used, the more effective they are likely to be.
6. **Recovery** – when the ship or ashore facility attempts, as nearly as possible, to return to a normal state of operations after decontamination is complete, casualties are fully accounted for, and the ship is clear of the contaminated area.

Ships may be attacked directly or indirectly by biological agents. Aerial spraying, aerosol dispersal devices, tactical weapons, through mail, ventilation systems or for a contagious disease by an infected individual, whether crewmember, medevac or refugee.

CBRN Environment on Operational Capability**.** The presence of chemical or biological agents or radiological fallout, or just the threat of exposure to one of these hazard environments, forces Navy activities whether afloat or ashore, into a protective posture that, at some point, begins to degrade its capability to accomplish its mission.

b. Chemical Attack Afloat

1. CHEMICAL ATTACKS ON SHIPS. From the point of view of the ship, the primary concern is where the release point is in relation to the ship. There are two possibilities:

   - The chemical weapon explodes in the **immediate vicinity** of the ship, possibly on impact or after penetrating the ship's hull. Other weapon effects, i.e., blast and thermal energy, accompany the release of agent. The result is a toxic chemical environment superimposed on structural damage and, possibly, fire and flooding.

   - Chemical agent is disseminated by **standoff delivery**, in which agent is released in the atmosphere and then moves under the influence of gravity and wind to achieve coverage of the area in which the ship is located. Chemical agent vapor, liquid droplets and solid particles can be disseminated in this manner. A release by any spray type device would fall into this category, as would a munition that bursts far enough away from the ship that no weapon effect is experienced except the deposition of chemical agent.

2. Chemical Warfare Environment. Chemical attacks on ships or landing forces embarked afloat will force the medical operation to function in a contaminated environment. In an amphibious environment, attacks on landing forces may create casualties on the ship by

CB-agent drifting from shore or result in CB casualties being evacuated to the ship. Medical personnel should have an understanding of the following:

- Nerve and blister agents pose the greatest chemical threat to a ship's operational capability. They create persistent, percutaneous hazards, which means:
    - They can contaminate shipboard surfaces for extended periods of time.
    - Full protective clothing may be required topside for extended periods of time for protection against the contact hazard.
    - Full protective clothing may be required inside the ship due to a percutaneous vapor hazard from secondary vapor.
- Nonpersistent agents require only eye-respiratory protection for a relatively short time except possibly when a temperature inversion exists. NAVSHIPS Technical Manual, Chapter 470, provides information on individual chemical agents and riot control compounds.

a) Preparation

PRE ATTACK PHASE. The focus in this phase is on evaluating the ship's vulnerability to a chemical threat and the nature of the hazard environment that could result from an attack. The C.O. is asked to address five issues that assist in defining the ship's vulnerability to a chemical attack. The way the C.O. resolves these issues determines to the protection level required topside and in compartments that are outside TP zones. The key decision is whether to don the CPO inside the ship or not. Donning the CPO is likely to cause heat stress in moderate and warm climates. Once it has been removed from its sealed package, it is subject to wear time limits, even in an uncontaminated environment. Replacements may not be readily available. Thus, this decision has the potential to significantly affect the ship's ability to conduct sustained operations in a chemical warfare environment. Propose questions are:

(1) Does the threat include persistent percutaneous agents?

(2) Based on current environmental conditions and the characteristics of threat weapons, can a percutaneous vapor hazard develop inside the ship?

(3) Is the risk of a chemical weapon penetrating area and own ship defenses assessed as unacceptable?

(4) Is warning time insufficient to don CPE before the arrival of agent?

(5) Does the threat include nonpersistent/nonpercutaneous agent?

Each person aboard ship should be trained in MOPP gear (including mask only status for heat stress areas of the ship), damage control conditions, danger of and procedures for crossing CPS boundaries, signs and symptoms of various agents, self aid and buddy aid, and the location of decontamination stations. Crewmembers should also be reminded of the importance of proper maintenance of water and air systems including changing air filters and maintaining Circle William fittings.

b) Prevention

Chemo prophylaxis may enhance the effectiveness of antidotes used when combating the effects of nerve agents. At this time, the only pretreatment that is available is pyridostigmine bromine. Pyridostigmine bromine (PB) can be referred to as PB tabs, blister packs, or as nerve agent pre-treatment pyridostigmine (NAPP). The use of NAPP is discussed in NAVMED P-5041 and US Army Medical Research Institute of Chemical Defense document USAMRICD-SP-98-01. PB use has been controversial, however, legal authorization for its use by military units comes from the FDA, which approved it as a wartime contingency measure under an interim rule that waived informed consent during Operation Desert Storm. The FDA has subsequently approved a modification to the PB product label. Currently, the administration of PB is restricted to the authorization of the President of the United States per _____.

M291 Kits are provided to individuals to decontaminate liquid chemical agents from exposed skin areas by physical removal, absorption and neutralization. M291 kits can prevent liquid chemical agents from being further absorbed through the skin if applied within the first few minutes of exposure. While best if used shortly after exposure, decontaminating patients exposed to liquid chemical agents may prevent medical personnel from being exposed to the agents and thereby becoming a casualty as well.

Inspecting food and water sources before an attack, to ensure its integrity is an important step in preventing possible attacks via these sources. Food and water should only be procured from sources approved by the US Army Veterinary Services. A listing of approved vendors can be found at http://vets.amedd.army.mil/vetcom/index.html. After an attack, water and food should be inspected and/or tested to ensure no contamination. Further guidance on food and water inspection is given in appendix K of this manual.

c) Detect

CHEMICAL SURVEYS. Surveys are conducted to detect, locate and identify chemical agents in either liquid or vapor form. There are five types of chemical surveys; on-station monitoring, periodic monitoring for the arrival of liquid agent, rapid internal survey and detailed surveys. A more complete discussion, with detailed procedures and recording formats, is provided in NAVSHIPS Technical Manual, Chapter 470.

Only vapor detectors are needed for nonpersistent agents because they are normally encountered only in the gaseous state. Liquid and vapor sensors are needed for persistent agents. Under some conditions, such as low temperatures, the amount of vapor off gassing from persistent agents in liquid form may not be enough to cause vapor sensors to alarm. A contact hazard could exist, as well as a low-level vapor hazard that is not detected by vapor sensors. A survey of shipboard chemical detection equipment draws the following analysis

- There is real-time, automatic alarm capability aboard ship for nerve agents in vapor form
- Manually operated systems are available to detect liquid agents and other agents in vapor form.

- Some detectors identify agents specifically, others by physiological group or series.

- The Chemical Agent Monitor (CAM), which is available for emergency issue, is suitable for personnel monitoring only. Note: CAMs are not available on board ships.

- A number of factors can interfere with detection of chemical agents. Some shipboard substances cause false alarms by some sensors. A land background, especially with pollution in the atmosphere, increase background interference with standoff detection.

INTELLIGENCE ESTIMATES. Sources of intelligence on the nuclear, biological and chemical capabilities of potential adversaries range from threat assessments that are available months before an operation begins to real time or near real time reports of enemy activity. The primary source document for threat information is the **Naval Chemical and Biological Warfare Threat Assessment**, which is published periodically by the Office of Naval Intelligence (ONI). As changes become known, the information is promulgated by message, the ONI Weekly Wire and Naval Intelligence Technical Assessments. Beyond these resources, current information on the nuclear, biological and chemical capabilities of military forces in the intended area of operations is needed before and during a deployment. Pre-deployment briefings are the first step, but current reports of enemy activity with CB weapons are needed to make optimal use of CB defense equipment with the least impact on mission accomplishment.

CHEMICAL HAZARD ASSESSMENT GUIDE (C-HAG). The Chemical Hazard Assessment Guide (C-HAG) provides a way to estimate the duration of the hazard resulting from the deposition of persistent chemical agents on a ship. Based on the results of monitoring and surveys for liquid contamination, an estimate of the duration of a persistent/percutaneous hazard is made using the C-HAG. The effect of the ambient temperature and wind on hazard duration can be assessed. The C.O. can consider delaying topside evolutions until the hazard decays or adding speed to increase wind across the deck and accelerate the decay process. The C-HAG is found in NAVSHIPS Technical Manual, Chapter 470, Appendix C.

REPORTING NUCLEAR DETONATIONS, BIOLOGICAL AND CHEMICAL ATTACKS AND PREDICTING AND WARNING OF ASSOCIATED HAZARDS AND HAZARD AREAS (ATP 45) This document provides procedures for predicting the hazard area in the vicinity of a nuclear detonation or chemical attack and downwind. These procedures take into account the nature of the chemical hazard (airborne or ground contaminating), the capabilities of the delivery system and meteorological conditions. Predictive procedures for biological hazard areas are not addressed.

SENSORS:

CHEMICAL AGENT DETECTION AND IDENTIFICATION SYSTEM. Although a single type of detector may be used for more than one of the functions described in the preceding paragraph, several different types are needed to provide the information necessary for operational decision-making and self-defense. Because of the wide variety of agents and the fact that agents can be encountered in any physical state, it is not practical with current technology to rely on a single detection device. There is no single chemical sensor that detects and identifies all

agents in every physical form. Several detectors are needed to comprise a chemical agent detection and identification system.

CHEMICAL AGENT VAPOR, LIQUID, SOLID TRACKING (VLSTRACK). The Chemical-Biological Agent Vapor, Liquid and Solid Tracking (VLSTRACK) Computer Model can predict hazard areas based on agent identification, weapon type, release point and current environmental condition & Predicted geographical patterns can be displayed showing agent deposition, persistence or dosage. Outputs are provided either as cumulative hazards from the time of the attack or periodic hazards for each of several time periods. A quick estimate can be produced in minutes or a refined projection based rigorous calculations can take an hour or more to produce. VLSTRACK can perform these functions for CB agents in any physical state. VLSTRACK is being developed as a module in the Tactical Environmental Support System (TESS), which is planned for installation on aircraft carriers and large amphibious ships.

Ships can be equipped with a chemical warfare directional detector (AN/KAS-1), a chemical agent point detector system (CAPDS), or an improved (chemical agent) point detector system (IPDS). The AN/KAS-1 is a manually operated passive sensor that can detect nerve agent vapor at distances of several nautical miles from the ship. The directional detector can detect the infrared signature of GA, GD, GB, GF, and VX, but cannot discriminate among these agents. The AN/KAS-1 also cannot determine the range to the vapor cloud. The CAPDS is an installed, automatic vapor sensor that provides point detection of several nerve agents. It provides a means of continuously sampling outside air and it automatically indicates the presence of an agent by audible and visual alarms. It detects GA, GB, GF, and VX nerve agent vapor. CAPDS detects chemicals by an ionization detector.

The IPDS can detect H-series blister agents in addition to the G- and V-series nerve agents. The IPDS uses an ion mobility spectroscopy (IMS) detector. Air samples are mixed with reagents and ionized. The ions are accelerated and separated based on their charge and mass. The time it takes each ion to travel through an electric field is measured. This is the IMS signature. Each substance that can be ionized produces a unique IMS signature that can be compared to the signatures of known substances. If the signature matches the signature of G or V-series nerve agents or H-series blister agents, the IPDS goes into an alarm condition.

In addition to the installed systems, ships are also equipped with M-256A1 detector kits. The M-256 kits provide a man-portable capability for detecting operational concentrations of nerve, blister and blood agents. In a single exposure, they detect nerve (V and G-series), blister (H-series, L, CX) and blood agents (AC, CK). M8 paper is included in the kit and can be used to detect liquid nerve and blister agents. A number of substances or conditions can produce unreliable or false positive test results with the M256A1 sampler-detector. NSTM Ch 470-4.2.5.1 has a complete list of conditions and substances.

USE OF DRAEGER DETECTION TUBES FOR DETECTING PHOSGENE IN A CHEMICAL ATTACK. Draeger tubes, provided for gas free engineering, are the only phosgene (CG) detection devices available aboard ship. In the event of a suspected chemical attack, use CG Draeger tubes to survey for CG. In the case of phosgene, a response time of one to two minutes is required to produce a result. A color change to bluish-green indicates the presence of phosgene.

CHEMICAL AGENT MONITOR. The Chemical Agent Monitor (CAM) is a hand held vapor sensor that detects nerve agents and blister agents. It has not been issued to the fleet but there is a stock available for use in emergency situations. If these items were ever issued to selected ships on this basis, instruction in operation and maintenance of the CAM would be provided.

M8 paper can be used for either point detection or monitoring. The paper can be mounted on shipboard surfaces to monitor for the arrival of agent droplets.

M9 detector paper is a chemically treated, dye-impregnated paper. The presence of liquid nerve (G & V) and blister (H & L) agents can be detected by color changes to some shade of red on the M9 paper. The identity of the agent cannot be determined with the M9 paper. M9 paper also has a number of substances or conditions, which can produce unreliable or false positive results. See paragraph 470-4.3.3.1 in NSTM Ch 470 for a complete listing. Like M8 paper, M9 paper can also be used for monitoring of shipboard surfaces.

SYNDROMIC SURVEILLANCE can also be used to detect low-level exposure to chemicals. During an attack using a chemical weapon, a large number of casualties can be expected. If a ship is on the outskirts of an attack or attacked using terrorist weapons, personnel may show symptoms from low-level exposures. These symptoms will vary due to the type of chemical, route of exposure, and dosage. Symptoms may include unexplained runny noses, blurring of vision and difficulty in focusing the eyes on close objects, a feeling of choking or tightness in the chest or throat, sudden feeling of depression, irritation of the eyes, unexplained difficulty in breathing or increased rate of breathing, slurred speech, nausea, skin rashes/burns, or muscular weakness. Some agents are **quick acting**, that is, their effects appear immediately after exposure. Others are **delayed acting**, which means the effects do not appear for up to several hours after exposure. Therefore, patients should be questioned about the delay or rapidity of the onset of symptoms.

Alert the Proper Authorities. Should initial appraisal of casualties suspect a chemical attack the notify chain of command and include primary and secondary clinical laboratory. This will enable laboratory personnel to take proper precautions when handling specimens and will also permit the optimal use of various diagnostic modalities. Contact Preventive Medicine personnel to assist in the delineation of contaminated areas and the search for further victims

d) Protect

Initial Actions — Pre-involvement Phase. When a CW attack is imminent, prudent actions will include limiting the exposure to CW agents by maneuvering the ship, if possible, and utilizing shipboard systems and personnel protection measures. The ship's mission may or may not permit avoidance of the chemical agent hazard area. The ship's assigned task may be too important to break off or geographical constraints in littoral operations may block escape routes. All reported locations of chemical hazards are approximates since material can be dispersed in unexpected ways and there is never a truly uniform wind front. A CO should therefore suspect potential contamination until after sampling, active preventative decontamination or sufficient *environmental decay occurs*. Specific actions that should be considered when a ship is in a threat area but not yet involved include:

- Set material condition ZEBRA to close most accesses and secure most ventilation.
- Initiate use of point detection equipment to monitor for possible contamination.
- Initiate intermittent operation of the ship's Countermeasure Washdown System (CMWDS) and Collective Protection System (CPS). The CMWDS is most effective when operating in advance of, and during the arrival of chemical agents (prewetting).
- As the threat environment increases, set Circle WILLIAM settings to secure the remaining supply and exhaust fans. Place priority on stopping forced air movement into the ship because it may not be practical to close all Circle William fittings rapidly enough.

Individual protective equipment is used during an attack. NSTM Ch 470, explains the various ship's MOPP Levels and associated personal protective equipment. Table C-1 indicates the various MOPP levels and the protective gear associated with the levels for military and civilian shipboard personnel and military field personnel.

Table C-1, MOPP Levels for Military and Shipboard Personnel and Military Field Personnel

MOPP LEVEL	MILITARY SHIPBOARD	CIVILIAN SHIPBOARD	MILITARY FIELD
0			Individual Protective clothing issued, medical supplies issued. Protective mask is in carrier and worn on person
1	Individual protective clothing issued, medical supplies issued		Mask carried, overgarment worn
2	Protective mask is in carrier and worn on person		Mask carried, overgarment worn, overboots worn, Helmet protective cover worn
3	Install new filter canisters on masks, maintain in carrier and on person, provide wet weather gear for donning over other protective clothing		Mask, overgarment, overboots, and helmet protective cover worn

	and equipment for weather deck activities. Weather deck personnel don over garments, protective boots. Prefill canteens.		
4	Don mask, secure hood over head and around mask, don protective gloves.		Masks, overgarment, overboots, helmet protective cover, and gloves worn

In addition to IPE, each ship is equipped with a countermeasure wash down system (CMWDS). CMWDS is activated to prevent the chemical agents from adhering to the skin of the ship. In addition to activating the CMWDS, the ship will also set material condition William which closes all ventilation systems to the outside and shuts down the inside ventilation to prevent the spread of agent through the ventilation system.

One other means of protecting personnel during an attack is to restrict their movement about the ship. Minimal personnel should be used to check for contamination levels throughout the ship.

e) Response

Actions When Exposed

If the ship cannot evade exposure to the CW hazard or is unsure of possible near future exposure, the ship should continue to employ a combination of effective use of material condition ZEBRA and Circle WILLIAM settings, operation of the ship's Countermeasure Washdown System (CMWDS), and operation of the ship's Collective Protection System (CPS) to limit the amount of hazardous material that collects on external ship surfaces and the penetration of contaminants into the ship's ventilation system. In addition to the actions already initiated during the "pre-involvement phase", the following actions should begin:

- Notify all personnel to don IPE appropriate for their individual battle stations.
- Adjust point detection equipment to conduct continuous monitoring to identify the time and intensity of actual involvement.
- Ensure total enforcement of topside access control to prevent the transfer of potential contamination into clean areas. Ensure that personnel who go topside reenter the ship only through a contamination control area or decontamination station.

Ship's personnel are divided into various repair lockers and support personnel for damage control personnel. First responders are contained within these repair lockers. These personnel may be corpsmen or they may be personnel trained in first aid and to act as stretcher-bearers. Medical also has a battle dressing station (BDS) for treating casualties. In the event of a chemical attack, the BDSs may be overwhelmed with casualties and a mass casualty collection

point may need to be established. Damage Control Central will determine patient transport and decontamination with care for fire boundaries and CPS integrity.

NSTM Ch 470 Section 7 gives detailed description of personnel decontamination. While some ships are equipped with collective protection system decontamination stations, others use conventional decontamination stations. The configuration of the decontamination station will vary from ship to ship, however, the basic layout is as follows. The contamination control area should have direct access to the weather deck and shall have a separate exit into the interior of the ship. If possible, it should have a deck drain for cleaning. When the CCA is set up, positions 1, 2, and 3 should be marked on the deck.

Calcium hypochlorite is the standard shipboard oxidizer for chemical decontamination. A minimum amount to be carried at all times is 192 six-ounce bottles for air capable ships and 144 six-ounce bottles for all other surface ships. There is a separate allowance for emergency water purification. NSTM CH 470 discusses the mixing of the decontamination solution and the varying strength of the solution.

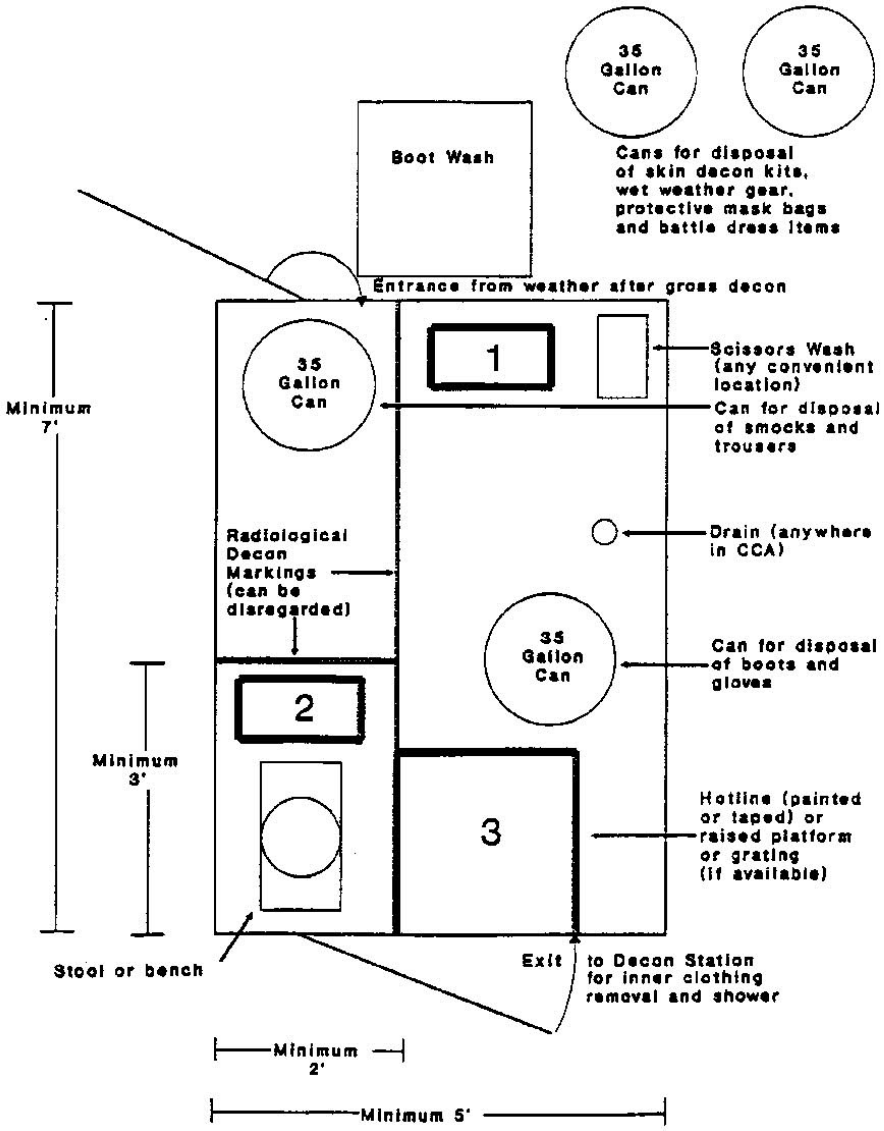


Figure 470-7-1 Generic Contamination Control Area (CCA) Layout for the One-Cutter Process

Personnel must be decontaminated prior to treatment. This will stop further exposure to agent, prevent contamination spread, and reduce exposure to chemical by medical personnel. The ship should set up at least two decontamination lines, one for casualties, and the other for unaffected personnel. However, due to space consideration, some ships can only set up a single decon station. Minor contamination may prevent timely treatment of life threatening hemorrhage or use of other wise capable personnel needed for damage control and salvage of the ship. Corpsmen will recommend priorities of decontamination of casualty personnel to the On Scene Leader. Healthy personnel will need to be available to conduct normal ship's functions. NSTM Ch 470 lays out decontamination methods. DC Division on the ship should be consulted for decontamination techniques and equipment available.

Medical countermeasures include nerve agent antidotes of atropine and 2-PAM Chloride auto injectors. Antidotes are held by DC Division and given out as either individual injectors or together as a Mark 1 kit. Three atropine and three 2-PAM CL are given out to each individual on board ship. These auto injectors are to be used individually or as buddy aid. Each crewmember is instructed to use only that issue to an individual and to place used ones on the pocket of the affected individual. In addition, diazepam often referred to as CANA is also handed out but is held by the Medical Department. NAVMED P-5041 chapter 2 give detailed description of the antidotes and their effects.

f) Recover

RECOVERING FROM AN ATTACK.

When the attack ceases, conduct a rapid internal survey. There may be no trace of a nonpersistent agent left by this time, as they dissipate very quickly, but some are heavier than air and they may collect in poorly ventilated spaces. **Tests should be conducted for all agents.** If the presence of any agent vapor was detected during the rapid internal survey or on-station monitoring, purge the ship in accordance with the procedures in NAVSHIPS Technical Manual, Chapter 470 and retest. When the ship is clear of agent vapor, execute the unmasking procedure described in NAVSHIPS Technical Manual, Chapter 470.

If the M256AI kit indicates that the ship was attacked with blood agent, order the crew to install new filter canisters on their protective masks. Blood agent uses up the filtration capacity of the activated charcoal in the filters more rapidly than other agents.

Exposure to nerve and blister agents may require a substantial amount of medical support beyond the capabilities of the ship's Medical Department. In addition, some long-term affects of both blister and nerve agents may prevent personnel from performing their jobs or by performing those jobs, can endanger others. Medical evacuation may also be limited to avoid cross contamination of logistic vessels and aircraft. Political situations may dictate available medevac options from contaminated ships. Therefore it is critical to prevent exposure. Replacements may be needed for the ship to remain fully functional.

c. Biological Attack Afloat

While the six general phases of response to CBRN weapons exhibit a logical chronological order, biological warfare is exceptional in at least one regard. In many cases, the stages will not be completely distinct, but will overlap or be concurrent. Indeed, for bioweapons, some phases may even be bypassed completely. This is due to the long lag time between release of many of the biological agents and the fact that they are most effectively employed using a covert release. In the most likely scenario, the first indication that an attack has taken place will be the appearance of ill casualties as patients begin arriving for medical treatment. In this case the "prevention" and "protection" phases may be completely missing and the "detection," "response," and "recover" phases may happen almost simultaneously. This possibility should be carefully considered during the "preparation" stage, because a delayed response in such a situation can seriously increase the severity of such an attack and potentially jeopardize the ship's mission capabilities.

While response to a biological attack on a shore facility will be essentially the same for all services, response to an attack on afloat forces will have unique features. Items specific to each of the general phases include:

a) Preparation

Ships have unique collective protective systems not found elsewhere (water washdown systems, filter systems, air handling systems, etc.) Further, these may vary from one ship type to another. Training plans for BW must take this into account and inspections must be done to ensure proper functioning.

Different ship designs result in different access points. Planning for decontamination stations and training of the crew in proper decontamination measures.

b) Prevention

Essentially the same as for other forces (immunization and chemoprophylaxis).

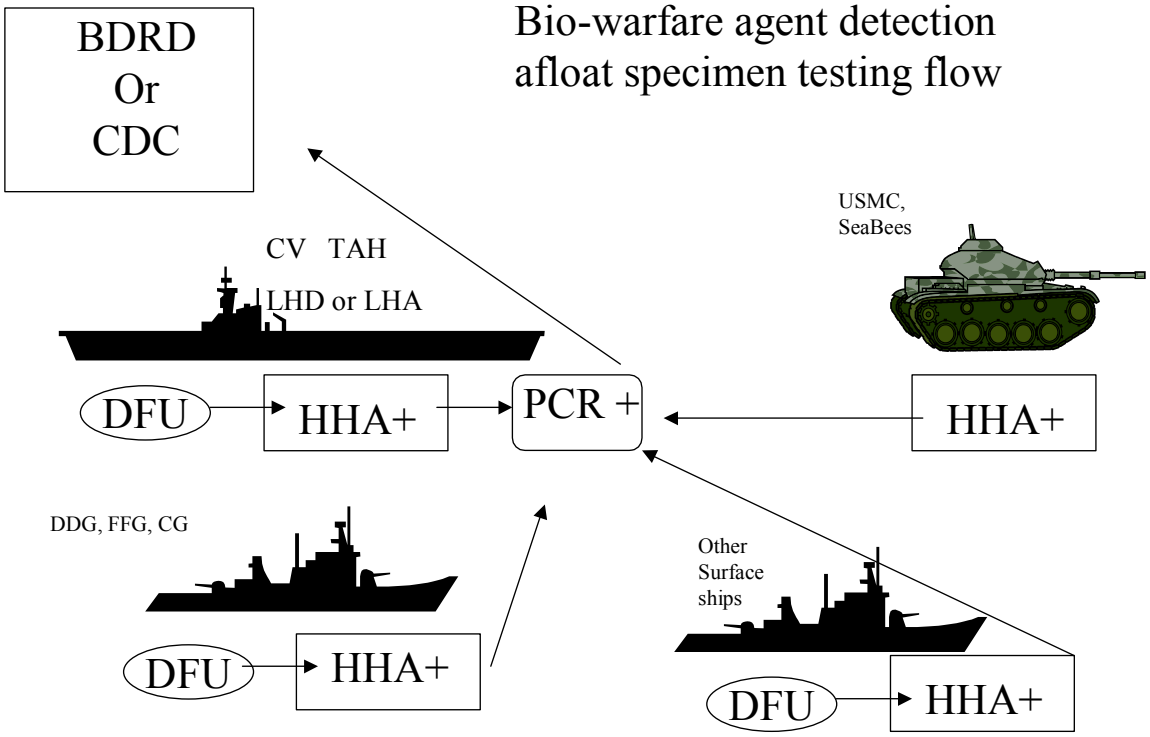
c) Detection

Different platforms have varying capabilities for detection of biological agents ranging from none to confirmatory, as shown in the Table C-2 below. Further, Figure C-2 illustrates the normal flow of BW specimens for processing and analysis.

Table C-2. Deployed Shipboard BW Agent Detection and Testing Equipment

Deployed Shipboard BW Agent Detection and Testing Equipment					
System	**Description**	**Types of ship**	**Personnel responsible**	**Level of Testing**	**Comments**
Hand Held Assays (HHA)	Rapid screening device for BW agents in environmental samples	All	Damage Control	PRESUMPTIVE –Confirmatory lab analysis required	Used in conjunction with DFU's and IBADS and to test suspicious parcels, packages, liquids and powders / Not for diagnostic use
Dry Filter Unit (DFU)	Air sampling device that collects airborne particulate matter including BW agents on filters / Uses HHA's for manual analysis of filters	All	Damage Control	PRESUMPTIVE –Confirmatory lab analysis required	Provides routine monitoring of air / Supply of HHA's and replacement filters required / Positive HHA results must be sent to a confirmatory lab for analysis
Interim Biological Agent Detection System (IBADS)	Semi-automatic mobile air monitoring system / Uses HHA's for analysis	MCM/MHC	Damage Control	PRESUMPTIVE – Confirmatory lab analysis required	Provides routine monitoring of air / Supply of HHA's required / Positive HHA results must be sent to a confirmatory lab for analysis
Culture	Growing bacteria on plates	CV/CVN LHA/LHD T-AH	Specially Trained Advanced Lab Techs (NEC 8506)	CONFIRMATORY – Consult technical reach back*	Conducted in bio-safety hood using CDC Bio-safety level 2 handling techniques / Definitive results in 12-14 hours for anthrax / Only means by which to determine whether bacterial BW agent is viable
Polymerase Chain Reaction Testing (PCR)	Rapid and highly specific test that detects presence of BW agent DNA	CV/CVN LHA/LHD T-AH	Specially Trained Advanced Lab Techs (NEC 8506)	CONFIRMATORY – Consult technical reach back* to arrange definitive lab analysis	Requires significant training and has a significant logistics tail / RAPIDS and LightCycler PCR equipment currently deployed
* Biological Defense Research Directorate (BDRD) or Nearest Navy Environmental Preventive Medicine Unit (NEPMU) or Forward Deployed Preventive Medicine Unit (FD-PMU)					

Figure C-2 Bio-Warfare Agent Detection Afloat Specimen Flow



Either suspicious substances or air filters from the dry filter units (DFU's) are given a preliminary test with hand held assays (HHA's). If positive, the specimen is sealed and transported (with chain of custody) to a large deck platform (carriers, hospital ships, larger amphibious ships or forward deployed EPMU) for confirmation by polymerase chain reaction testing (PCR). If still positive, specimen is sent for culture, antibiotic sensitivity or strain typing as well as confirmation testing required for any legal actions.

d) Protection

As mentioned above, ships have unique collective protection measures that can be employed

Unlike a fixed facility, a ship's mobility can be used to maneuver away from areas known or suspected to be contaminated.

e) Response

Essentially the same as for other forces (specific and non-specific treatment of casualties, decontamination)

f) Recovery

Due to close, enclosed quarters, the shipboard environment may pose significant difficulties during this phase, particularly if a contagious agent, such as smallpox or plague, is known or suspected to have been the weapon employed. Strict control measures must be considered to prevent further spread of infection to other crewmembers, up to and including isolation or quarantine of infected patients. Further, if the number of casualties is large, remains of deceased casualties could present a major problem in terms of storage and as a danger to surviving crewmembers. Command decisions for proper disposal of remains should be made in consult with expert medical advice.

d. Rad/Nuc Attack Afloat

1. **Radiological/Nuclear Warfare Environment**

- Radiological Threat**:**

The hazard posed by radiological contamination requires fundamentally different defensive measures than those appropriate for chemical and biological contamination. Many of the same procedures described for response to a nuclear weapon attack will apply both to afloat and ashore scenarios.

- Nuclear Weapons:

Attainment of a nuclear weapon capability is a technologically complex challenge. As a result, relatively few nations possess the capability and those that do are generally well known. Bombs and missiles are the most likely delivery means. Radiological contamination resulting from detonation of a nuclear weapon is a secondary weapons effect, the primary effects being blast, thermal pulse, and shock.

- Radiological Weapons:

  - Radiological Dispersal Devices – Dirty Bombs: A radiological dispersal device (RDD) is a device designed to spread radioactive contamination over the widest possible area and effect the greatest number of people. The radioactive material could be in the form of a fine powder, a liquid mist or a gas. The material could be spread by hand, such as emptying a container over a desired area, or by incorporating the radioactive material into a conventional explosive device. The explosive device would have the potential to spread the material over a larger area than manual dispersal.

- Radiological Exposure Device: A radiological exposure device (RED) is radioactive material, either as a sealed source or as material within some type of container that is intended to expose people in the vicinity of the device to radiation emitted from it.

The most likely threat from radiological weapons will be employment by terrorists either onboard ship, in its vicinity or attacks ashore; for example attacking a ship with conventional explosives in combination with radioactive contaminants.

2. Radiological Hazards

Ionizing radiation as a consequence of nuclear detonation constitutes a radiological hazard. This will consist of radiation emitted at the time of detonation as well as nuclear radiation occurring minutes to hours after the detonation.

Radiological Warfare Environment Afloat.

The key operational consideration to minimize the effects of any radiological hazard is contamination avoidance. However, should avoidance not be possible, COs should apply the principles of time, distance, and shielding to mitigate radiological impact on personnel. Increasing the distance of the ship from ground zero or the resulting fallout pattern, minimizing the time spent in the contaminated environment and shielding personnel through the use of shelters/deep shelters will significantly reduce the radiological impact. In the event of shipboard contamination, the same principles of time, distance and shielding at an individual level will act to reduce dose accumulation for individuals.

a) Prepare

Advanced Planning

Nuclear weapons defense actions are those, which reduce the effects to personnel from penetrating radiation, air blast, underwater shock and thermal radiation. Design features enhance a ship's survivability and, combined with the setting of proper material condition, provide the ship with protection from air blast, underwater shock and thermal radiation. The remedial action for ship damage by a nuclear weapon is application of standard damage control procedures. Those actions which are undertaken to protect personnel from initial and residual nuclear radiation are termed radiological countermeasures. These countermeasures prevent adverse effects on the ship's operational capability by avoiding or forestalling radiation sickness among ship's personnel.

Training

Prior training provides the greatest knowledge with respect to pre-attack preparation of personnel. Complete battle dress and availability of pre-fitted protective masks will ensure

adequate readiness. Personnel should be reminded of the procedures to brace for shock and the importance of not eating, drinking or smoking following the attack.

The basic objective of radiological defense training is to ensure the readiness of personnel to deal with shipboard emergencies created by nuclear weapons effects. Damage control training evolutions must include a program of periodic radiological defense exercises which, at a minimum, consists of the following:

1. Fundamentals of nuclear weapons effects
2. Countermeasures against nuclear weapons effects
3. Organization and procedures to evaluate and control hazards
4. Radiation detection and measurement
5. Decontamination principles and procedures
6. Training of relief or partial crews for personnel at vital stations to minimize radiation exposures
7. Practice of rigging and activation of washdown systems
8. Self-aid and first aid training (mass casualty)
9. Performing individual primary duties in support of the ship's mission in a radiological environment.

Indoctrination of newly reporting personnel must include familiarity with ship's systems, location of equipment, knowledge of shelter and deep shelter station locations, methods of donning protective clothing, decontamination procedures and familiarization with personnel responsibilities necessary to meet requirements.

b) Prevent

Contamination Avoidance:

The key operational consideration to minimize the effects of any radiological hazard is contamination avoidance.

Time, Distance, Shielding:

Should avoidance not be possible, COs should apply the principles of time, distance, and shielding to mitigate radiological impact on personnel. Increasing the distance of the ship from ground zero or the resulting fallout pattern, minimizing the time spent in the contaminated environment and shielding personnel through the use of shelters/deep shelters will significantly reduce the radiological impact. In the event of shipboard contamination, the same principles of time, distance and shielding at an individual level will act to reduce dose accumulation for individuals.

Shielding

Ionizing radiation is significantly decreased in intensity (absorbed) when it must pass through an appreciable thickness of material such as steel, water, concrete or earth. The cumulative thickness of steel and water surrounding certain below decks ship areas is sufficient to significantly decrease ionizing radiation. This shielding is an important countermeasure for

protecting personnel from initial and residual nuclear radiation. Shipboard shielding stations are categorized as either ready or deep shelter stations:

1. Ready-shelter stations are just inside the weather envelope, with access to deep shelter. They provide minimum shielding from nuclear radiation and allow the crew to remain close to battle stations.

2. Deep-shelter stations are low in the ship and near the centerline. They provide maximum shielding from nuclear radiation, often requiring personnel to be far removed from battle stations.

Superstructures provide little shielding. For below-decks spaces, the amount of intervening shielding above the space will be generally much larger than the amount on the sides. The well protected locations are those below the water line or behind heavy plating where available. The effectiveness of a given thickness of shielding differs for initial radiation, radiation from airborne fallout or base surge. This difference arises in part from the fact that initial nuclear radiation and the radiation from airborne sources penetrate through the upper portion of the ship's structure whereas radiation from deposited sources penetrates through the decking to the interior. Shielding protection is generally expressed in terms of the transmission factor TF: the ratio of the radiation exposure rate at a shielded location to the exposure rate at an unshielded location (usually topside on the weather deck). No simple transmission factor can be assigned to a compartment that could be applied to all radiological involvements. In the case of an air burst, because of the direction of initial nuclear radiation (which has its source in the fireball, steam or cloud), the transmission factors for initial nuclear radiation will vary.

c) Detect

Detection Equipment

Radiation Detection Indication and Computation (RADIACs) are intended for the detection of varying types of shipboard nuclear radiation contamination. Shipboard RADIACs intended for contamination detection are maintained by the damage control assistant (DCA) and stowed in repair lockers and bridge monitoring stations. There are two basic types of RADIACs, some of which will indicate both gamma (penetrating) and beta (non-penetrating) radiation:

1. Intensity (or dose-rate) meters, which indicate radiation intensity in terms of dose per unit of time.
2. Dosimeters, which indicate the total dose received from radiation exposure. For further information on use of these RADIACS consult NSTM 070.

d) Protect

Hazards to Personnel

Nuclear radiation is a hazard to personnel at distances beyond the range of lethal damage from other nuclear effects. The cumulative exposure to radiation may govern the future capability of the ship. Following initial radiation, continued personnel performance will depend upon dosage received, availability of deep shelter and reduction of the hazard. The consequences of personnel exposure to penetrating radiation are the most serious result of an involvement in a radiological event. The amount of radiation received determines not only the severity of the injury but also the length of the latent period. In general, the larger the dose, the sooner the injury becomes noticeable. In wartime, a 200-rad whole body dose, accumulated over a 24 hour to 14 day period, is not expected to cause personnel to become combat ineffective; additional exposure for personnel who have received 200 rads could become serious.

Individual Protective Equipment (IPE)

Decontamination crews should make full use of protective clothing to reduce personnel contamination. Clothing provides protection from alpha and beta radiation. It provides no protection from initial or residual gamma radiation. In general, protective clothing should be worn by personnel other than decontamination crews if its use does not hamper response to an assigned mission. Clothing guidelines are presented for the following groups:

1. Monitoring Teams — Personnel should wear normal battle dress to include rubber gloves, a protective overboot and a respirator or chemical protective mask if there is danger of exposure to airborne radioactive contamination.
2. Decontamination Teams — Personnel should wear normal battle dress to include rubber gloves and rubber boots. A respirator or the chemical protective mask should be worn if there is a danger of exposure to airborne radioactive contamination. Wet weather gear should also be worn.

Dosimetric Devices

Devices that measure total dose or exposure are called dosimeters. A personal dosimeter measures the accumulated dose of the wearer. This information is used to make decisions about each crew member's involvement in actions that may involve additional radiological exposure.

1. Personnel dosimeters. Personnel dosimeters are used to monitor deep and shallow dose. Personnel dosimeters are normally worn at the waist or chest. In unique situations where an individual is exposed in a high gradient field or an individual is expected to receive a partial body exposure, the monitoring device should be worn on or at the part of the body, e.g., head, neck, upper arm or thigh, expected to receive the highest exposure. Personnel dosimeters provide a very sensitive, accurate and dependable indication of the exposure to an individual. Because of their sensitivity, accuracy, and dependability, these are referred to as primary dosimetric devices. Lithium fluoride and calcium fluoride thermoluminescent materials are the sensitive elements of the three primary Navy personnel dosimeters, the DT-702/PD, DT-648/PD and DT-526/PD respectively. Thermoluminescent dosimetry (TLD) is based on the measurement of radiation using a crystalline substance sensitive to radiation that, when heated, produces light output that is proportional to the amount of radiation exposure.

2. Pocket dosimeters are self indicating devices used to monitor exposure to gamma or x-ray radiation in situations where an immediate indication of the exposure is desirable. Pocket

dosimeters are pencil shaped devices containing a small ionization chamber. These devices provide very sensitive and accurate indications of the exposure of the individual, however they are susceptible to shock, dirt, moisture and other environmental factors, which may produce a false over response. Consequently, they are used as secondary dosimetry devices. An alternative to the pocket dosimeter is the electronic dosimeter, which is normally battery powered, has a digital display of integrated dose and can be set to alarm at a preset dose or dose rate. Electronic dosimeters are used as secondary dosimetric devices.

3. Battlefield dosimeters provide an estimate of personnel exposure to high levels of ionizing radiation that can be used to aid in medical triage of affected individuals. These dosimeters are less accurate than personnel dosimeters but have a much higher range.

The latter two types have been selected for shipboard use in nuclear warfare defense. The IM-143/PD is an ionization chamber pocket dosimeter. The DT-60 Navy Battlefield Dosimeter is a radioluminescent dosimeter that is worn like a pendant. While neither provides total dose as accurately as a TLD, they are more reliable than dose calculations based on exposure rate measurements.

If the shipboard allowance is sufficient, some type of dosimeter shall be issued to all hands. Self-reading dosimeters are preferred. If the allowance is insufficient, dosimeters shall be placed at each vital station, ready shelter and deep shelter location and issued to at least one person in each survey, monitoring and decon team.

e) Respond

Personnel Casualties

Ships are equipped with battle dressing stations (BDS) for emergency handling of personnel casualties. Most ships are configured with multiple BDSs to provide more dispersed medical treatment capabilities and to facilitate more rapid delivery of advanced treatment to casualties during battle. Medical department personnel should supervise each BDS. In addition to BDSs, first aid supply boxes are distributed throughout the ship to support immediate on station care.

The DC organization has substantial responsibility in the handling of serious personnel casualties. The DC organization shall be capable of locating seriously injured or incapacitated personnel and coordinating their safe egress or extrication. The DCA is responsible for defining safe routes of passage for transporting injured personnel. Stretcher bearers are personnel capable of administering advanced first aid and carefully transporting nonambulatory personnel through constrained passages within and around the ship. Each ship will assign a minimum of four stretcher bearers to support each active battle dressing station. Stretcher bearer personnel may be provided from DCRS personnel or from outside the DC organization. Ships should have as many personnel trained to function as stretcher bearers as deemed necessary to handle mass casualties.

Personnel Injury

Air blast produces injury among topside personnel from bodily displacement (picking them up and throwing them about) and among below-decks personnel from bodily displacement and displacement of loose gear. Potentially severe injury can be reduced if personnel brace for shock to prevent bodily displacement. Underwater nuclear detonation shock produces injury among topside and below-decks personnel from the rapid upward acceleration of the deck. This hazard results from the transmission of the shock wave force through the entire ship structure. Personnel are "hit" by the deck and are thrown off balance or propelled into the overhead or bulkheads. Potentially severe injury can be reduced if personnel, upon warning of immediate attack, hang onto solid ship structures, flex their arms and knees, and rest on the balls of their feet.

Countermeasures to Radiological Contamination:

Ionizing radiation is relatively easy to detect using shipboard detection equipment. Detection of areas of radioactive contamination and active measures to either avoid (using the principles of time, distance and shielding) or remove the contamination are the principal countermeasures. Establishment of maximum permissible exposures and monitoring of individual doses will mitigate the effect on personnel.

Personnel Decontamination

Adequate decontamination of personnel can be accomplished using decontamination stations, designated washrooms and/or showers. Expeditious movement of topside personnel going below decks through decontamination stations will minimize their exposure. Personnel decontamination stations should be located within the ship to afford personnel the best shielding from radiation. Detection of contaminated personnel with RADIACs is difficult when the intensity of penetrating radiation from other sources is high.

f) Recover

Actions After Attack

Radiological hazards can last for a long period of time and can range in severity from the incidence of casualties in a few hours to a health hazard that is long-term but of no immediate operational significance. Radiological countermeasures cannot be applied in the same sequence in all situations. Command consideration of both the tactical situation and the degree of radiological involvement will influence decisions regarding countermeasures to be used, when they are used and how long they will remain in effect. When a ship is under attack, the CO must first defend the ship from attack. If the attack is very intense, all radiological countermeasures must wait until the requirements for essential defense of the ship have subsided.

Operational Recovery

The operational recovery phase of a major radiological involvement starts when emergency actions are discontinued. Maintenance of the level of operational capability required to satisfy the existing tactical situation is the objective of this phase, and includes reducing radiation hazards and repairing damage. The phase extends over the period of time of decreasing

shipboard radiation when vital stations can be operated for limited periods of time without producing casualties. Ship maneuvering, personnel shelter, crew rotation and reduction and early ship decontamination are applicable countermeasures. In this phase as in the attack phase, command may have to accept some casualties to maintain the required offensive or defensive capability of the ship. Setting the appropriate material condition to secure the ship is essential. When ordered, the closure of fittings is never to be given priority over the movement of personnel to sheltered locations. Ventilation ducts, boilers and air passages should also be checked for accumulations of contaminants. Food and potable water may be considered safe to use without special treatment, even when the ship's interior is contaminated, except in very unusual circumstances.

C-4. Ashore

a. Chemical Attack Ashore

The threat of a chemical attack ashore presents several challenges to the Medical Treatment Facility Commanding Officer/Officer in Charge, the most important of which is planning and coordinating between base and the host nation. This is especially true if the MTF exists independent of a host Naval Activity and necessitates that the MTF CO/OIC harden the facility without the benefit of the assets available to the co-located facilities. In preparation for a chemical attack ashore, whether by a weapon of mass destruction or by natural means, similar planning must be performed. Toxic Industrial Chemicals (TICs)/Toxic Industrial Materials (TIMs) are chemicals which can be used by terrorists and must be addressed. For overseas locations Non-combatant evacuation Operation (NEO) evacuation and identification of critical civilian positions are essential planning elements. The local military organizations and surrounding communities should be aware of what health services MTFs and line commands expect to provide and what services would be needed from outside resources.

1. Prepare:

The commander should establish a Disaster Preparedness Working Group. The Disaster Preparedness Working Group should include Command & Control, the Public Affairs Officer (PAO), Public Works (especially HVAC), Security (for controlled entry to the base and the CBRN site), Fire, Medical, Explosive Ordnance Disposal (EOD), Hazardous Material Disposal (HazMat), & host nation liaison.

Table Top Exercises should be performed at least annually and more frequently when changes are made to the response plan.

Real Time Exercises should be performed annually and must include all organizations involved in a response. Exercises improve the ability to respond effectively in an emergency and identify weaknesses in the response plan that would otherwise be unnoticed until an actual emergency. Exercises should initially be based on simple scenarios and gradually increased in complexity.

NEO evacuation and identification of critical civilian positions are essential elements of CBRN planning. Memoranda of Understanding (MOU) need to be developed addressing the

expectations and needs of the MTF. Installations and Regional Commanders need to be aware of the capabilities and limitations of each treatment facility. CONOPS should be developed to ensure agreement of all parties. In coordinating and planning responses to biological attacks overseas, the MTF must participate in drills with both the installation commander. Political sensitivity may dictate whether the local community is invited to participate in these drills.

Preparing for an attack, the commander should make full use of up to date intelligence in consultation with medical planners.

Threat Assessments and Vulnerability Assessments must be performed at least annually to assess the risks associated with a biological attack and to mitigate the consequences. The Risk Assessment derived from Threat and Vulnerability Assessments will help identify the areas that can quickly be addressed to harden the facility and to identify weaknesses that have been overlooked.

Exercise, Exercise, Exercise.

For overseas locations NEO evacuation and identification of critical civilian positions are essential elements of CBRNE planning. The surrounding communities should be aware of what health services each command expects to provide and what services would be needed from outside sources. Memoranda of Understanding (MOU) need to be developed addressing the expectations and needs of the MTF. Installations and Regional Commanders need to be aware of the capabilities and limitations of each treatment facility. CONOPS should be developed to ensure agreement of all parties. In coordinating and planning responses to chemical attacks, the MTF must participate in drills with both the installation commander and may include the local community (local fire department, hospitals, and other organizations discussed in MOUs).

Preparing for an attack includes the use of intelligence and communications with the installation commander. Intelligence may indicate higher threat conditions for chemical or biological attacks, what agent may be used, and what methodology for dispersion may be employed. MOPP gear must be made available to personnel and may or may not be provided by the Installation Commander for tenant commands.

Threat Assessments and Vulnerability Assessments must be performed at least annually to assess the risks associated with a chemical attack and to mitigate the consequences. The Risk Assessment derived from Threat and Vulnerability Assessments will help identify the areas that can quickly be addressed to harden the facility and to identify weaknesses that have been overlooked. Toxic Industrial Chemicals (TICs) and Toxic Industrial Materials (TIMs) that are located on base and surrounding the facility/base should be identified. These may be easy targets for terrorists in that they are readily available to be used to generate explosions, toxic clouds, etc., and may be used as a diversion or secondary device.

2. <u>Prevention:</u>

- Medical Surveillance is essential for both the MTF and base/local population. Communication between MTF personnel and health care facilities outside the base must be coordinated. Rapid onset of illness in patients received at any of the available MTFs in an area may be the first indication of an incident.

- Syndromic surveillance (both human and animal) may be important in identifying a chemical release, to define its boundaries and to preventing its spread. (May be more biological than chemical?)

3. Detection:

The ability to "Detect" is not perfected at this time. Detection equipment is available to "Detect to Warn" for most chemicals, but is only available to "Detect to Treat" for biological agents.

Detection equipment for the ashore medical treatment facility is similar to that used afloat. Care must be taken to ensure that large concentrations of staff and patients are protected. This is especially true when the staff is housed in a central area such as a barracks or the berthing area for a fleet hospital.

Chemical Surveys.

Surveys are conducted to detect, locate and identify chemical agents in either liquid or vapor form. There are five types of chemical surveys: on-station monitoring, periodic monitoring for the arrival of liquid agent, rapid internal survey and detailed surveys (only 4 listed). A more complete discussion, with detailed procedures and recording formats, is provided in NAVSHIPS Technical Manual, Chapter 470.

Only vapor detectors are needed for non-persistent agents because they are normally encountered only in the gaseous state. Liquid and vapor sensors are needed for persistent agents. Under some conditions, such as low temperatures, the amount of vapor off gassing from persistent agents in liquid form may not be enough to cause vapor sensors to alarm. A contact hazard could exist, as well as a low-level vapor hazard that is not detected by vapor sensors. A survey of shipboard chemical detection equipment draws the following analysis

- There is real-time, automatic alarm capability aboard ship for nerve agents in vapor form

- Manually operated systems are available to detect liquid agents and other agents in vapor form.

- Some detectors identify agents specifically, others by physiological group or series.

- The Chemical Agent Monitor (CAM), which is available for emergency issue, is suitable for personnel monitoring only. Note: CAMs are not available on board ships.

- A number of factors can interfere with detection of chemical agents. Some substances cause false alarms by some sensors. Background, especially with

pollution in the atmosphere (construction dust), increase interference with standoff detection.

4. Protect:

- Chemical Prophylaxis:
  - Atropine, Diazepam, & Pralidoxime chloride (2-PAMCL) are necessary and must be readily available on short notice for use when exposure to chemical agents occur. Treatment time for some agents is minutes.
  - Pyridostigmine bromide (PB tabs) is a pretreatment for some nerve agents. PB use is only authorized by presidential order.
- Individual Protective Equipment (IPE):
  - IPE must be available in the work area, sized properly, and available in quantity to provide the time necessary to accomplish the mission in the contaminated area.
  - Training in the use of Individual Protective Equipment must be accomplished. Proper sizing and fitting of IPE is essential to its proper functioning.
  - Each individual should have 2.25 suits available for use (.25 allows for training suits used to properly fit individuals and provide opportunities for individuals to practice donning, decontamination and removal procedures).
  - Some staff may need as many as four (4) suits per person. This is especially true if they will be expected to work in a contaminated environment for extended periods of time (i.e.: medical members of primary and secondary decontamination teams).
- Shelter-in-Place:

Some threats can be overcome by protecting the staff in an interior space. The ability to secure the HVAC system is imperative. Water, communication equipment, material to seal the interior ventilation openings, and signage for the outside entry/exit points are necessary.

5. Respond:

- Decontamination:
  - Current decontamination procedures are described in Appendix E. Some victims will arrive at the MTF without gross decontamination. The ability to

decontaminate self- transported ambulatory patients, as well as patients on litters, is required by all MTFs. All patients suspected of being contaminated need to be directed to a single MTF entry point where they can be tested for contamination. Running water is required and collection of run off water must be considered.

- The "Walking Wounded" and other individuals believing they have been exposed and desiring decontamination may be overwhelming.

- Crowd control measures in the contamination screening area, to the decontamination station and into the MTF are essential.

- Medical staff working in the contaminated area will need to be supported (see support staff below). They will be exposed to trauma-inducing events in addition to whatever agent has been used. Exposures may occur before anyone realizes there has been an incident.

- Equipment, ambulances and other vehicles used to transport victims will require decontamination (which may or may not be a medical responsibility).

- Walking Wounded:

  - Support staff (social workers, psychologists, clergy, and nurses) can be utilized to support these patients. A separate area (gym) can be a collecting point for this group. This group is potentially the largest and most time consuming population of an incident.

- Surveillance:

  - Surveillance is imperative before, during, and after a CBRNE incident. Communication with the fire department, security, police, public works, and area civilian MTFs is critically important. Processes should be developed to continuously share surveillance information between military and civilian medical personnel.

- Security:

  - Entry to the MTF must be controlled. Contamination of the MTF is not an option. Security around the hospital decontamination area is necessary to have an orderly flow of patients and to keep the clean area from becoming contaminated.

- Patient Tracking System:

  - Develop a system to track casualties from the Hot Zone, to the MTF, and on to the secondary treatment areas (other military or civilian hospitals). Military system may be overwhelmed to the point of not being able to

treat other patients (heart attacks, strokes, & etc). These patients also need to be tracked.

- Medical Logistics:

  - The ability to replenish consumable items, replace equipment and relieve staff members is an important part of responding to an incident. Supplies, equipment, and staff may be expended in a short time and plans for replacement must be available in advance. **DOMS** is equipped to provide rapid access to pharmaceuticals, equipment, and personnel to help support the MTF. Additional Logistics information is provided in Appendix __.

- Mortuary Affairs:

  - The deceased must be decontaminated prior to pick up from the scene or delivery to the funeral director.

- Laboratory Services:

  - Laboratory services will be needed for confirmation of detector results. Confirmatory testing laboratories must be identified in advance, with sample packaging, transportation and financial documents prepared and available. Care must be taken to avoid contaminating the lab and or the MTF.

- Recall Plans:

  - Recall plans must be exercised. Simulation is not an option. The arrival (or inability to do so) of key personnel after a recall is vital knowledge. Time from recall to actual arrival on compound should be noted. Priority entry into base will help shorten arrival time. Phone numbers must be verified and recall bill exercised on a monthly basis.

6. Recovery:

- Psychiatric Support:

  - Psychiatric support will be integral in recovery. SPRINT teams can be requested to assist the normal psychiatric support available at the MTF. All staff should be advised of support available.

- Return to Normal Plan:

  - Return to Normal plan should be developed and include specific assessment, evaluation and documentation processes including: staff replacement, physical damage to the MTF, lessons learned, shortfalls noted. Disaster response plan revisions must be considered from lesson learn reports.

- Prioritization of Treatment:
  - The MTF will be overwhelmed with patients following a chemical attack. Prioritization must continue even through the recovery phase to allow the MTF to return to normal.

- **Ground Forces:**
  - Follow U.S. Army and Marine Doctrine.

b. Biological Attack Ashore

The threat of a Biological attack ashore presents several challenges to the Medical Treatment Facility Commanding Officer/Officer in Charge, the most important of which is planning and coordinating between base and civilian counterparts. This is especially true if the MTF exists independent of a host Naval Activity and necessitates that the MTF CO/OIC harden the facility without the benefit of the assets available to the co-located facilities. In preparation for a biological attack ashore, whether by a weapon of mass destruction or by natural means, similar planning must be performed. For overseas locations Non-combatant Evacuation Operation (NEO) evacuation and identification of critical host nation contacts are essential planning elements. Local military organizations and surrounding communities should be aware of what health services MTFs and line commands expect to provide and what services would be needed from outside resources.

(1) Prepare:

The commander should establish a Disaster Preparedness Working Group. The Disaster Preparedness Working Group should include Command & Control, the Public Affairs Officer (PAO), Public Works (especially HVAC), Security (for controlled entry to the base and the CBRN site), Fire, Medical, Explosive Ordnance Disposal (EOD), Hazardous Material Disposal (HazMat), & host nation liaison.

Table Top Exercises should be performed at least annually and more frequently when changes are made to the response plan.

Real Time Exercises should be performed annually and must include all organizations involved in a response. Exercises improve the ability to respond effectively in an emergency and identify weaknesses in the response plan that would otherwise be unnoticed until an actual emergency. Exercises should initially be based on simple scenarios and gradually increased in complexity.

NEO evacuation and identification of critical civilian positions are essential elements of CBRN planning. Memoranda of Understanding (MOU) need to be developed addressing the expectations and needs of the MTF. Installations and Regional Commanders need to be aware of the capabilities and limitations of each treatment facility. CONOPS should be developed to ensure agreement of all parties. In coordinating and planning responses to biological attacks

overseas, the MTF must participate in drills with both the installation commander. Political sensitivity may dictate whether the local community is invited to participate in these drills.

Preparing for an attack, the commander should make full use of up to date intelligence in consultation with medical planners.

Threat Assessments and Vulnerability Assessments must be performed at least annually to assess the risks associated with a biological attack and to mitigate the consequences. The Risk Assessment derived from Threat and Vulnerability Assessments will help identify the areas that can quickly be addressed to harden the facility and to identify weaknesses that have been overlooked.

(2) Prevention:

Medical Surveillance is essential for both the MTF and base/local population. Communication between MTF personnel and health care facilities outside the base must be coordinated. Rapid onset of illness in patients received at any of the available MTFs in an area may be the first indication of an incident.

Syndromic surveillance (both human and animal) may be important in identifying a biological release, to define its boundaries and to preventing its spread. (More true with biological than chemical). Animals may be the first clue to BW attack, but human pathogens may not affect animals.

(3) Detection:

The ability to "Detect" is not perfected at this time. Detection equipment is available to "Detect to Warn" for many chemicals, but is only available to "Detect to Treat" for biological agents.

Detection equipment for the ashore medical treatment facility is similar to that used afloat. Care must be taken to ensure that large concentrations of staff and patients are protected. This is especially true when the staff is housed in a central area such as a barracks or the berthing area for a fleet hospital.

(4) Protect:

Chemical Prophylaxis:

Vaccinations & antibiotics are important in the fight against biological agents.

Individual Protective Equipment (IPE):

IPE must be available in the work area, sized properly, and available in quantity to provide the time necessary to accomplish the mission in the contaminated area.

Training in the use of Individual Protective Equipment must be accomplished. Proper sizing and fitting of IPE is essential to its proper functioning.

Each individual should have 2.25 suits available for use (.25 allows for training suits used to properly fit individuals and provide opportunities for individuals to practice donning, decontamination and removal procedures).

Some staff may need as many as four (4) suits per person. This is especially true if they will be expected to work in a contaminated environment for extended periods of time (i.e.: medical members of primary and secondary decontamination teams).

Shelter-in-Place:

Some threats can be overcome by protecting the staff in an interior space. The ability to secure the HVAC system is imperative. Water, communication equipment, material to seal the interior ventilation openings, and signage for the outside entry/exit points are necessary.

(5) Respond:

Decontamination:

Current decontamination procedures are described in Appendix E. Some victims will arrive at the MTF without gross decontamination. The ability to decontaminate self- transported ambulatory patients, as well as patients on litters, is required by all MTFs. All patients suspected of being contaminated need to be directed to a single MTF entry point where they can be tested for contamination. Running water is required and collection of run off water must be considered.

The "Worried Well"(individuals believing they have been exposed), desiring decontamination may be overwhelming. Crowd control measures in the contamination screening area, the decontamination station and into the MTF are essential.

Medical staff working in the contaminated area will need to be supported (see support staff below). They will be exposed to trauma-inducing events in addition to whatever agent has been used. Exposures may occur before anyone realizes there has been an incident.

Equipment, ambulances and other vehicles used to transport victims will require decontamination (which may or may not be a medical responsibility).

Worried Well

Support staff (social workers, psychologists, clergy, and nurses) can be utilized to support these patients. A separate area (gym) can be a collecting point for this group. This group is potentially the largest and most time consuming population of an incident.

Security:

Entry to the MTF must be controlled. Contamination of the MTF is not an option.

Security around the hospital decontamination area is necessary to have an orderly flow of patients and to keep the clean area from becoming contaminated.

Evidence (determined by FBI/NCIS) collected at the site, decontamination area, or MTF must be documented and turned over to the authorities for safe keeping. Remember this may be a crime scene. **Chain of Custody for evidence is imperative.**

Patient Tracking System:

Develop a system to track casualties from the Hot Zone, to the MTF, and on to the secondary treatment areas. Military system may be overwhelmed to the point of not being able to treat other patients (heart attacks, strokes, & etc). These patients also need to be tracked.

Medical Logistics:

The ability to replenish consumable items, replace equipment and relieve staff members is an important part of responding to an incident. Supplies, equipment, and staff may be expended in a short time and plans for replacement must be available in advance. **DOMS** is equipped to provide rapid access to pharmaceuticals, equipment, and personnel to help support the MTF.

Mortuary Affairs:

The deceased must be decontaminated prior to pick up from the scene or delivery to the funeral director.

Laboratory Services:

Laboratory services will be needed for confirmation of detector results. Confirmatory testing laboratories must be identified in advance, with sample packaging, transportation and financial documents prepared and available. Care must be taken to avoid contaminating the lab and or the MTF.

(6) Recover:

Psychiatric Support:

Psychiatric support will be integral in recovery. SPRINT teams can be requested to assist the normal psychiatric support available at the MTF. All staff should be advised of support available.

Return to Normal Plan:

Return to Normal plan should be developed and include specific assessment, evaluation and documentation processes including: staff replacement, physical damage to the MTF, lessons learned, shortfalls noted. Disaster response plan revisions must be considered from lesson learn reports.

Prioritization of Treatment:

The MTF may be overwhelmed with patients following a biological attack. Prioritization must continue even through the recovery phase to allow the MTF to return to normal.

Ground Forces:

Refer to U.S. Army and Marine Corps Doctrine.

c. Rad/Nuc Attack Ashore

1) Radiological Warfare Environment Ashore.

- These guidelines apply to OCONUS Medical Treatment Facilities (MTFs), Fleet Hospitals and other ashore medical units as appropriate. This information is presented as a guide, which must be amplified and modified to meet the requirements of individual users.

- Medical facilities ashore must be prepared to meet the internal and external challenges associated with a nuclear weapon or radiological weapon attack. Facilities can become easily overwhelmed when dealing with patients from a nuclear weapon attack and therefore must have clear, predefined processes and scenarios in place that can immediately be activated.

- In nuclear warfare, burns could become the most frequent injury seen. Because of the complexity of burns treatment and the increased logistical requirements associated with the management of burns, they will constitute the most difficult problem faced by the medical service.

- Radiation injury alone or in conjunction with other injuries or diseases will be common in nuclear warfare. Radiation injury can result from a single exposure to prompt radiation at the time of detonation of a nuclear weapon, from exposure to high levels of fallout radiation, or from repeated exposures to both with complex patterns of recovery from an accumulation of radiation damage.

- The prognosis for all combined injuries is worse than for radiation injury alone. When other injuries are accompanied by sublethal doses of radiation, infections are much more difficult to control, and wounds and fractures heal more slowly. Thus, potentially survivable burns and trauma will be fatal in a large percentage of persons who have also received significant injury from sublethal doses of radiation.

- Historically, the conduct and outcome of military operations have been profoundly affected by a small number of infectious diseases. The use of nuclear weapons, with their potential for massive destruction, could produce situations in

which epidemic outbreaks of disease among civilian populations would become highly probable. Enteric and respiratory diseases would be particular problems. These, in turn, could present serious hazards to military forces in the area and serious problems for a military medical service, particularly when civilian medical facilities and personnel are inadequate to handle the problems.

- A nuclear weapons detonation can produce an effect which could adversely affect the capability of medical units, that being electromagnetic pulse (EMP). Unless military medical equipment developers ensure their critical electric or electronic equipment is hardened against EMP effects, medical operations could be thrust into very primitive conditions.

- The success of medical support operations in nuclear war will depend to a great extent on the adequacy of planning, training, and preparation prior to the occurrence of hostilities. Nuclear warfare is capable of producing a huge disparity between the available medical resources and the number of patients requiring treatment. This problem will be further complicated by disruption of lines of communication, isolation of medical units, and shortages of transportation, supplies, and equipment. Experiences gained during conventional wars will, in many instances, be applicable to the conditions on a nuclear battlefield. However, unique problem areas must be identified and methods of developing solutions sought by all available means, including the use of modern techniques of war gaining and operations research.

2) Mobility of Medical Support.

Forward medical support elements should be fully mobile with organic transportation and communication systems. Medical elements and facilities located in "rear areas" will not require the same degree of mobility. However, these elements should be organized to obtain some degree of flexibility through the use of dispersed facilities and mobile augmentation teams to concentrate the medical effort in areas of the greatest need. Adequate provisions must be made for coordination with other support type elements to obtain the auxiliary support services, which are essential to the accomplishment of the medical support mission.

3) Personnel and Medical Unit Requirements.

It is possible that entire medical units including large hospitals will be lost or will become incapable of functioning because of large-scale losses in personnel and equipment. Hospitals should be dispersed away from potential nuclear target areas to improve the probability of these facilities surviving nuclear weapons attacks. Planning for whole unit replacement must also be considered.

4) Performance of Mission in a Radiologically Contaminated Environment.

- Residual radiation does present a problem, both to survivors and to rescue and medical personnel coming into the area. Appropriate survey and protective measures must be taken to minimize this danger to survivors and rescue-medical personnel.

- Medical units required to remain in areas of high dose rates can survive and continue their patient care activities if adequate shelter is available to shield against radiation. Materials such as concrete and earth afford substantial shielding. There may also be structures and terrain features already available, which will afford excellent protection from radioactive fallout. Tunnels, caves, culverts, overpasses, ditches, ravines, and heavily constructed buildings are examples. In the case of existing buildings, below ground basements give the best protection. With a minimum of effort, windows and overhead floor can be sandbagged or covered with dirt to provide additional protection.

- It should be a matter of policy for mobile medical units to locate in or near existing shelter whenever possible. When either fixed facilities or mobile units are unable to locate near existing shelter, adequate shelter must be constructed.

C-5. Documentation/Reporting

Noted in Table C-3 are the forms for tracking documentation and appropriate reports.

Table C-3 Forms for tracking Documentation and appropriate Reports

UNIT LEVEL RESPONSIBILITY	REPORT TOPIC	NAME OF REPORT	REPORTING AUTHORITY	FREQUENCY OF REPORT	PURPOSE OF REPORT	REPORTING CHAIN
All Five Levels of Care	DNBI	Weekly Disease Non-Battle Injury Report	Joint Chiefs of Staff; DoDD 6490.2 DoDI 6490.3	Weekly	Unit level data collection of injuries and illnesses not related to combat	Local Chain of Command; As per guidance from Theater Commander
All Five Levels of Care	OEHS	Occupational and Environmental Health Surveillance Report	DoDI 6055.5 Industrial Hygiene and Occupational Health; DoDD 4715.1 Environmental Security		Occupational and environmental health surveillance for health risk assessment of occupational and environmental exposures to physical, radiological, chemical and endemic and other biological hazards.	Local Chain of Command; As per guidance from Theater Commander
	Pre-Deployment	DD Form 2795 Pre-	DoDI 6490.3 Implementation	A copy of any completed from		Shall be mailed to the

	Health Assessment	Deployment Health Assessment	and Application of Joint Medical Surveillance for Deployments	shall be mailed within 30 days of completion.		Deployment Surveillance Team

C-6. References & Resources

OPNAVINST 3440.15A DON Nuclear Weapon Accident Response Management, 30 May 97
OPNAVINST 4600.18C DOD use of Domestic Civil Transportation Under Emergency Conditions, 1 Apr 80
OPNAVINST 4630.9 Worldwide Aero-medical Evacuation
OPNAVINST 5210.16 Security of Nuclear Reactors and Special Nuclear Material, 21 Sep 78
OPNAVINST 3400.10F Chemical, Biological, and Radiological Defense Requirements Supporting Operational Fleet Readiness, 22 May 96
OPNAVINST 3440.16C Navy Civil Emergency Management Program, 10 Mar 95

BUMED Instructions

BUMEDINST 3400.1 Operational Concept for Medical Support and Casualty Management in Chemical and Biological Warfare Environments, 28 Feb 94
BUMEDINST 3440.4 Activity Disaster Preparedness Plans and Material for Disaster Preparedness Teams, 28 Mar 89
BUMEDINST 6320.1E Patient Regulating to and Within the Continental United States, 30 Mar 90
BUMEDINST 6321.3 Bed Capacity and Licensed Beds, 10 Oct 89
BUMEDINST 6470.10A Initial Management of Irradiated or Radioactively Contaminated Personnel, 07 Dec 98
BUMEDINST 6470.23 Medical Management of Non-ionizing Radiation Casualties, 18 Aug 99
BUMEDINST 6700.42 Ambulance Support, 13 Feb 95

NAVMED P-5041 Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries: FM8-285 dtd 22 December 1995

Medical

Bioterrorism Readiness Plan: A Template for Healthcare Facilities (APIC APR 1999)
Commanders Guidebook: MTF Preparedness and Response to Biological Terrorism (BUMED)
WHO Guidance: Public Health Response to Biological and Chemical Weapons (NOV 2001)
An Alternative Health Care Facility: CONOPS for the Off-Site Triage, Treatment, and Transportation Center (SBCCOM March 2001)
1st MEF Surgeon Medical Plans and Operations Guide for Consequence Management (17JUNE1998)

Interactions between Nerve Agent Pretreatment and Drugs Commonly Used in Combat Anesthesia (Mil. Med, 155, 11:527, 1990)
Lessons Learned From a Full-Scale Bioterrorism Exercise (TOPOFF) (Em. Inf. Dis. Vol 6, no. 6 Nov-Dec 2000)
Lessons Learned From Dark Winter
MMRS Field Operations Guide for Metropolitan Medical Strike Team (MMST) (NOV 1998)
MMST/NMRT CARD (triage for WMD)
FDA Guidance: Potassium Iodide as a Thyroid Blocking Agent in Radiation Emergencies (DEC 2001)
AR 40-13 Medical Support-Nuclear/Chemical Accidents and Incidents (FEB 1985)
Field Operations Guide for Disaster Assessment and Response (USAID)
Bioterrorism and the People: How to Vaccinate a City against Panic CID 2002:34 (15 January)
Biological Warfare Mass Casualty Management
Medical Risk Assessment of the Biological Threat (Battelle, May 2001)
Health Aspects Of Biological And Chemical Weapons (WHO draft, AUG 2001)
Emergency Room Procedures in Chemical Hazard Emergencies A Job Aid (CDC)
Navy Medical Department Pocket Guide to Malaria Prevention and Control (NEHC-TM PM 6150.1 SEP 2000)
Diagnosis And Treatment Of Diseases Of Tactical Importance To USCENTCOM
Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response (MMWR April 21, 2000 / Vol. 49 / No. RR-4)

DECONTAMINATION:

- First Responders' Environmental Liability Due to Mass Decontamination Runoff (EPA JUL 2000)
- Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident (SBCCOM JAN 2000)
- EPA Letter on Runoff due to Decontamination

Handbooks and Texts

Textbook of Military Medicine: Medical Aspects of Chemical and Biological Casualties
The Medical NBC Battlebook (USACHPPM TG 244, May 2000)
Field Management of Chemical Casualties (USAMRICD, APR 2000)
Medical Management of Biological Casualties (USAMRIID, FEB 2001)
Medical Management of Radiological Casualties (AFRRI, DEC 1999)
Defense Against Toxin Weapons (USAMRIID, 1997)
Weapons of Mass Destruction Terms Handbook (DTRA-AR-40H, JUL 1999)
AF Handbook 10-2502 USAF WMD Threat Planning and Response Handbook (OCT 2001)

C-7. Glossary/Acronyms

Appendix D

US Marine Corps Health Service Support

CASUALTY MANAGEMENT

D-1. Overview.

a. This appendix provides defense considerations for planning and conducting HSS in a nuclear, biological, and chemical environment (NBC). Future technological trends point to the increased effectiveness of new CB weapons and delivery systems. The possession and employment of chemical weapons are no longer limited to major powers. The ability to manufacture CB weapons in the Third World increases the possibility of United States forces encountering CB weapons.

b. The introduction of CBRN-weapons into a conventional conflict significantly influences medical support. Chemical injuries mixed with conventional, and combat injuries complicate the casualty environment. Triage becomes even more critical since the medical system may be rapidly overloaded. Medical personnel will be severely constrained and encumbered by individual protective equipment (IPE). Personnel who perform duties while wearing IPE are especially susceptible to heat injuries and physical exhaustion. Due to the physical constraints imposed by IPE, many routine tasks require more time. To provide effective support, medical personnel shall be equipped and trained to overcome difficulties imposed by a CB warfare environment.

c. Effective HSS of the operating forces in CB environment shall be predicated on a realistic concept of operations. Effective HSS in a CB environment requires sufficient manpower, facilities, equipment, and training. The concept of operation shall encompass the treatment, handling, and evacuation of CB casualties with traumatic or combined injuries. The environment may change, but concepts of casualty handling do not change appreciably. Decontamination, protected environment, hazard monitoring, and patient protection capabilities are required for effective HSS. What does change is the nature of the hazard and its resulting casualty profile.

d. This appendix applies to all USMC medical activities, afloat and ashore. This appendix contains a general overview of USMC medical operations for preparing and responding to a NBC event. Information that is more complete is available in the following publications:

(1) BUMED 3400.1, Operational Concept for Medical Support and Casualty Management in Chemical and Biological Warfare Environments

(2) MCWP 3.37.1/, MTTP for Nuclear Biological and Chemical Defense Operations

D-2. The NBC Environment.

a. A number of potential adversaries have or are in the process of developing WMD. Some terrorist groups and several countries designated as “State Sponsors of Terrorism” have also shown an interest in pursuing an NBC capability. Others are strongly engaged in the sale or transfer of associated NBC technology. NBC weapons are considered “Asymmetric threats,”

since adversaries will seek an advantage over the U.S. by using unconventional approaches to circumvent or undermine our strengths while exploiting our vulnerabilities. The potential for catastrophic use of WMD is greater than it has been in many decades. Aimed at responding to the overwhelming power and superiority of the military infrastructure of the U.S., either domestically or abroad, WMD could seriously disrupt the execution and tempo of military operations. It is imperative that HSS are prepared to reduce the effects that WMD has on the execution and tempo of military operations.

b. The commander must consider the nature of the environment. If the immediate medical environment is vulnerable to nuclear, chemical or biological attack, the commander should determine the level of protection that would be needed before, during, and after the attack. After the attack, in addition to providing medical care, the commander needs to know whether to expect residual contamination to remain and how long it is likely to persist. The commander needs to determine:

(1) **Level of Protection Required.** Is eye-respiratory protection sufficient or is full body coverage required?

(2) **When to Increase the Protective Posture.** Donning protective clothing too soon can have an unwarranted negative impact on the crew's ability to perform mission related tasks. Donning it too late can result in casualties.

(3) **Medical Facility Decontamination.** Is facility decontamination required and, if so, which option is best?

(4) **When to Relax the Protective Posture.** When is it safe to remove protective clothing to reduce heat stress and other restrictions on job performance?

c Chapter one of this manual provides a detail assessment of the threat that nuclear, biological, and chemical weapons and other toxic materials pose to US military operations worldwide.

D-3. Medical Intelligence and Preventive Medicine Principles

a. The Defense Intelligence Agency (DIA) develops and disseminates medical intelligence. The Armed Forces Medical Intelligence Center (AFMIC), Fort Detrick, Maryland, is the sole producer of medical intelligence for DIA. AFMIC can assist in the theater threat assessment by evaluating the state of a potential adversary's BW preparedness. AFMIC currently produces and disseminates finished intelligence products via studies, message traffic, compact disk, and on-line electronic systems. Another source of intelligence is the USMC and In-theater Intelligence Departments.

b. Medical preventative medicine personnel conduct medical surveillance activities for disease resulting from suspected enemy employment of BW agents and can provide limited analyses of enemy drugs, serums, antibiotics, and prophylaxis. They are instrumental in gathering data from the various medical and non-medical units.

c. Preventive medicine personnel must be aware of the NBC threat in the theater of operations and continuously update medical intelligence information regarding disease threats, disease vectors, and susceptibility. Preventive medicine personnel must assist the commander in determining the health hazards associated with NBC agents and make recommendations regarding prophylaxis, pretreatments, immunizations, and other preventive measures associated with NBC welfare. The need for continuous medical surveillance by preventative medicine personnel cannot be overstated.

D-4. HSS Command Control and Communication. In a high threat NBC environment, it is imperative that the communications architecture includes lines of communication among deployed combat units, medical units tasked with providing medical care, and specialized units providing NBC detection, warnings, and decontamination functions. To provide adequate defense, the MAGTF commander organizes NBC defense assets. Units at all levels must be capable of detecting and identifying NBC agents, warning of and reporting NBC attacks, performing individual and collective protection measures, decontaminating personnel, equipment, and terrain, and administering first aid in accordance with unit medical operations and exposure guidance.

D-5. USMC NBC Capabilities. NBC Control Centers will form the hub for all NBC defense operations. For additional information on USMC NBC capabilities, refer to MCWP 3-37.1.

D-6. Impact on HSS

a. The contaminated battlefield will be a difficult environment in which to operate. Stress from MOPP, reduced visual and tactile senses from protective equipment, reduced communications capability, which causes sense of isolation that can be damaging to military HSS operations. Additionally, several unique aspects must be considered.

b. Contamination may be transferred to the medical facilities if patients are evacuated without being decontaminated. All personnel should perform personal decontamination or be decontaminated by a buddy or their unit immediately after being exposed to NBC contaminants, mission permitting. However, patients may arrive at the medical facility still contaminated. In either case, patients must be decontaminated before they are admitted into the facility. This is required to prevent the medical staff and the facilities from becoming contaminated; ordinarily, the medical staff works without protective equipment to maintain full patient care capabilities.

c. Decontamination operations are extremely resource intensive. Current medical personnel authorizations may not be able to manage both medical treatment and decontamination of patients. For this reason, plans must address the requirement for providing nonmedical personnel from supported units or units within the geographical area/base cluster to assist in decontaminating casualties.

d. Additional heat casualties can be anticipated due to the heat stress caused by wearing full MOPP gear.

D-7. Casualty Management in a NBC Environment.

a. The **commander** is responsible for maintaining the health of their command in an NBC environment. The command surgeon is responsible for guiding and integrating al HSS

capabilities available to the command to support mission accomplishment in an NBC environment. The most common way to categorize chemical agents is by their physiological effects. The primary categories are nerve, blister, blood, and chocking agents. HSS needs categories that support decision making about what kind of protection is required, how long it is needed, and how soon after exposure physiological effects begin to manifest themselves. A general knowledge of the capabilities and limitations of biological weapons, coupled with rational approach to the treatment of casualties, will increase the probability of survival and assure the ability to sustain operations in a BW environment.

b. The HSS concept must encompass the treatment, handling, and evacuation of chemical, biological, or radiological contaminated casualties. Before an attack, it is imperative that personnel are issued self-aid and buddy-aid items in accordance with the MOPP system. Navy medical doctrine is for each Sailor and Marine to carry either three Mark I kits or three nerve agents. The operational concept for medical support in a NBC environment is described in BUMED INSTRUCTION 3400.1 series.

c. **Levels of Care.** The current Naval health system consists of five echelons of medical care. Initial trauma care (including some emergency resuscitative surgery) is normally provided at the first two echelons and initial definitive surgery at the third. Full definitive surgery is usually provided at echelon IV and corrective surgery is conducted at echelon V. This same level of care system will be used to provide care to NBC contaminated casualties. As the casualties move from the lowest level upward, increased medical support is available.

(1) **Level 1.** Marine Corps Level 1 capabilities include only first aid, self-aid, buddy-aid, and emergency care provided by a unit corpsman, battalion aid station, shock trauma platoon, and Marine wing support group. Lifesaving capability is limited because the care providers and casualties must be in protective clothing while in a contaminated environment. Procedures should be limited to saving life or limb. If possible, hasty decontamination with the M291 Skin Decon Kit is performed prior to evacuation. This is the first response phase of care.

(2) **Level 2.** The medical battalion's surgical company and the forward resuscitative surgery system are the only units in the Marine Corps that provide Level 2 care. This phase of care focuses on specific life saving practices/core competencies to manage severe bleeding, airway compromise, and life-threatening chest injuries, and to prepare the casualties for evacuation.

Casualty receiving and treatment ships (CRTS) are amphibious ships that have surgical and holding capabilities for stabilization of casualties awaiting evacuation. Treated and stabilized patients are protected to prevent contamination while they are being transported to the next level of care.

(3) **Level 3.** Care at Level 3 and above is provided by other services as determined by the joint force commander

D-8. NBC Defense

a. During triage in a chemical environment, all casualties are in various levels of mission oriented protective posture (MOPP). According to current doctrine, as MOPP levels increase, Chemical Protective Equipment (CPE) is added to the equipment worn at lower levels. Each increase in the MOPP Level reduces the time troops must take to attain MOPP Level-4 and full protection. When the threat of chemical warfare agent use is high, commanders may establish a standing MOPP level (other than MOPP-0) for troops during military operations. In the event of

a chemical attack, this effectively reduces the time required to attain MOPP-4. For information, the levels of MOPP are:

- MOPP Level 0 -- None of the protective clothing and equipment is worn, but it is readily available.
- MOPP Level 1 (Suspected). MOPP suit on (jacket and trousers) carry boots, gloves and mask.
- MOPP Level 2 (Possible). MOPP suit on, boots on, carry gloves and mask.
- MOPP Level 3 (Probable). MOPP suit on, boots on, mask on (with hood), carry gloves.
- MOPP Level 4 (Imminent). All MOPP gear on.

b. The protective over garment and hood can cause body heat buildup, which can lead to heat exhaustion in warmer weather. The protective mask and hood degrade the ability to see, speak, and hear. The rubber gloves restrict air circulation and limit the sense of touch and/ the ability to perform tasks requiring delicate manipulation. The wearing of full CPE can cause psychological stress (e.g., claustrophobia) in some people. All of these problems can reduce the effectiveness of HSS. Therefore, flexibility in adjusting the MOPP levels should be exercised to meet mission requirements, environmental conditions, and the threat of NBC exposure.

D-9. Other NBC Defenses.

(1) It is advisable to assign preventive medicine representatives to monitor the breakout, preparation and handling of food supplies in a contaminated environment. They should also be involved in the monitoring of potable water supplies for contamination.

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(2) In a biological hazard environment, preventive medicine is responsible for evaluating biomedical samples for use in identification of the agent.

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(3) In radiological defense, medical personnel are responsible for recording the accumulated radiological dose of each crewmember, treating casualties from radiation illness and monitoring personnel who appear to have absorbed, inhaled or ingested radiological contamination.

(4) Personnel may be given potassium iodide pills if the fallout from nuclear reactors is a threat

D-10. Casualty Management.

a. Casualty Management in Marine Corps operations poses some interesting challenges. There are three scenarios (shipboard, sustained operations ashore, and amphibious operations) that must be addressed by USMC HSS.

(1) **Shipboard.** Ships may become contaminated directly as a result of an actual hit or nearby airburst. Clouds of vapor or aerosols, which drift offshore, may also contaminate ships indirectly. Initial casualties, which will primarily be exposed deck

personnel or personnel within spaces contaminated by penetrating chemical munitions, should be moved to a collection area where initial triage and hasty decontamination can be performed before transfer to the ships medical department.

(2) **Amphibious Operations.** Casualties will be moved from the point of illness or injury to different levels of care. Movement of the casualties may not progress through each level in sequence. Depending on the tactical situation and degree of air superiority, casualties may move from the point if illness or injuries directly to Level 3 care. Nonambulatory casualties should be placed in patient protective wraps before transfer between levels. In the early stages of amphibious operations, the assault force is extremely vulnerable because of the lack of established support base ashore.

(3) **Sustained Operations Ashore**. These operations are generally characterized by established bases and logistical support

b. The arena of patient treatment involves treatment issues surrounding exposure to agents found in events such as: chemical events, biological event, radiation exposure, and toxin event.

(1) Chemical events can involve nerve, blister, blood, pulmonary, incapacitating and riot-control agents. Detail treatment information for chemical casualties is found in *MCRP 4-11.1A, Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries; USAMRID, Medical Management of Chemical Casualties Handbook; NAVMED P-5059, NATO Handbook on the Medical Aspects of NBC Defensive Operational AMEDP-6.*

(2) Biological events can cause casualties of these types: anthrax, plague, tularemia, Q-fever, and smallpox. Treatment for these agents can be found in *MCRP 4-11.1C , Treatment of Biological Warfare Agent Casualties and USAMRID, Medical Management of Biological Casualties Handbook.*

(3) Radiation exposure events can create casualties who may have internal contamination. Information detailing treatment of radiological casualties is found in *MCRP 4-11.1B, Treatment of Nuclear and Radiological casualties and Armed Forces Radiology Research Institute (AFFRRI), Medical Management of Radiological Casualties.*

(4) Based upon the agent (s) found, different variation in treatment issues such as: pre exposure prophylaxis, post exposure prophylaxis, infection control, supportive care, and medical management will need to be examined. It may be warranted to quarantine or isolate casualties. If such situations exist than quarantine and isolation procedures should be followed. Refer *to MCRP 4-11.1C, Treatment of Biological Warfare Agent Casualties, and USAMRIID, Medical Management O f Biological Casualties Handbook,* for additional information. Allow for other precaution procedures to come into play such as: standard precautions, airborne precautions, droplet precautions, and contact precautions.

D-11. Casualty Evacuation and the Management of Human Remains.

a. There are three basic modes of evacuating casualties in the combat zone- personnel, ground vehicles, and aircraft. Individual protective gear, climate, increased workloads, and fatigue will greatly reduce personnel effectiveness. The unit commander decides which evacuation assets will be sent into the contaminated area. Every effort will be made to limit the number of evacuation assets that are contaminated. To ensure contamination of evacuation assets is limited, casualties should be decontaminated before transport whenever practical.

b. Although the management of human remains is a service responsibility, the medical community advises to protect the health of the force and prevent the spread of disease and NBC contamination. For more information, *reference JP 4-06, JTTP for Mortuary Affairs in Joint Operations.*

D-12. Patient Decontamination and Triage

a. The management and treatment of contaminated casualties will vary with the tactical situation and the nature of the contaminant. Each medical unit must have a plan that can be put into effect immediately. Decentralization is the objective—casualties must not be forced to wait at a central point for decontamination. The following general principles should be adhered to if possible:

(1) Use critical medical personnel at their highest skill level.

(2) Minimize the injuries resulting from contaminating agents and prevent the aggravation of conventional injuries.

(3) Protect the personnel handling contaminated casualties or working in a contaminated environment.

(4) Continue essential medical services unrelated to NBC defense.

b. Each surgical company has sets of medical items and decontamination equipment for treatment of contaminated patients. Decontamination of the casualties serves two purposes: it prevents the patients from absorbing additional contaminants and it protects other patients and medical personnel from contamination. Designated decontamination areas and procedures should be established at each medical facility.

c. When casualties arrive, they must be seen at a triage point and directed to the proper area. The triage officer must determine which patients need to be seen first and determine if the patients have a medical condition that requires treatment priority over decontamination.

d. A significant amount of all contamination can be removed by removing the outer clothing and shoes. This can usually be accomplished before admission without interfering with medical treatment. Actions should be taken immediately to ensure that all personnel suspected of being contaminated by an agent are cleaned and contaminated patients are not permitted to enter.

Chemical casualty triage procedures, decontamination of casualties and a NBC medication matrix are included in BUMED instruction 3400.1.

D-13. NBC Mass Casualty can drastically task Casualty Management operations.

a. With the employment of NBC weapons/agents a mass casualty situation can present itself at any time and at any level of care. A major problem with a BW mass casualty is that the HSS personnel are more susceptible to becoming a casualty to BW agents. Treatment is often limited to life or limb-saving care in a mass casualty situation; triage must be conducted within strict guidelines. It is important that all patients be decontaminated before they are admitted into an uncontaminated area. Management of patients suffering from the effects of BW agents may include the need for isolation. Barrier nursing for patients suspected of suffering from exposure to BW agents will reduce the possibility of spreading the disease to health care providers and other patients. Specimens must be collected and submitted to the designated supporting laboratory for identification. Refer to BUMEDINST 6210.3, Handling of Etiologic agents/biomedical material, for additional information.

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Appendix E

Casualty Decontamination

Section I. General Information

E-1. General: The control and treatment of contaminated casualties will vary with the tactical situation and the specific contaminants. Although the primary responsibility for decontamination of casualties prior to transportation to MTFs rest with the unit, a medical unit must be prepared to receive contaminated casualties. MTFs supporting operations in potential NBC environment must establish appropriate procedures for casualty decontamination and triage. All medical units should have readily available, and be proficient in the use of, the necessary decontamination equipment for self and patient decontamination. These defensive measures should include:

a. Military surveillance of key sectors to deter an attacker disseminating chemical, biological, or radiological agents from a ship, aircraft, or ground-base source;

b. Medical defensive measures to protect personnel at risk against exposure, infection, or intoxication;

c. Physical defensive measures to reduce the risk of personnel inhaling any weaponized hazardous material that may be present;

d. Early detection.

E-2. Decontamination Operations. Casualty decontamination differs from equipment decontamination. While equipment decontamination may not have to be thorough in all situations, it is imperative that contaminated patients who are entering a clean MTF be thoroughly decontaminated to minimize any harm to unprotected MTF staff. If they are not entering a clean MTF, then spot decontamination may be appropriate. Casualty decontamination will differ from standard personnel decontamination in that medical concerns must be considered during the decontamination process.

a. All personal decontamination actions must take place as soon as possible, within the first 2 to 5 minutes, after individuals realize they have been contaminated. After successful personal (self) decontamination a more thorough decontamination must be conducted for those casualties entering a clean MTF so that unprotected medical staff inside a clean facility will be protected from contamination.

b. There is no single machine, decontamination kit, team, technique, or procedure presently capable of fulfilling all decontamination requirements. The medical unit's best chance of mitigating the effects of NBC contaminations rests with its ability to accurately evaluate the situation, determine an overall course of action, and direct trained personnel to accomplish a variety of tasks based on their individual circumstances. Decontamination operations can't be planned and/or conducted as a stand-alone entity. Individual chemical agent toxicity, persistency, mission criticality, the likelihood of decontamination operations achieving desired objectives within desired time frames, and the degree of acceptable risk must all be factored into the equation.

E-3. Classification of Patients. In a NBC environment, two major classifications of patients will be encountered: contaminated and uncontaminated. Those contaminated may suffer from the effects of an NBC agent, of a conventional wound, or both. Some may suffer combat stress or heat injuries induced by the stress of NBC conditions and extended time spent in MOPP Level 4. The most important decontamination is performed most expeditiously after the contamination has occurred. Decontamination at a later time may be too late to prevent injury to the individual, especially when exposed to vesicants. All agents should be promptly removed from the skin.

E-4. Patient Decontamination. Patient decontamination is the removal and /or the neutralization of hazardous levels of nuclear, biological, and chemical contamination from patients at a medical treatment facility. Patient decontamination is performed under the supervision of medical personnel to prevent further injury to the patient's health status during the decontamination process. Patient decontaminations serve multiple purposes; it protects the patient from further injury, it prevents exposing medical personnel to the contamination, and it prevents contamination of the medical facility. Patient decontamination must be operational at Level I, II, III, and IV MTFs

E-5. Decontamination Solutions. In a military environment, physical removal of contaminants is the primary method of decontamination. Physical removal does not require vigorous scrubbing; in fact, vigorous scrubbing can force some agents deeper into the skin; thus, increasing the agent effect rather than reducing its effects. Recommended means of decontamination includes--

a. The M291skin decontaminating kit (SDK) neutralizes/reduces the effects of nerve and vessicant agents, but physical removal is of utmost importance. It is the preferred method of emergency individual skin decontamination. It can be used for skin and around wounds, but not for the eyes or in open wounds. SDK is particularly effective for spot decontamination.

b. The use of soap and water should be considered as the next best method when a SDK is not available. This is best for whole body decontamination. The use of soap and water requires large amounts of water that may not be available, because the soap must be rinsed from the skin to reduce skin irritation from the soap. Soapy water mixtures are effective as long as suds are maintained. Soap lowers the surface tension of water, thus increasing the wetting power and helping the water to loosen and carry off dirt and grease. Mustard agents are emulsified by this process but are not neutralized. Nerve agents are partially neutralized.

c. Sterile saline irrigation (such as an IV bag of saline) can be used for open wounds, wounds to the abdominal or thoracic cavities, or intracranial head injuries. In these cases any contaminated debris must be removed first to eliminate the contamination source.

d. An alternate skin decontaminant is a dilute 0.5 percent hypochlorite solution, By liberating chlorine on contact, chlorine solutions change nerve and blister agents to less toxic chemicals. Contact with the eyes, or opened wounds, must be avoided. The chlorine in the solutions will gas off and be neutralized by organic materials and the chemical agents, so the solutions must be changed frequently to ensure that the proper chlorine concentrations are maintained.

e. Hypochlorite (Chlorine) solutions must be prepared. Two concentrations of the hypochlorite solution are required. A 5 percent hypochlorite solution to decontaminate gloves, aprons, litters, cutting devices, the patient's mask hood, and other nonskin contact areas. The patient's mask, skin, splints, and tourniquets and their wounds are irrigated using a 0.5 (½) percent hypochlorite solution. It may be much easier to differentiate the two if the 0.5% solution is marked "skin" and the 5% solution is marked "equipment". To prepare the solutions, use calcium hypochlorite (HTH) granules (supplied in 6-ounce jars in the chemical agent patient treatment and chemical agent patient decontamination MES), bulk HTH, or sodium hypochlorite (household bleach). The Chlorine Solution Measuring Device, national stock number NSN 4610-00-205-0810, can be used to prepare the solutions to the proper concentrations or a field expedient method using meals ready to eat (MRE) spoon (see Table E-1). Prepare the required solutions as shown in Table E-1 below.

Table E-1. Preparation of Hypochlorite Solutions for Patient Decontamination

HTH OUNCES	HTH MRE SPOONFULS	HOUSEHOLD BLEACH	PERCENT IN 5 GALLONS OF WATER
6	*5	2 quarts	0.5
48	40	**	5.0

* These measurements are used when bulk HTH is used. To measure this preparation, use the plastic spoon supplied with your MRE. The amount of hypochlorite to be used is a heaping spoonful (that is, all that the spoon will hold). Do not shake any granules off of the spoon before adding to the water.

** Do not dilute in water; household bleach is 5 to 6.25 percent solution; it is used full strength for 5 percent applications.

CAUTIONS

1. **Do not use the 5 percent hypochlorite solution on the patient's skin. The 5 percent solution can burn the skin.**

2. **Only wipe the skin when applying the 0.5 percent hypochlorite solution. Vigorous scrubbing may force the agent into the skin.**

E-6. Triage of Suspected Contaminated Casualties. The purpose of casualty triage is to prioritize patient care and effectively allocate medical resources. Casualties will not only need to be triaged for medical care, but will simultaneously need to be triaged for decontamination priority. When casualties arrive at the MTF, they must be seen at a triage point and directed to the proper area. The triage officer will determine decontamination priorities based on the

urgency of patients needs. Patients with life or limb-threatening conditions should receive emergency medical treatment before, or concurrent with, decontamination. Casualties will need to be retriaged as they progress through decontamination and the various levels of care and their medical situation, and available medical resources, change. A discussion of triage categories and first aid for chemical, nuclear, and biological agents can be found in FM 4-02.285, Treatment of Chemical Agent Casualties, FM 8-284 Treatment of Biological Warfare Agent Casualties, and FM 4-02.283 Treatment of Nuclear and Radiological Casualties. General medical triage categories / guidelines are as follows,

a. *Immediate.* Casualties in this category need to have an available medical procedure performed within an hour or sooner to save their life. This may be as simple as giving an atropine injection or inserting an airway. Once the procedure is provided, and their condition stabilizes, their category may be changed.

b. *Minimal.* Casualties in this category require minor care and are expected to return to duty within hours after the care is provided. In a noncontaminated environment these casualties will generally not be evacuated. In a contaminated environment this might be a casualty with a minor injury resulting in torn protective clothing and are individuals that can be cared for by a medic/ corpsman at their present location.

c. *Delayed.* Casualties in this category are persons who have injuries requiring definitive medical care from a physician, but their medical condition is such that they can wait for care without impacting their ultimate outcome. Generally, delayed casualties will not be sent to the emergency treatment area. They can be decontaminated prior to evacuation or, if adequate assets are not currently available, they can be provided with spot decon and evacuated in a dirty vehicle for decontamination and retriage at a higher level facility where care by a physician, with the necessary resources, is available.

d. *Expectant.* Casualties in this category are individuals who require care that is beyond the capability of the current MTF to provide, or would expend limited medical resources. In addition, the needed care is required before the casualty can be evacuated to the MTF that can provide such care. Depending on this condition, and the circumstances in the MTF at the time, the casualty will initially be set aside, but will be decontaminated. Periodic re-examination will provide opportunity for ongoing re-triage, care to insure patient comfort, and possible retriage to another category.

E-7. Detection Devices. Currently fielded detection equipment does not detect all possible chemical warfare agents. Detection devices that are helpful in the patient decontamination area include, but is not limited to--

- M-8 paper: Detects the liquid G nerve agents but does not differentiate between them. Identifies liquid V nerve agent. Detects the liquid H blister agents but does not differentiate between them. Does not detect vapors. This could be used by decontamination personnel to help detect liquid agent residue on a casualty before or after decontamination.

- M-9 tape: Detects the liquid H, G, and V agents but does not differentiate between them. Does not detect vapors. This is typically worn on MOPP gear and can be checked

by decontamination teams before the individual's protective ensemble is removed. It is typically not used as a detector during the decontamination process.

- Chemical Agent Monitor (CAM / ICAM): Monitors levels of nerve and blister vapors in the air (but only one at a time). Used after the presence of nerve or blister agents has been established to pinpoint contaminated areas. These may be used at the entry control point to verify contamination and assist in determining if decontamination is required, and at the end of the decontamination process to verify the effectiveness of decontamination based on service guidelines. It may also be used within airlocks on chemically protected MTFs to verify decontamination of individuals entering the facilities. They can be deployed in pairs, with one on G (nerve agent) mode and one on H (vesicant) mode. Instructions for use are given in *TO 11H2-20-1 and US Army Technical Manual 3-6665-327-13P*.

- M8A1 Automatic Chemical Agent Alarm: This consists of the M43A1 Detector and one or more M42 Remote Alarms. This is not used to detect agent on a casualty, but is used to monitor an area for possible air contamination in clean areas and upwind of the decontamination area and MTF. It serves as an early warning alarm for nerve agent vapors only.

- M22 Automatic Chemical Agent Alarm (ACADA): This is a replacement for the M8A1. It consists of the M88 Chemical Detector and one or more M42 Remote Alarms. This is not used to detect agent on a casualty, but is used to monitor an area for possible air contamination in clean areas and upwind of the decontamination area and MTF. It serves as an early warning alarm for nerve and mustard agent vapors.

- Surface detectors for monitoring skin and wound radiation contamination. These include the AN/VDR-2, AN/PDR-77, or ADM-300 RADIAC Set. These can be deployed, in the event of radiological contamination, at the same locations as the CAM to verify radiologically contaminated casualties and equipment for those at the entry control point and to verify the effectiveness of decontamination.

E-8. Zones of Contamination. According to joint doctrine and EPA Standard Operating Safety Guidelines, OSHA 29 CFR 1910.120, NFPA 472, there are three zones and a variety of control lines and points that are designated by the level of contamination from NBC agents. These are (see Fig E-1)--

a. Cold Zone. This is an area that is free from contamination. This is typically where an MTF is located. This is an area where protective clothing is not required. Some areas of this zone may become a warm zone as contaminated casualties arrive. This is also referred to as the clean zone, green zone, or support zone..

b. Warm Zone. This is an area between the hot and cold zones where personnel and equipment decontamination, emergency treatment, and triage take place. These areas are initially in the cold zone when the decontamination line is set up for an MTF and then become a yellow zone as contaminated casualties arrive. This zone includes control points into and out of it to assist in reducing the spread of contamination. It is an area where agent liquid and vapor hazards may be present and protective ensemble is required. This is also referred to as the contamination reduction corridor, contamination reduction zone, yellow zone, or limited access zone.

c. Hot Zone. This is area that is contaminated by NBC agents. Casualties are brought from the hot zone into the warm zone for decontamination. The protective ensemble is required in the hot zone.

d. Entry Control Point. These are the designated points of entry and / or exit into the hot zone, warm zone, and cold zone. The entry control point is used to maintain control of the number of personnel and vehicles entering and departing from the different zones to insure that the appropriate level of individual protection is worn and contamination is not spread to the cold zone. Of particular importance is the entry control point between the warm zone (decontamination area) and the cold zone (MTF).

e. Hot Line. This is the line that separates the warm zone from the cold zone. It is typically an entry control point where security is in place, in the form of a barrier or personnel, to prevent contaminated individuals from entering the cold zone. At the hot line all liquid contamination stops. There may still be some residual vapor hazard. Patients who cross the hot line have been decontaminated and are checked for signs of agent contamination before being allowed to cross.

f. Vapor Control Line. This is a line that encompasses the warm zone. It indicates an area where there is a possible vapor hazard but no liquid hazard. It is typically outside of the Hotline / Liquid control line. Depending on the situation it can be synonymous with the hot line. It can also be called the vapor hotline.

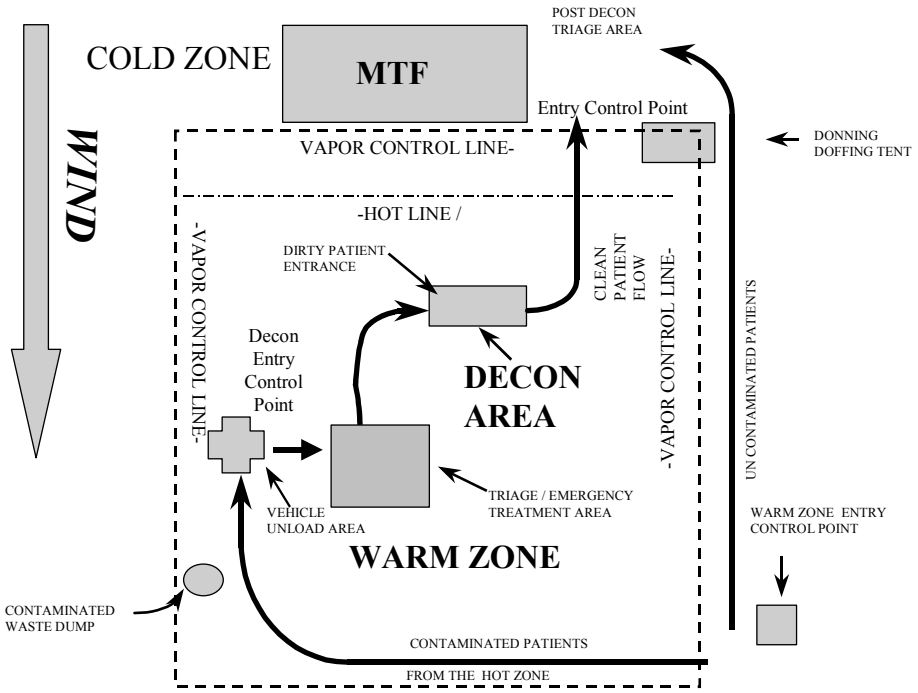

Fig E-1 Generalized Schematic of the Zones of Contamination

Appendix E

Casualty Decontamination

SECTION II US Army

E-9. General

a. Patient decontamination presents special problems for units and HSS personnel. Nuclear, biological, and chemical contaminated patients create increased hazards to rescuers and HSS personnel; thus, causing delays in providing essential first aid and medical treatment for injuries from sources other than the exposure to NBC weapons/agents.

b. Casualty decontamination procedures are performed by each individual, as buddy aid, or at a unit decontamination station prior to the arrival of medical personnel. See FM 3-5 for procedures on individual, buddy aid, and unit decontamination. Patient decontamination procedures are normally performed at an MTF, under medical supervision.

c. To consolidate resources, patient decontamination stations, may be established (collocated) at central unit decontamination facilities, if medical support is available. In these instances, decontamination lines for medical casualties must be separate from nonmedical personnel decontamination lines. This separation is required to allow for litter decontamination, triage, and medical care during the decontamination process. Medical decontamination must be augmented by the collocated decontamination unit or supported units under medical supervision.

d. When a unit is undergoing decontamination operations, organic medical personnel must also decontaminate their equipment and personnel. At these times they will not be available to provide medical support for operating the patient decontamination station that is collocated with the central unit decontamination facility.

e. The term "decontamination" as used herein means the removal or neutralization of radioactive particles, BW agents, and CW agents to levels low enough that patients may be treated without contaminating the MTF and without posing health risks to unprotected medical providers. "Decontamination" does not imply absolute removal of contaminants.

NOTE

The decontamination procedures described below are for NBC contaminated patients. These procedures may also be used for most TIM contaminated patients. However, soap and water will suffice for most TIMs; but some TIMs react with water. For those TIMs another material must be used to decontaminate these patients. For detailed information on decontamination of TIM contaminated patients, see FM 8-500.

E-10. Immediate Decontamination

a. Decontamination must begin with the individual soldier, through self-aid and buddy aid, and then at the platoon and company level, before the arrival of medical personnel. More thorough decontamination will be needed if the casualty is to go into a clean MTF, where medical personnel are not wearing NBC protection. Enter the time and type of contamination on a field expedient NBC casualty card (Figure E-2).

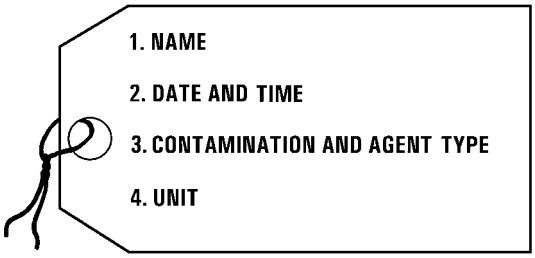

Figure E-2. Field expedient nuclear, biological, and chemical patient card.

When the casualty's condition and the mission permit, they may go through a MOPP gear exchange at their unit before evacuation (see FM 3-5). Performing a MOPP gear exchange at the unit before evacuation will reduce the amount of contamination that can be transferred to the MEDEVAC vehicle. However, the MOPP gear exchange must not cause further injury to the casualty.

b. First aid for CW agent must be administered; such as administering nerve agent antidotes and convulsant antidote for nerve agent [CANA], as required.

c. Use the CAM or M8 chemical agent detector paper to determine the type of chemical contamination. Placement of M9 Tape on the protective garment can indicate the presence of a chemical agent contaminant, but not the type. Use a radiation detection device to determine the level of radioactive contamination, if required. Currently, there are no BW agent detectors that can be used to check patients for BW agent contamination, which may be present on clothing and equipment. Therefore, all patients suspected of being contaminated with a BW agent of the type that could contaminate clothing and equipment (such as anthrax spores) must be decontaminated.

d. When medical personnel arrive, they should enter the time and type of contamination and number of antidote injections that were administered as first aid on the Department of Defense (DD) Form 1380 (Field Medical Card [FMC]).

E-11. Patient Decontamination and Thorough Decontamination Collocation

a. Collocating patient and thorough decontamination operations may provide several advantages (Figure E-3). It—

- Preserves the principle of limiting the spread of contamination.

- Reduces confusion on the battlefield.

- Reduces demand on logistics support elements.

- Improves contamination control and reporting: One location and one person in charge.

- Reduces overall security requirements.

- Speeds patient decontamination closure by using the thorough decontamination site.

b. An identified disadvantage is the increased size of the site and the requirement for medical support augmentation (a treatment squad from another organization with required patient decontamination and treatment medical equipment sets) to operate the patient decontamination site.

NOTE

Augmentation medical personnel must be used to perform the HSS mission at the collocated site. Medical personnel assigned to units undergoing decontamination are must not be used to perform medical care at the collocated decontamination site. They must go through the decontamination process with their unit in order to be ready to continue the mission with their unit.

c. These operations do not require that both patient decontamination and unit thorough decontamination be executed simultaneously. The patient decontamination can be running while the thorough decontamination side is being prepared. Patient decontamination cannot be delayed since patients may be suffering life-threatening injuries as well as exposure to NBC agents. Therefore, the patient decontamination site must be established and operational before the first patients arrive. The wind direction must be common to both sites.

d. The decontamination platoon leader is in responsible for establishing the combined decontamination site at brigade level or higher. The medical unit commander/surgeon coordinates with the decontamination platoon leader for the location of the patient receiving, PDS, and MTF. The lowest level at which this operation will usually be planned is brigade. This operation requires extensive planning and must involve the brigade chemical officer, brigade S4, and the medical company commander/brigade surgeon. Decontamination support for special operation forces, other unique operational organizations, or for nonlinear operations may require execution at a lower level. The supporting medical personnel operate the PDS. Nonmedical personnel perform patient decontamination procedures under medical supervision. Patient decontamination procedures are described below.

NOTE

Patient decontamination differs from thorough decontamination in that the patients' medical status

must be monitored and medical treatment must be provided during the decontamination process.

e. Although a PDS may be collocated with thorough decontamination, a PDS must be operational at Levels I, II, III, and IV MTFs. Contaminated patients may present directly to the MTF for care, or patients previously decontaminated may become contaminated en route. Therefore, all patients arriving at a MTF must be checked for contamination. If contaminated, they must be decontaminated before they are admitted to the MTF.

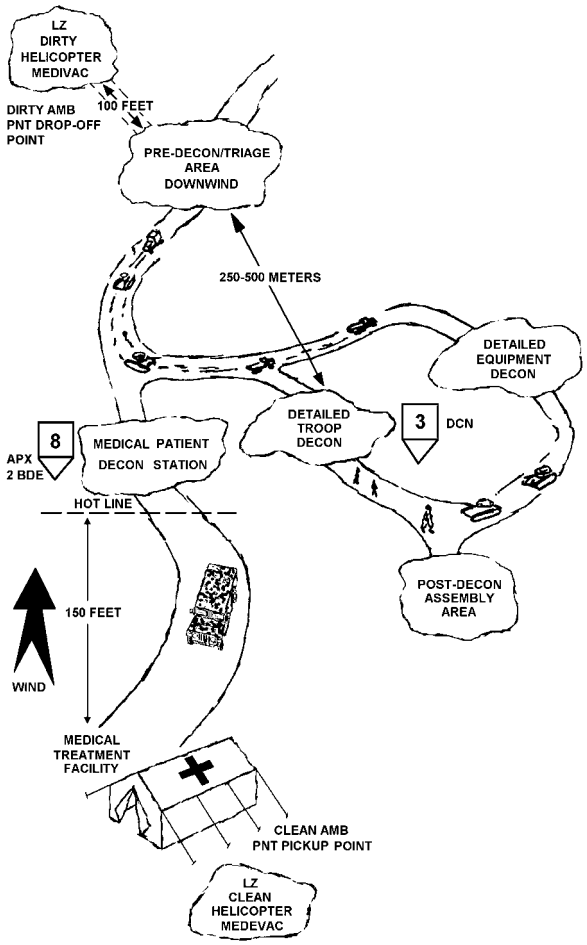

Figure E-3. Thorough decontamination site collocated with patient decontamination station, without CPS.

E-12. Patient Decontamination at the Battalion Aid Station (Level I MTF)

a. When battle conditions prevent patient decontamination procedures forward or the patient is contaminated en route, the patient may have to be decontaminated at the level I MTF. Contaminated patients who must be treated in the level I clean treatment area, must be thoroughly decontaminated before admission into the clean treatment area. Patients who require additional care, but can survive evacuation to a higher level of care, and will not enter the clean treatment area, can have their MOPP spot decontaminated and then sent on to the next level of care .

b. Patient decontamination is performed by a minimum of eight nonmedical personnel from the supported unit at the level I MTF. The patient decontamination personnel operate as two-man teams to perform the patient decontamination procedures. The patient decontamination teams operate under the supervision of medical personnel to ensure that no further injury is caused to the patient by the decontamination process. Each team receives a patient from the triage point and performs both clothing removal and skin decontamination procedures. The team requires assistance from another team to perform litter changes; see details below.

E-13. Patient Decontamination at the Medical Company Clearing Station (Level II)

The medical company level II MTF may receive patients from the level I MTF or directly from other areas who have not been decontaminated. The clearing station must also have a patient decontamination area. As with the level I MTF, the clearing station must have a minimum of eight nonmedical personnel from the supported units to perform patient decontamination. Procedures for patient decontamination at the clearing station are the same as for the level I MTF.

E-14. Patient Decontamination at a Hospital (Level III or IV)

To the maximum extent possible, hospitals are located away from tactical or logistical targets. Contaminated patients will arrive from forward MTFs and units located within the geographical area of the hospital. Patient decontamination is done by at least 20 nonmedical personnel from units located in the geographical area/base cluster of the hospital. Procedures for patient decontamination at the hospital are the same as for the level I MTF. However, several patient decontamination stations can be operated simultaneously at the hospital patient decontamination site. Further, all patients arriving at the hospital will be decontaminated and receive full treatment within the capabilities of the hospital.

E-15. Preferred method of individual Decontamination

The preferred methods of individual decontamination are the use of the M291 kit or soap and water. An alternative patient decontamination agent is a hypochlorite solution; however, the hypochlorite solution must be prepared. Two concentrations of the hypochlorite solution are required. A 5 percent hypochlorite solution to decontaminate gloves, aprons, litters, cutting devices, the patient's mask hood, and other nonskin contact areas. The patient's mask, skin, splints, and tourniquets and their wounds are irrigated using a 0.5 (½) percent hypochlorite solution.

E-16. Patient Treatment

This appendix only describes patient decontamination procedures. For NBC treatment procedures, refer to FM 4-02.283, FM 8-284, and FM 8-285.

Section II A. PATIENT DECONTAMINATION PROCEDURES

E-17. Decontaminate a Litter Chemical Agent Patient

Before contaminated patients receive medical treatment in the clean treatment area, they must be decontaminated. Place the cutting device in a container of 5 percent hypochlorite solution between each use. Each decontamination team member decontaminates his gloves and apron with the 5 percent hypochlorite solution frequently to prevent spreading any contamination to patient's skin. Decontaminate the patient's skin, bandages, wounds, mask, identification tags with chain, and splints with a **0.5** percent hypochlorite solution. The litter patient is decontaminated and undressed as follows:

NOTE

Litter patients requiring EMT or ATM in the clean area of the MTF will be completely decontaminated. A patient not requiring clean EMT or ATM at the MTF, but requiring further evacuation (for example: a stable patient with a partial amputation of a lower extremity) should only have his wound area and MOPP spot decontaminated to remove any gross contamination. The patient should be evacuated in his MOPP.

a. **Step 1. Physical remove gross contamination.** Use any stiff material (stick, cardboard, plastic strip, metal banding strap) to physically remove gross contamination from the patient's MOPP ensemble. Much of the CW agent contamination can be removed through physical means.

b. **Step 2. Decontaminate the patient's mask and hood.** The patient has been triaged and stabilized (if necessary) by the senior trauma specialist in the patient decontamination area. A two-man decontamination team moves him to the litter stands at the clothing removal station.

(1) **Decontaminate the mask and hood.** Use the SDK, or use a 5 percent hypochlorite solution or household bleach to sponge down the front, sides, and top of the mask hood. Decontaminate spots with the SDK or the 5 percent hypochlorite solution.

(2) **Remove hood.** Remove the hood by cutting the hood. Before cutting the hood, dip the cutting device in a 5 percent hypochlorite solution. For the M17-series mask, cut the neck cord and the small string under the voicemitter. Release or cut the hood shoulder straps and unzip the hood zipper. Cut the hood, close to the filter inlet cover and eye-lens outsert, upward to the top of the eye-lens outsert, and across the forehead to the outer edge of the other eye-lens outsert. Proceed downward toward the patient's shoulder, staying close to the eye-lens, then across the lower part of the voicemitter to the zipper. After dipping the cutting device in the 5 percent hypochlorite solution, cut the hood from the center of the forehead over the top of the head (see Figure E-4). Fold the left and right sides of the hood to the side of the patient's head, laying the sides of the hood on the litter. For the M40-series protective mask cut the hood shoulder straps, then cut the quickdoff hood from the front bottom center to the chin through the

elastic band under the chin. Fold the left and right sides of the hood to the over the shoulders away from the head.

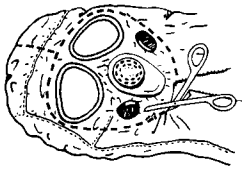

Figure E-4. Cutting the M17 protective mask hood.

(3) **Decontaminate the protective mask and exposed skin.** Using the SDK, soap and water, or a 0.5 percent hypochlorite solution, wipe the external parts of the mask. Cover the mask air inlet(s) with gauze or your hand to keep the mask filter dry. Continue by wiping the exposed areas of the patients' face, including the neck and behind the ears.

(4) **Remove the Field Medical Card.** Cut the patient's FMC tie wire, allowing the FMC to fall into a plastic bag. Seal the plastic bag and rinse the outside of the bag with a 0.5 percent hypochlorite solution. Place the plastic bag with the FMC under the back of the protective mask head straps. The FMC will remain with the patient.

c. **Step 2. Remove gross contamination from the patient's overgarment.** Remove all visible gross contamination by scraping with a stick or other device.

d. **Step 3. Remove the patient's personal effects and protective overgarment.**

(1) **Remove patient's personal effects.** Remove the patient's personal effects from his protective overgarment pockets. Place the articles in a plastic bag, label with the patient's identification, and seal the bag. If the articles are not contaminated, return them to the patient. If the articles are contaminated, place them in the contaminated holding area until they can be decontaminated, and then return them to the patient.

(2) Cut the patient's overgarment. The overgarment jacket and trousers may be cut simultaneously. Two persons may be cutting clothing at the same time. **Cut around bandages, tourniquets, and splints, leaving them in place.**

NOTE

A cut is a separation of material by use of a cutting device that cuts material into two pieces. EXAMPLE: Cutting the sleeve from the cuff to the jacket collar is one cut.

CAUTION

Bandages may have been applied to control severe bleeding and are treated like tourniquets. Only medical personnel remove bandages, tourniquets, and splints.

(3) **Remove overgarment jacket.** Make two cuts, one up each sleeve from the wrist up to the shoulder, and then through the collar (Figure E-5). Do not allow the gloves to touch the patient along the cut line. Dip the cutting device in the 5 percent hypochlorite solution before making each cut to prevent contamination of the patient's uniform or underclothing. Keep the cuts close to the inside of the arms so that most of the sleeve material can be folded outward. Unzip the jacket; roll the chest sections to the respective sides, with the inner surface outward. Continue by tucking the clothing between the arm and chest. Roll the cut sleeves away from the arms, exposing the black liner.

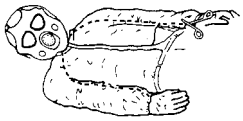

Figure E-5. Cutting the overgarment jacket.

(4) **Remove overgarment trousers.** Cut both trouser legs starting at the ankle as shown in Figure E-6. Keep the cuts near the inseams to the crotch. With the left leg, continue cutting to the waist, avoiding the pockets. With the right leg, cut across at the crotch to the left leg cut. Place the cutting device in the 5 percent hypochlorite solution. Fold the cut trouser halves away from the patient and allow the halves to drop to the litter with contaminated (green) side down. Roll the inner leg portion under and between the legs.

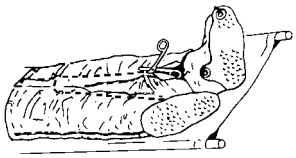

Figure E-6. Cutting the overgarment trousers.

(5) **Remove outer gloves.** This procedure can be done with one person on each side of the patient working simultaneously. The decontamination team will decontaminate their gloves in 5 percent hypochlorite solution. Next, lift the patient's arms up and out of the cutaway sleeves unless detrimental to the patient's condition. Grasp the fingers of the glove, roll the cuff over the fingers, turning the glove inside out. Do not remove the inner cotton glove liners at this time. Carefully lower the arms across the chest after the outer gloves have been removed (Figure E-7). Do not allow the patient's arms to come into contact with the exterior of his overgarment. Drop his gloves into the contaminated waste bag. Dip your gloves in the 5 percent hypochlorite solution.

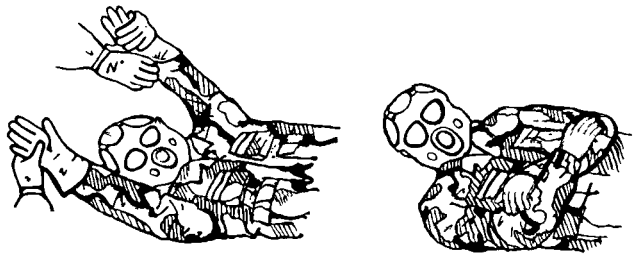

Figure E-7. Remove outer gloves and position arms after glove removal.

(6) **Remove overboots.** First try to remove the green vinyl overboot (GVO) without cutting; if necessary, cut the boot along the front. While standing at the foot of the litter, hold the heel with one hand, pull overboot downwards, and then pull towards you to remove the overboot over the combat boot heel. Remove the two overboots simultaneously. This reduces the likelihood of contaminating one of the combat boots. While holding the heels off the litter, have a decontamination team member wipe the end of the litter with the 5 percent hypochlorite solution to neutralize any liquid contamination that was transferred to the litter from the overboots. Lower the patient's heels onto the decontaminated litter. Place the overboots in the contaminated waste bag. Decontamination personnel dip their gloves in the 5 percent hypochlorite solution. If the older, laced overboot, is worn then cut the overboot laces and fold the lacing eyelets flat outwards and then remove the boot as noted above.

e. **Step 4. Remove patient's battle dress uniform.**

(1) **Remove the patient's personal effects from his BDU pockets.** Place these in the plastic bag where items from the protective overgarment were placed. Reseal the bag. If the articles are not contaminated, return them to the patient. If the articles are contaminated, place them in the contaminated holding area until they can be decontaminated, and then return them to the patient.

(2) **Remove battle dress uniform.** Cut the BDU jacket and trousers as described above for the protective overgarment. Roll the jacket and trousers as described for the protective overgarment.

(3) **Remove combat boots.** Cut the bootlaces along the tongue. Remove the boots by pulling them towards you. Place the boots in the contaminated waste bag. Do not touch the patient's skin with contaminated gloves when removing his boots.

(4) **Remove undergarments.** Remove the patient's tee shirt. Dip the cutting device in the 5 percent hypochlorite solution between each cut. Cut both sleeves from the inside, starting at the elbow, up to the armpit. Continue cutting across the shoulder to the collar. Cut around bandages or splints, leaving them in place. Next, peel the tee shirt away from the body to avoid spreading contamination. If the patient is wearing a brassiere, cut it between the cups. Cut both shoulder straps where they attach to the cups and lay them back off of the shoulders. Remove the patient's under shorts/panties by cutting from the lower side of the hip to the waist on both sides. Fold the front flap of the shorts/panties down between the patient's legs onto the litter. Do not allow the outside of the garment to touch the patient's skin. Remove the socks and cotton glove liners. Do not remove the patient's identification tags.

f. **Step 5. Transfer the patient to a decontamination litter.** After the patient's clothing has been cut away, he is transferred to a decontamination litter or a canvas litter with a plastic sheeting cover. Three decontamination team members decontaminate their gloves and aprons with the 0.5 percent hypochlorite solution. One member places his hands under the patient's legs at the thighs and Achilles tendons, a second member places his arms under the patient's back and buttocks, and a third member places his arms under the patient's shoulders and supports the head and neck. They carefully lift the patient using their knees (not their backs) to minimize back strain. While the patient is elevated, another decontamination team member removes the litter from the litter stands and replaces it with a decontaminated (clean) litter. The

patient is carefully lowered onto the clean litter. The contaminated clothing and overgarments are placed in bags and moved to the contaminated waste dump. The dirty litter is rinsed with the 5 percent hypochlorite solution and placed in the litter storage area.

g. **Step 6. Decontaminate skin.**

(1) **Spot decontamination.** With the patient in a supine position, spot decontaminate the skin using the SDK or a 0.5 percent hypochlorite solution. Decontaminate areas of potential contamination. Include areas around the neck, wrists, and lower parts of the face. Decontaminate the patient's identification tags and chain, if necessary.

NOTE

Complete body wash is not appropriate and may be injurious to the patient. During complete body wash, the patient would have to be rolled over to reach all areas of the skin. This is not necessary for adequate decontamination.

(2) **Trauma specialist care.** During decontamination, the clothing around bandages, tourniquets, and splints was cut and left in place.

- The trauma specialist replaces the old tourniquet by placing a new tourniquet ½ to 1 inch above the old one. He then removes the old tourniquet and decontaminates the patient's skin using the M291 pads or a 0.5 percent hypochlorite solution.

- The trauma specialist gently cuts away bandages and decontaminates the area around the wound with SDK, if soapy water is not available, or use 0.5 percent hypochlorite solution. Irrigated the wound with normal saline or the 0.5 percent hypochlorite solution. If bleeding begins, the trauma specialist replaces the bandage with a clean one. The trauma specialist ensures splints are not removed, but are decontaminated in place by applying the 0.5 percent hypochlorite solution to them, to include the padding and cravats. Splints will only be removed by a physician or by other medical personnel under the supervision of a physician.

WARNINGS

1. DO NOT APPLY THE SDK OR IRRIGATE WOUNDSIN THE ABDOMINAL AND THORACIC CAVITIES OR INTRACRANIAL HEAD INJURIES.

2. DO NOT REMOVE SPLINTS.

(3) **Check patient for completeness of decontamination.** The patient is checked with the chemical agent monitor (CAM) or with M8 detector paper for completeness of decontamination.

NOTE

Other monitoring devices may be used when available.

(4) **Dispose of contaminated waste.** Dispose of contaminated bandages and coverings by placing them in a contaminated waste bag. Seal the bag and place it in the contaminated waste dump.

h. **Step 7. Transfer the patient across the shuffle pit.**

(1) The patient's clothing has been cut away; his skin, bandages, and splints have been decontaminated. Now the litter is transferred to the shuffle pit and placed upon the litter stands. The shuffle pit is wide enough to prevent the patient decontamination team members from straddling it while carrying the litter. Four decontamination team members transfer the patient to a clean treatment litter in the shuffle pit.

(2) A member of the patient decontamination team removes the bagged FMC and holds it so that a trauma specialist on the clean side of the hot line can read it and transfer the information to a clean FMC. A trauma specialist on the clean side of the hot line prepares a new FMC before the patient is moved to the clean area. The old FMC is disposed of with other contaminated waste.

(3) Decontamination team members rinse or wipe down their aprons and gloves with the 0.5 percent hypochlorite solution.

(4) Three decontamination team members lift the patient off the decontamination litter.

(5) While the patient is elevated, another decontamination team member removes the litter from the stands and returns it to the decontamination area on the dirty side of the hot line. A trauma specialist from the clean side of the shuffle pit replaces the litter with a clean one. The patient is lowered onto the clean litter. Two trauma specialists from the clean side of the shuffle pit move the patient to the clean treatment area. The patient is treated in this area or waits for processing into the CPS. The litter removed by the decontamination team member is wiped down with the 5 percent hypochlorite solution in preparation for reuse.

NOTE

Before decontaminating another patient, each decontamination team member drinks approximately one-half quart of water. The exact amount of water consumed is increased or decreased according to the temperature (see Table E-2 below).

Table E-2. Heat Injury Prevention and Water Consumption.

HEAT CATEGORY	WBGT INDEX DEGREES F	EASY WORK		MODERATE WORK		HARDWORK	
		WORK/ REST MIN	WATER INTAKE QT/HR	WORK/ REST MIN	WATER INTAKE QT/HR	WORK/ REST MIN	WATER INTAKE QT/HR
1 (WHITE)	78-81.9	NL	1/2	NL	3/4	40/20	3/4
2 (GREEN)	82-84.9	NL	1/2	50/10	3/4	30/30	1
3 (YELLOW)	85-87.9	NL	3/4	40/20	3/4	30/30	1
4 (RED)	88-89.9	NL	3/4	30/30	3/4	20/40	1
5 (BLACK)	> 90	50/10	1	20/40	1	10/50	1

The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hours of work in the specified heat category. NL= no limit to work time per hour.

Rest means minimal physical activity (sitting or standing) accomplished in shade, if possible.

CAUTION:

Hourly fluid intake should not exceed 1 quart.
Daily fluid intake **should not exceed 12 quarts.**
Wearing body armor adds **5° F** to wet bulb globe temperature (WBGT) Index.
Wearing all MOPP overgarments adds **10° F** to WBGT Index.

WARNING

Do not exceed a fluid intake of 1 quart per hour.
Do not exceed a fluid intake of 12 quarts per day.

E-18. Decontaminate an Ambulatory Chemical Agent Patient

a. All ambulatory patients requiring EMT or ATM in the clean area of the BAS will be decontaminated. A member of the decontamination team or other ambulatory patients will assist the patient in removing his clothing and decontaminating his skin.

b. Patients requiring only minimal care will undergo spot decontamination of their MOPP gear as required for their medical treatment. They will be treated in the contaminated EMT area and returned to duty. They will undergo decontamination and a MOPP gear exchange with their unit.

c. Stable patients not requiring treatment at the BAS, but requiring evacuation to a higher level of care for treatment (example: A patient with a broken arm) should be evacuated in MOPP Level 4 by any available transportation. However, before evacuation, spot remove all thickened/persistant agents from protective clothing.

NOTES

1. Remember, do not remove clothing from an ambulatory patient unless he requires treatment in the clean treatment area of the level I MTF or clearing station. Only spot decontaminate the patient's clothing and evacuate him to the next level of care.

2. Place cutting device used in this procedure in a container of 5 percent hypochlorite solution when not in use. Most ambulatory patients will be treated in the contaminated treatment area and returned to duty. Upon removal of an ambulatory patient's clothing, he becomes a litter patient. The level I MTF and clearing station do not have clothing to replace those cut off during the decontamination process. The patient must be placed in a PPW for protection during evacuation. A battery operated blower unit with a CB filter is attached to the PPW to provide fresh air to the patient; thus reducing the carbon dioxide buildup inside the PPW (Figure E-8).

CAUTION

DO NOT leave a patient inside a PPW in direct sunlight for more than a few minutes. To do so can cause a severe heat load on the patient and lead to a heat injury.

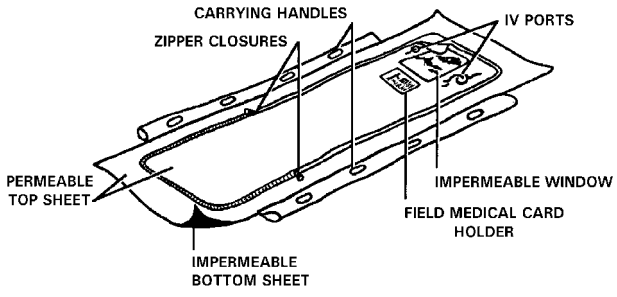

Figure E-8. Chemical warfare agent protective patient wrap.

a. **Step 1. Remove load-carrying equipment.** Remove load-carrying equipment (LCE) by unfastening/unbuttoning all connectors or tie straps; then place the equipment in a plastic bag. Place the plastic bag in the designated storage area for later decontamination.

b. **Step 2. Decontaminate the patient's mask and hood.** After the patient has been triaged and treated (if necessary) by the senior trauma specialist in the PDS, the patient (assisted by another ambulatory patient or a member of the patient decontamination team, if necessary) begins the clothing removal process.

(1) **Decontaminate and remove mask hood.** Sponge down the front, sides, and top of the hood with a 5 percent hypochlorite solution. Remove the hood by cutting (Figure E-3) or, with the quick-doff hood or other hoods, by loosening the hood from the mask attachment points. Before cutting the hood, dip the cutting device in the 5 percent hypochlorite solution. Begin by cutting the neck cord and the small string under the voicemitter. Next, release or cut the hood shoulder straps and unzip the hood zipper. Proceed by cutting the hood upward, close to the filter inlet cover and eye-lens outserts, to the top of the eye-lens outsert, across the forehead to the outer edge of the other eye-lens outsert. Proceed downward toward the patient's shoulder, staying close to the eye-lens and filter inlet. Cut across the lower part of the voicemitter to the zipper. After dipping the cutting device in the 5 percent hypochlorite solution again, cut the hood from the center of the forehead over the top of the head and fold the right and left sides of the hood away from the patient's head, removing the hood.

(2) **Decontaminate the mask and patient's face.** Decontaminate the mask and the patient's face by using the SDK or a 0.5 percent hypochlorite solution. Wipe the external parts of the mask; cover both mask air inlets with gauze or your hands to keep the mask filters dry. Continue by wiping the exposed areas of the patient's face, to include the neck and behind the ears.

c. **Step 3. Remove Field Medical Card.** Cut the FMC tie wire, allowing the card to fall into a plastic bag. Seal the plastic bag and rinse it with the 0.5 percent hypochlorite solution. Place the plastic bag under the back of the protective mask head straps.

d. **Step 4. Remove all gross contamination from the patient's overgarment.** Remove all visible contamination spots by using the SDK (preferred method) or a sponge dipped in a 5 percent hypochlorite solution.

e. **Step 5. Remove overgarments.**

(1) **Remove the patient's personal effects.** Place the patient's personal effects in a clean bag and label with the patient's identification. If they are not contaminated, give them to him. If his personal effects are contaminated, place the bagged items in the contaminated storage area until they can be decontaminated, and then return them to the patient.

(2) **Remove overgarment jacket.** Have the patient stand with his feet spread apart at shoulder width. Unsnap the jacket front flap and unzip the jacket. If the patient can extend his arms, have him clinch his fist and extend his arms backward at about a 30° angle. Move behind the patient, grasping his jacket collar at the sides of the neck, peel the jacket off the shoulders at a 30° angle down and away from the patient. Avoid any rapid or sharp jerks that can spread contamination. Gently pull the inside sleeves over the patient's wrists and hands. If the patient cannot extend his arms, you must cut the jacket to aid in its removal. Dip the cutting device in the 5 percent hypochlorite solution between each cut. As with the litter patient, cut both sleeves from the inside, starting at the wrist, up to the armpit. Continue cutting across the shoulder to the collar. Cut around bandages or splints, leaving them in place. Next, peel the

jacket back and downward to avoid spreading contamination. Ensure that the outside of the jacket does not touch the patient or his inner clothing.

(3) **Remove overgarment trousers.** Unfasten or cut all ties, buttons, or zippers before grasping the trousers at the waist and peeling them down over the patient's combat boots. Again, the trousers are cut to aid in removal. If necessary, cut both trouser legs starting at the ankle, keeping the cuts near the inside of the legs, along the inseam, to the crotch. Cut around all bandages, tourniquets, or splints. Continue to cut up both sides of the zipper to the waist and allow the narrow strip with the zipper to drop between the legs. Place the cutting device in the 5 percent hypochlorite solution. Peel or allow the trouser halves to drop to the ground. Have the patient step out of the trouser legs, one at a time. Place the trousers in the contaminated disposal bag.

(4) **Remove overboots.** Remove the patient's overboots by cutting the laces with cutting device dipped in the 5 percent hypochlorite solution. Fold the lacing eyelets flat on the ground. Step on the toe and heel eyelets to hold the overboot on the ground and have the patient step out of it. Repeat this procedure for the other overboot. If the GVO is worn, first try to remove the overboots without cutting; if necessary, cut the overboot along the front. If the overboots are in good condition, they can be decontaminated and reissued.

(5) **Remove the patient's outer gloves.** Grasp the heel of the glove, peel the glove off with a smooth downward motion. Place the contaminated gloves in a plastic bag with the overgarment jacket. Do not allow the patient to touch his clothing or other contaminated objects with his exposed hands.

(6) **Remove the patient's cotton glove liners.** Have the patient remove his cotton glove liners to reduce the possibility of spreading contamination. Have the patient grasp the heel of one glove liner with the other gloved hand, peeling it off of his hand. Hold the removed glove by the inside and grasp the heel of the other glove, peeling it off of his hand. Place both glove inserts in the contaminated waste bag.

f. **Step 6. Remove patients BDU.**

(1) **Remove the patient's personal effects.** Place the patient's personal effects in a clean bag and label with the patient's identification. If they are not contaminated, give them to him. If his personal effects are contaminated, place the bagged items in the contaminated storage area until they can be decontaminated, and then return them to the patient.

(2) **Remove BDU jacket.** Have the patient stand with his feet spread apart at shoulder width. Unbutton the jacket front flap of the jacket. If the patient can extend his arms, have him clinch his fist and extend his arms backward at about a 30° angle. Move behind the patient, grasping his jacket collar at the sides of the neck, peel the jacket off the shoulders at a 30° angle down and away from the patient. Avoid any rapid or sharp jerks that can spread contamination. Gently pull the inside sleeves over the patient's wrists and hands. If the patient cannot extend his arms, you must cut the jacket to aid in its removal. Dip the cutting device in the 5 percent hypochlorite solution between each cut. As with the litter patient, cut both sleeves from the inside, starting at the wrist, up to the armpit. Continue cutting across the shoulder to the collar. Cut around bandages or splints, leaving them in place. Next, peel the jacket back and

downward to avoid spreading contamination. Ensure that the outside of the jacket does not touch the patient or his inner clothing.

(3) **Remove BDU trousers.** Unfasten or cut all ties, buttons, or zippers before grasping the trousers at the waist and peeling them down over the patient's combat boots. Again, the trousers are cut to aid in removal. If necessary, cut both trouser legs starting at the ankle, keeping the cuts near the inside of the legs, along the inseam, to the crotch. Cut around all bandages, tourniquets, or splints. Continue to cut up both sides of the zipper to the waist and allow the narrow strip with the zipper to drop between the legs. Place the cutting device in the 5 percent hypochlorite solution. Peel or allow the trouser halves to drop to the ground. Have the patient step out of the trouser legs, one at a time. Place the trousers in the contaminated disposal bag.

(4) **Remove undergarments.** Remove the patient's tee shirt. Dip the cutting device in the 5 percent hypochlorite solution between each cut. Cut both sleeves from the inside, starting at the elbow, up to the armpit. Continue cutting across the shoulder to the collar. Cut around bandages or splints, leaving them in place. Next, peel the tee shirt away from the body to avoid spreading contamination. If the patient is wearing a brassiere, cut it between the cups. Cut both shoulder straps where they attach to the cups and lay them back off of the shoulders. Remove the patient's under shorts/panties by cutting from the lower side of the hip to the waist on both sides. Allow the shorts/panties to fall to the ground. Do not remove the patient's identification tags.

g. **Step 7. Check patient for contamination.** After the patient's BDU and underwear has been removed check the skin for contamination by using M8 detector paper or the chemical agent monitor (CAM). Carefully survey all areas of the patient's skin, paying particular attention to areas around the neck, wrist, ears, and dressings, splints, or tourniquets.

h. **Step 8. Decontaminate skin.**

(1) **Spot decontamination.** Use the SDK or the 0.5 percent hypochlorite solution to spot decontaminate exposed neck and wrist areas, splints, other areas where the protective overgarment was damaged, and where dressings or bandages were removed. Decontaminate the patient's identification tags, if necessary. Have the patient hold his breath and close his eyes. Have him, or assist him, lift his mask at the chin. Wipe his face with the M291 pad or the 0.5 percent hypochlorite solution. Wipe quickly from below the top of one ear, being careful to wipe all folds of the skin, top of the upper lip, chin, dimples, ear lobes, and nose. Continue up the other side of the face to the top of the other ear. Wipe the inside of the mask where it touches the face. Have the patient reseal and check his mask.

CAUTION

Keep the decontamination solution out of the patient's eyes.

(2) **Trauma specialist care.** During clothing removal, the clothing around bandages, tourniquets, and splints was cut and left in place.

- The trauma specialist replaces the old tourniquet. by placing a new one ½ to 1 inch above the old tourniquet. When the old tourniquet is removed, the skin where it was located is decontaminated with the SDK or the 0.5 percent hypochlorite solution.

- *During decontamination do not remove splints.* Decontaminate them by thoroughly rinsing the splint, padding, and cravats with the 0.5 percent hypochlorite solution.

- Usually, the trauma specialist will gently cut away bandages. The area around the wound is dusted with the SKD or rinsed with the 0.5 percent hypochlorite solution, and the trauma specialist irrigates the soft tissue wound with normal saline or 0.5 percent hypochlorite solution. If bleeding begins, the trauma specialist replaces the bandage with a clean one.

i. **Step 9. Dispose of contaminated waste.** Dispose of contaminated bandages and coverings by placing them in a plastic bag and sealing the bag with tape. Place the plastic bags in the contaminated waste dump.

j. **Step 10. Proceed through the shuffle pit to the clean treatment area.** Have the decontaminated patient proceed through the shuffle pit to the clean treatment area. Make sure that the patient's boots are thoroughly decontaminated by stirring the contents of the shuffle pit with his boots as he crosses it. The patient will remove his combat boots and socks at the entrance of the clean treatment area or CPS; remove the protective mask at the entrance to the clean treatment area or inside the ambulatory air lock of the CPS.

E-19. Biological Patient Decontamination Procedures

The decontamination station as established for chemical agent patients is also used for biologically contaminated patients. The eight-man patient decontamination team is required for biologically contaminated patient decontamination procedures.

E-20. Decontaminate a Litter Biological Agent Patient

a. **Remove the patient's personal effects.** Place the patient's personal effects in a clean bag and label with the patient's identification. If they are not contaminated, give them to him. If his personal effects are contaminated, place the bagged items in the contaminated storage area until they can be decontaminated, and then return them to the patient.

b. **Remove the Field Medical Card.** Remove the FMC by cutting the tie wire and allowing the FMC to drop into a plastic bag. Keep the FMC with the patient.

c. **Remove the patient's clothing.** Patient decontamination team members first apply the 5 percent hypochlorite solution to the patient's clothing and the litter. Then, remove the patient's clothing as in decontamination of chemical agent patients. Bandages, tourniquets,

and splints are not removed. Move patient to a clean litter as described for a chemical agent patient. Place patient's clothing in a plastic bag and dispose in the contaminated waste dump.

d. **Decontaminate the patient's skin.** Bathe the patient with soap and warm water or apply the 0.5 percent hypochlorite solution. The trauma specialist replaces the old tourniquet. First the skin where the new tourniquet is to be placed is decontaminated, then the new tourniquet is placed ½ to 1 inch above the old tourniquet. When the old tourniquet is removed, the skin where it was located is decontaminated with soap and water or the 0.5 percent hypochlorite solution. The trauma specialist removes bandages and decontaminates the skin and wound with the 0.5 percent hypochlorite solution; he replaces the bandage, if needed, to control hemorrhage. Soaking the splint, cravats, and straps with the 0.5 percent hypochlorite solution disinfects splints.

NOTE

Use a 0.5 percent hypochlorite solution to decontaminate patients suspected of being contaminated with mycotoxins.

e. **Transfer patient to hot line.** Two decontamination team members move patient to the hot line. Request assistance from two other decontamination team members to transfer him to a clean litter as described for chemical agent patients. Place the patient's FMC in the plastic bag on the clean litter with him. Two trauma specialists from the clean side of the hot line move the patient from the hot line to the clean treatment/holding area.

E-21. Decontaminate an Ambulatory Biological Agent Patient

a. **Remove the patient's personal effects.** Place the patient's personal effects in a clean bag and label with the patient's identification. If they are not contaminated, give them to him. If his personal effects are contaminated, place the bagged items in the contaminated storage area until they can be decontaminated, and then return them to the patient.

b. **Remove the Field Medical Card.** Remove the FMC by cutting the tie wire and allowing the FMC to drop into a plastic bag. Keep the FMC with the patient.

c. **Remove the patient's clothing.** Patient decontamination team members first apply the 5 percent hypochlorite solution to the patient's clothing. Then remove the patient's clothing as in decontamination of chemical agent patients. Bandages, tourniquets, and splints are not removed. Place patient's clothing in a plastic bag and dispose in the contaminated waste dump.

d. **Decontaminate the patient's skin.** Have the patient bathe with soap and warm water or apply the 0.5 percent hypochlorite solution. If the patient is unable to bathe himself, a member of the decontamination team must bathe him. The trauma specialist replaces the old tourniquet. First the skin where the new tourniquet is to be placed is decontaminated, then the new tourniquet is placed ½ to 1 inch above the old tourniquet. When the old tourniquet is removed, the skin where it was located is decontaminated with soap and water or the 0.5 percent

hypochlorite solution. The trauma specialist removes bandages and decontaminates the skin and wound with the 0.5 percent hypochlorite solution; he replaces the bandage, if needed, to control hemorrhage. Soaking the splint, cravats, and straps with the 0.5 percent hypochlorite solution disinfects splints.

NOTE

Use a 0.5 percent hypochlorite solution to decontaminate ambulatory patients suspected of being contaminated with mycotoxins.

e. **Direct patient across hot line.** Direct the patient to cross the hot line to the clean treatment area. His boots must be decontaminated at the hot line before he enters the clean treatment area.

NOTES

1. Remember, do not remove clothing from an ambulatory patient unless he requires treatment in the clean treatment area of the Level I MTF or clearing station. Only spot decontaminate the patient's clothing and evacuate him to the next level of care.

2. Place cutting device used in this procedure in a container of 5 percent hypochlorite solution when not in use. Most ambulatory patients will be treated in the contaminated treatment area and returned to duty. Upon removal of an ambulatory patient's clothing, he becomes a litter patient. The Level I MTF and clearing station do not have clothing to replace those cut off during the decontamination process. The patient must be placed in a PPW for protection during evacuation (Figure E-8).

E-22. Decontaminate Nuclear-Contaminated Patients

The practical decontamination of nuclear-contaminated patients is easily accomplished without interfering with the required medical care.

NOTE

Patients must be monitored by using a radiac meter (AN/VDR2, AN/PDR27, or AN/PDR77) before, during, and after each step of the decontamination procedure.

E-23. Decontaminate a Litter Nuclear-Contaminated Patient

a. **Remove patient's personal effects.** Patient decontamination team members remove the patient's personal effects and place them in a plastic bag. Place plastic bag in a clean holding area.

b. **Remove patient's clothing.** Patient decontamination team members remove the patient's outer clothing as described for chemical agent patients. Do not remove bandages, tourniquets, or splints. Move the patient to a clean litter. Place the patient's contaminated clothing in a plastic bag and move the bagged clothing to the contaminated waste dump.

NOTE

Patients arriving at the MTF in MOPP will only have their MOPP removed. They can remain in their BDU unless contamination is found on it.

c. **Spot decontaminate patient's skin.** Wash exposed skin surfaces with soap and warm water. Wash the hair with soap and warm water, or clip the hair and wash the scalp with soap and warm water.

d. **Transfer patient to hot line.** Move the patient to the hot line. Two trauma specialists from the clean side of the hot line move the patient into the clean treatment area.

E-24. Decontaminate an Ambulatory Nuclear-Contaminated Patient

a. **Remove patient's personal effects.** Have the patient remove his personal effects and place them in a plastic bag.

b. **Remove patient's outer clothing.** Have the patient remove his outer clothing (or have a decontamination team member assist him). Place his contaminated clothing in a plastic bag and move the bagged clothing to the contaminated waste dump.

NOTE

Patients arriving at the MTF in MOPP will only have their MOPP removed. They can remain ambulatory in their BDU unless contamination is found on it.

c. **Spot decontaminate patient's skin.** Have the patient wash his exposed skin surfaces with soap and warm water. Wash his hair with soap and water, or clip the hair and wash the scalp with soap and water.

d. **Transfer patient to hot line.** Direct the patient to move to the hot line. Decontaminate his boots by stirring the shuffle pit contents with his feet before he crosses into the clean treatment area.

NOTE

If a new protective overgarment is not available, after treatment, the ambulatory patient must be placed in a PPW for protection during MEDEVAC to the next level of care MTF. Thus, he becomes a litter patient for evacuation.

Appendix E

Casualty Patient Decontamination

SECTION III US AIR FORCE

E-25. General:

a. Air Force medical decontamination is conducted by the wartime medical decontamination team (WMDT), which is an Air Force MTF directed asset. The WMDT encompasses the unit type code (UTC) packages FFGLA for equipment and FFGLB for personnel. Each of these packages has a specific quantity of resources. The medical NBC team (MNBC) team, biological augmentation team (BAT) team, and the WMDT team, are considered a basic-level medical NBC defense package, and will be assigned to a bed-down location when an NBC threat develops or is anticipated. The WMDT is typically deployed with an expeditionary medical support hospital (EMEDDS). Air Force base civil engineering manages NBC decontamination operations, other than medical decontamination, for each Air Force base. The WMDT manages decontamination operations for casualties sent to the MTF.

b. The information below describes current AF concepts. The Air Force has tested and is currently developing an entirely new method for patient decontamination. The new AF CONOPs will involve pre-plumbed tents with water spraying systems. Non-ambulatory patients will be placed on decontamnable litters, stripped of all clothing, and thoroughly washed with warm soapy water. A roller system will be employed to move the patient through the decontamination line quickly and prevent the need to repetitively lift patients during this process.

c. This appendix offers general guidance for Air Force medical decontamination teams and provides information to allow the joint planner to understand the organization and operational procedures of the Air Force WMDT. For the most detailed reference on the manning, set up, organization, and function of the WMDT refer to the Air Force CONOPS for the Wartime Medical Decontamination Team. WMDT members should refer to the earlier chapters of this manual, Air Force CONOPS for the WMDT, FM 4-02.285, Treatment of Chemical Agent Casualties, FM 8-284 Treatment of Biological Warfare Agent Casualties, FM 4-02.283 Treatment of Nuclear and Radiological Casualties, and FM 8-500 HAZMAT Handbook for Prehospital Care (Fourth Edition) for more specific information on chemical agent characteristics, common decontamination principles, decontamination solution mixture instructions, and medical treatment protocols.

E-26. UTC FFGLA, Decontamination Equipment. The Air Force decontamination equipment package is designed to occupy 3 aircraft pallet positions, or 2 Ship & Storage Containers (Brooks & Perkins Containers) and 1 aircraft cargo pallet. 3 aircraft pallets can be used until adequate

Ship & Storage Containers are available. It has an approximate weight of 5,589 lbs. This UTC contains the necessary decontamination equipment and supplies to decontaminate 500 casualties. It contains chemical warfare defense ensembles for the WMDT members, items for the construction of an Alaska tent and a donning / doffing tent for WMDT members, two 1300-gallon water bladders, electric water pump, two environmental control units, shelving, and interior lighting. Current packages contain NBC decontaminable litters and NATO litter stands to reduce personnel requirements for patient transport. In the future patient roller and overhead water sprayer systems will be added to further ease physical work requirements for WMDT members and speed decontamination.

E-27. UTC FFGLB, WMDT Personnel. This is a 19 man team. The team Chief is typically a physicians assistant, Air Force Specialty Code (AFSC) 42G or a Senior Nursing Technician AFSC 4NO7. At least one other member of the team is a medical technician (4NO7) with skills in providing emergency medical care. The other individuals on the team have some type of medically related skill. All individuals are capable of performing dual roles to help in the operations of the MTF when not needed for decontamination operations. Members of each FFGLB UTC Team are from the same home unit and have trained together. Two UTC FFGLB teams are typically assigned to one UTC FFGLA equipment package. Each 19-member FFGLB team is designed to operate one 12-hour shift. If 24-hour operations are required then the second 19-member FFGLB team is deployed to man the second 12-hour shift. In most cases, each FFGLB personnel team will come from a different home base and may also not necessarily be from the same home base as the deployed MTF. The FFGLA equipment packages may not be from the same base as the personnel package, though it is preferred that the initially deployed equipment and personnel packages come from the same home base. The aim is to have standardization in equipment and training levels across all UTC packages Air Force wide to allow for interchange of personnel teams and equipment packages. Team members are designated by the Medical Commander and must be competent in the emergency management of life threatening wounds and administration of chemical agent antidote.

NOTE

FFGLB manning packages may be changed by theater planners (e.g., Planners in Central Command Air Forces (CENTAF) are calling for only one12 man team per FFGLA equipment package).

E-28. Patient Decontamination Operations.

a. General

(1) The WMDT is activated when NBC weapons have been introduced by the enemy.

(2) Through field tests, it is estimated that a 19 member WMDT team, using the NATO litters, can simultaneously process between 4-5 litter and 6-7 ambulatory patients in one hour depending on the level and type of contaminant. This quantity may decrease as heat stress and fatigue increase. Efficiency is expected to further increase once the roller system is integrated into the UTC FFGLA package.

(3) Some individuals, who have not been decontaminated, may arrive at the medical facility. Contaminated casualties will be sent to a medical decontaminated area where they will be triaged, treated for emergency life-and limb-threatening

conditions (if required), and decontaminated as soon as possible.

(4) The WMDT team members must wear personal protective gear effective against NBC agents. Members on the decontamination team using water must wear tap rubber aprons to keep their protective clothing dry.

b. Set Up Guidance.

(1) The decontamination area is established in the security perimeter of the supported MTF (Fig 2) but far enough away from the MTF so that the MTF remains in the cold zone where there is no liquid contamination and only minimal possibility of a vapor hazard . The MTF should be outside the anticipated vapor area. Both the MTF and the decontamination area should initially be established in a clean area. The decontamination area will become a warm zone once contaminated casualties are received.

(2) The WMDT chief must coordinate with civil engineering to assist in preparing level pads for the decontamination tents and clean water bladders. There should be road access to the water bladders for refill when needed. Grading to prepare a sump for waist water run off from the decontamination tentage and equipment, and a deep pit to serve as a contaminated waste dump for contaminated clothing and other hazardous waste also needs to be coordinated with base civil engineering. The water run off sump, or collection bag, and the contaminated waste dump must be located far away from the MTF tentage and remain in the warm zone. A larger waste dump, located outside the facility perimeter, can also be considered if there is a way to transport the contaminated materials, by vehicle, from the smaller waste dump, inside the warm zone, to the larger outside waste pit on a regular basis during decontamination operations.

(3) The WMDT chief must coordinate with the supported MTF and logistics to insure that there is an adequate water supply (water may be brought in by tanker truck if needed) and power supply (from the MTF) for the operation of the decontamination equipment.

(4) The WMDT chief must coordinate with the supported MTF and civil engineering for proper wastewater disposal before decontamination operations begin.

(5) A triage area is established at the entrance to the decontamination tents where there is no interference with the patient flow into the decontamination tent. This should be an area large enough to hold 10 – 20 litter casualties.

(6) An emergency medical treatment station is set up between the triage area and the decontamination tent. Additional supplies of atropine, 2PAM CL, intubation items to establish airways, CANA (diazepam), IV bags with saline, IV lines, several resuscitation device individual chemical (RIDIC) s, and pressure bandages / tourniquets should be available in this area. Treatment at emergency medical treatment station is limited to the administration of atropine, 2PAM CL, and diazepam auto-injectors, application of pressure dressings, establishing a patient airway, and starting an IV infusion. If immediate clearing of the airway must be done at this point to save a life, then the airway is cleared, and the mask replaced.

(7) Both ambulatory and litter decontamination lines must be established. Tentage for these lines is set up in the anticipated warm zone between the emergency treatment area and the MTF.

(8) A WMDT two section donning / doffing tent is established at the vapor hot line between the MTF and the DECON facility. It should not be directly next to the MTF. This is an area where WMDT personnel perform shift changes and resupply. A tent is necessary to provide protection to the team members and supplies from the elements and pilferage. The WMDT's Ship & Storage Containers (Brooks & Perkins) will be co-located with the donning/doffing tent. This tent could also serve as the staging/treatment area for the post decontamination triage team during patient influx.

(9) An initial entrance point should be established at the perimeter of the warm zone, away from the cold zone, and downwind of the MTF. At this location ambulatory and litter patients are monitored for contamination and referred to the dirty or clean triage areas.

(10) A clean patient triage area (post decontamination triage area) is also established near the MTF, inside the cold zone for those patients who are not contaminated and those who have been decontaminated.

(11) The contaminated waste dump for contaminated clothing / materials and hazardous waste should be established at the downwind side of the warm zone away from the decontamination tents and MTF. See Figure E-9.

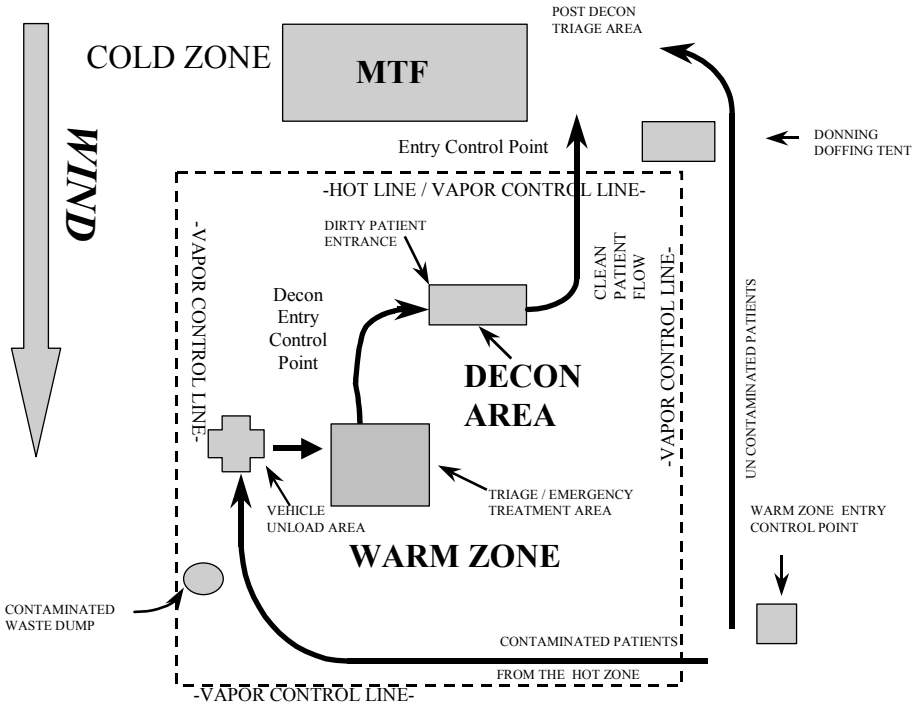

Figure E-9 Generalized Schematic of the Zones of Contamination

E-29. **PROCESSING AND PATIENT FLOW:**

i. All arriving casualties are directed to stop at the MTF entry control point so an NBC team or WMDT member can ascertain if decontamination is needed (by using M-8 paper, M-9 tape, or evaluating circumstantial evidence such as presence of chemical agent in the area from which the patient came). Casualties suspected or confirmed to be contaminated are directed to the vehicle unload area in the warm zone and then to the triage area in the warm zone. Those who have no confirmed contamination are referred to the post decontamination triage area.

ii. Contaminated casualties are initially triaged in the warm zone triage area. Here emergency treatment is provided, as needed, to insure that the patient is stabilized before decontamination is begun. Life-saving medical treatment should be provided prior to decontamination, as described in AFM 44-158, The Air Force Independent Duty Medical Technician Medical and Dental Treatment Protocols; AFJMAN 44-149, Treatment of Chemical Agent Casualties; AFMAN (I) 44-156, Treatment of Biological Warfare Agent Casualties; AFMAN (I) 44-161 Treatment of Nuclear and Radiological Casualties; and FM 8-500 Hazardous Materials Injuries.

iii. Contaminated patients, once stabilized, are sent through decontamination. Priority for decontamination is set by the patient's triage category. Those triaged as immediate have priority, followed by minimal, delayed, and expectant in that order unless otherwise directed by the WMDT chief.

iv. Clean casualties are directed around the DECON facility, and warm zone, to the MTF post decon triage area.

e. Two litter decontamination and ambulatory lines will be set up by the WMDT. Typically these will be set up inside decontamination tents. This process allows a smooth flow of patients. Usually, twelve of the 19 decontamination personnel man the litter line (four at each station). Specific guidelines for decontamination procedures is noted in CONOPS for the WMDT.

f. The patient will retain their protective mask after decontamination. The mask will be decontaminated and filter replaced. Masks are not removed from patients until they have been transferred out of the liquid and vapor hazard areas. **Exception**: The mask can be removed from the patient for emergency airway management or resuscitation by the EMT trained personnel assigned to the Decon team. The RIDIC must be used to prevent exposing the patient to vapor hazards.

g. Personal items removed from the clothing of patients during decontamination operations are collected from contaminated clothing, placed in a plastic bag for each patient. They are decontaminated prior to being placed in the bag, or can be bagged and marked and decontaminated at a later time and then transferred to a clean plastic bag. The bags will be given to the MTF Administrator for safekeeping and disposition. The WMDT Chief will personally ensure the integrity of this operation. The contents of each bag can then be examined for personal information or can be identified by patients.

h. Dog tags are decontaminated and remain with the patient.

E-30. Contamination Control of Equipment, Facilities and Patient Property.

a. **GENERAL:** The WMDT will attempt to decontaminate medical facilities and equipment. When possible, conduct cleaning operations in the patient decontamination facility to minimize spreading of contaminants.

b. **HANDLING AND DISPOSAL OF CONTAMINATED MATERIEL:** WMDT members will conduct all handling and disposal tasks. MOPP 4 will be maintained during all disposal procedures. The MTF Commander, based on WMDT Chief recommendations, will designate a disposal site and its perimeter will be clearly marked. Markings will include the NBC agent(s) present and the date of last use of the site. See CONOPS for WMDT for more detailed guidance.
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c. DECON FACILITY CLEAN UP AND SHUT DOWN: The WMDT staff will clean the decontamination facility if it is necessary for their continued use or for the safety of other medical assets. The Medical Commander will determine when the WMDT and facility will be deactivated (temporarily or permanently). Shut down procedures as outlined in the CONOPS for WMDT will be followed. Disposed/potentially contaminated clothing and equipment items are salvaged only if ordered by the MTF Commander. When so ordered, instructions should be sought from the Civil Engineering Air Base Operability Section.

Appendix E

Casualty Decontamination

SECTION IV US Navy

E-31. General.

This Annex specifies the procedures, equipment, supplies and personnel required for receiving, decontaminating and monitoring limited numbers of patients who have been exposed to chemical or biological warfare agents. This document is divided into two parts, The first section covers decontamination procedures aboard Naval Vessels from NSTM 470 and the second section applies only to procedures for the receipt of contaminated personnel on hospital ships (T-AH). It is assumed that steps of gross liquid decontamination have been applied before casualties are transported to the hospital ship.

E-32. Medical Support.

The operational concept for health service support in a nuclear, biological and chemical environment is described in Appendix C of this manual.

SECTION IV A.
SHIPBOARD PERSONNEL DECONTAMINATION

E-33. DECONTAMINATION OF PERSONNEL

a. GENERAL COMMENTS ON PERSONNEL DECONTAMINATION. The personnel decontamination process is at the heart of contamination control. Strict observance of these procedures minimizes the amount of contamination that reaches the interior of the ship.

b. EMERGENCY PERSONNEL DECONTAMINATION - CHEMICAL. If individuals who are not wearing a complete chemical protective ensemble are exposed to liquid chemical agents, it is necessary to perform emergency personnel decontamination procedures immediately to remove liquid agent from their skin or eyes.

(1) Emergency Skin Decontamination. If the contamination is deposited on the skin during an attack, a mask shall be donned, overhead protection sought and skin decontamination procedures begun at once. If the contamination is the result of a post-attack transfer from a surface contact hazard, the individual shall immediately

cease other activities and begin skin decontamination procedures. M291 skin decontamination kits are available for this purpose.

(2) Emergency Decontamination of the Eyes. Following contamination of the eye with any chemical agent, the agent shall be removed immediately. If an individual suspects contamination in the eyes or on the face, the person shall immediately leave the contaminated area if possible. If it is not possible to leave the area because of the operational situation, the individual shall seek overhead cover if an attack is ongoing.

- Obtain clean, uncontaminated water from a known source. **Never use the M291 kit in the eyes** as it is irritating to the eyes. Since the ship will probably be at general quarters with material condition ZEBRA set, it will probably be necessary to use water from a canteen at the individual's general quarters station.

- Take a deep breath of filtered air and hold it (keeping mouth closed).

- Loosen the cheek straps on the mask, break the seal on the mask but do not remove the mask.

- Place one hand between the mask and face to hold open eyelids and keep the mask away from the face.

Flush or irrigate the eyes immediately with the clean water by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eye so that it will run off the side of the face to avoid spread of the contamination. This irrigation shall be carried out despite the presence of toxic vapors in the atmosphere. The breath should be held as long as possible and the mouth kept closed during this procedure to prevent contamination and absorption through mucous membranes. The risk of leaving unknown toxic agents in the eyes is much greater than from exposure to vapors, so decontamination of the eye shall be performed before resealing the mask.

- **When the breath can no longer be held, remove the hand from behind the mask and with the palm of the hand cover the outlet valve assembly and push the mask against the face to make a seal. Exhale sharply to purge the mask of contamination by forcing it out around the seal. Uncover the outlet valve assembly but maintain the pressure on the mask to keep a seal. Resume breathing, repeat this procedure until the eyes have been flushed**.

- When the eyes have been thoroughly flushed use M291 wipes to decontaminate both the face and that portion of the mask, which has come into contact with the facial contamination. Reseal the mask and seek medical treatment.

c. CHEMICAL DECONTAMINATION PROCEDURES FOR PERSONNEL IN A CONVENTIONAL DECONTAMINATION STATION. The basic functions in the personnel decontamination process, are performed in the following locations in conventional

decontamination stations and contamination control areas (CCA's). Stage 1, gross decontamination, takes place outside the ship because of the danger of spreading liquid contamination into the ship. Stage 2, removal of contaminated outer clothing, shall be done as close to the point of entry from the weather deck as possible. With a conventional decon station, this function is performed in a CCA, which may be collocated with the decon station if it has an entrance from the weather deck and sufficient room. If not, a separate CCA is set up for this purpose. Stage 3, removal of inner clothing, and stage 4, showering, are performed in the conventional decon station. Stage 5, medical review, is performed at the CCA exit except when the CCA and the decon station are collocated. Then, it is performed at the exit from the decon station.

(1) Manning in a Conventional Decontamination Station and CCA. Personnel decon teams shall be assigned to each CCA/decon station. They will consist of four to five personnel (depending on whether a one-cutter or two-cutter process is used) with the following responsibilities:

- Team leader posted outside the entrance, to direct exposed personnel in removal of battle dress equipment, use of the M291 kit to decon mask and gloves, and stepping into the bootwash. The team leader also ensures that personnel enter the CCA in an organized manner.

- One or two cutters posted in the CCA to doff protective clothing from exposed personnel and instruct them in the proper procedures during processing. Relief cutters shall be readily available.

- A Hospital Corpsman or a medically trained person posted at the inboard side of the CCA exit, to diagnose symptoms of agent exposure and heat stress and take appropriate action. Also directs personnel to decon station or casualty collection stations (CCS) and arranges for relief of cutter(s).

- One monitor at decon station to direct personnel through the station and perform periodic checks of the area with the M256 kit. The monitor shall assist in the removal of pullover shirts as described in NSTM/470 paragraph 470-7.5.3.7, step a, if necessary. A second personnel decon team shall be standing by ready to don protective clothing and relieve the first team, if warranted by the number of personnel expected to be processed through the CCA.

(2) Activating a Conventional Decontamination Station or CCA. To prepare for decon, the personnel decon team moves all equipment and supplies from the lockers and storerooms in which it is kept to the CCA. The team dresses in full chemical protective ensemble (the decon station monitor does not have to don chemical protective equipment (CPE) unless the decon station and CCA are collocated). In warm or hot weather, the team shall drink as much water as possible before starting to provide some protection against heat stress. If liquid agent is confirmed or suspected in the CCA (especially if the CCA is located on a weather deck or in a hangar bay), the personnel decon team

will decontaminate the CCA by cleansing with a 9 percent solution of calcium hypochlorite in sea water. The bootwash, mask lens wash, scissors wash and trash cans lined with plastic bags are placed in the locations specified in NSTM/470 paragraph 470-7.2.1.2. Ten pairs of scissors are placed in the CCA scissors wash, two in the decon station for removing tee shirts and flight deck jerseys. The preferred location for the bootwash is outside the CCA, directly in front of the door. Pails with any extra calcium hypochlorite solution are set-aside in the CCA. Scrub the exterior grab handle and lever, handwheel and dogs of the door briskly with 9 percent calcium hypochlorite solution.

(3) Preparing Calcium Hypochlorite Solutions. Calcium hypochlorite solutions are prepared as follows by personnel wearing CBR protective gear:

- Bootwash: Fill 2'x2'x6"tray with approximately 4"of sea water (about 10 gallons). Add 22 - six ounce bottles of calcium hypochlorite, for a 9 percent solution, and stir. Add nine ounces of detergent and stir again. Tray location: outside of the CCA entrance directly in front of the door.

NOTE

Some calcium hypochlorite will settle to the bottom, especially in the 9 percent solution. These solutions remain effective for processing of about 100 personnel, or about six hours of continuous personnel processing. If fewer personnel are processed, the solutions remain effective longer.

- Mask Lens wash. Fill one of the five-gallon pails with about two gallons of **fresh** water. Add approximately three ounces (half of a six ounce bottle) of calcium hypochlorite, to make a 1 percent solution, and stir, add three sponges. Container location: outside CCA entrance.

NOTE

Do not use salt water for mask lens wash as it may scratch the mask lens.

- Scissors wash: Fill a five-gallon pail with about 2 1/2 gallons of sea water. Add five - six ounce bottles of calcium hypochlorite to make a 9 percent solution and stir. Add two ounces of detergent. Transfer a portion of this to the shallow pan, which is provided for ease in recovering scissors. Pan location: inside CCA.

- CCA Cleaning solution. Fill a five-gallon pail with four gallons of water. Add nine - six ounce bottles of calcium hypochlorite to make a 9 percent solution and stir. If calcium hypochlorite is in short supply, add only five - six ounce bottles of calcium hypochlorite to make a 5 percent solution. Add four ounces of detergent. Pail location: inside CCA.

WARNING

In the absence of a reliable way to monitor contamination on personnel or their clothing and protective equipment all personnel on the weather decks

in a chemically contaminated environment shall reenter the ship through a CCA and go through the entire personnel decontamination process. Everyone who has gone outside after a chemical attack is considered contaminated.

WARNING

Chemical Protective Overgarments should never be hosed down or subjected to showering, since they are permeable and contamination can be transferred to the skin. In a chemical environment, external showers, if available, should only be used for contaminated personnel who are not wearing the CPO.

(4) Gross Personnel Decontamination Procedures. The CCA team leader directs personnel to remove all load bearing gear, battle dress items, wet weather gear, flight deck safety equipment and load bearing gear such as the mask carrier and canteen belt and place them in a plastic bag in the trash can outside the CCA. Personnel being decontaminated are divided into pairs to assist each other. Personnel shall perform the buddy system to decontaminate each other's mask and gloves using the M291 skin decon kit as follows:

- Each doffee removes one packet from his M291 kit in the pocket of the smock along with the unused atropine injectors, 2-PAM chloride, injectors and Nerve Agent Pre-treatment Pyridostigmine (NAPP). The doffee opens the packet and decontaminates the outside of the medical self-aid items and places them in the plastic bag in the designated trashcan outside the CCA. Each doffee also decontaminates the fingertips of his gloves in preparation for the next step.

- The doffee removes a second packet from his M291 kit, opens it and decontaminates all exposed areas of his buddy's mask and then his own gloves. If an outsert is attached to the mask, it is **not** to be removed from the mask. **The buddy shall place two fingers on the mask voicemitter during this procedure to prevent breaking the mask seal** .

- The buddy opens a second packet from his M291 kit and decons the first doffee's mask and then his own gloves. Again, the outsert is not to be removed. **The doffee shall place two fingers on the mask voicemitter during this procedure to prevent breaking the mask seal** .

- If the black resin on the mask lens (or outsert, if one is attached) makes vision difficult, a sponge dipped in 1 percent calcium hypochlorite solution from the mask lens wash pail and wrung out to prevent drips may be used on the lens to remove the resin. **Do not let the solution drip from mask as it may contaminate the neck area.**

- If a contaminated surface is touched, personnel shall again use the decon kit.

(5) Proceeding Through the Contamination Control Area for Removal of CPO. After completing gross decontamination, individuals proceed through the CCA when directed.

WARNING

CCA door may be kept open for short periods of time to allow accumulated agent vapors to dissipate to the weather. CCA door shall not be opened while ship is enveloped in primary vapor. When outer door is open, the inboard door shall remain closed.

WARNING

If there is concern about secondary vapor, time that CCA door is open may be minimized by having doffee complete bootwash before opening CCA door. This requires angling position of bootwash so CCA door can be opened without hitting doffee standing in bootwash and doffee can still step directly from bootwash into CCA.

- When door to CCA is open and cutter signals ready, doffee steps into bootwash and gently scrubs his boots with brush for approximately 10 seconds. Doffee then enters CCA without touching door with his gloves, which have already been decontaminated, and stands on Position #1, as shown in NSTM/470/Figure-470-7-1 or NSTM/470/Figure-470-7-2. Cutter closes door and begins doffing procedures.

WARNING

Contact with doffee's protective garment contaminates cutter's gloves. Cutter shall not touch doffee's skin or inner clothes, and should rinse his own gloves in 9 percent HTH, without removing them, whenever possible.

- Cutter releases hook and pile tabs at waist of smock, at wrists, and at bottom of trousers. Cutter instructs doffee to **about face** so that doffee's back is toward cutter. **Cutter instructs doffee to place two fingers on voicemitter to prevent breaking mask seal** . Pulling smock away from doffee, cutter cuts up back of smock to neck area, then completely through either side of hood to face opening. **Cutter shall touch only green outer fabric of smock and not black inner fabric**.

- Cutter instructs doffee to **about face.** Cutter ensures that smock is not snagged on doffee's mask. Cutter then instructs doffee to place two fingers on mask voicemitter while smock is being removed from head and then, when directed, to to extend arms at a 45° angle with deck in front of and away from body, making a fist to prevent removal of gloves. It is useful if the cutter mimics this sequence for the doffee. Cutter then grasps top of hood with hand on opposite side from where hood was cut and top of doffee's shoulder with other hand. Cutter removes smock

from doffee's head, taking care not to snag smock on doffee's mask. Cutter pauses when smock is clear of doffee's head and instructs doffee to extend arms forward as described above. Cutter then pulls smock away from doffee in a smooth motion, turning smock inside out. Cutter pulls smock over gloves, which are not removed, and deposits it in first trash can.

NOTE

When trash can becomes full, cutter lifts plastic bag from can and places it outside CCA when ready for another doffee to enter. Cutter then lines trashcan with another plastic bag. Bags can hold about five overgarments or 10 sets of boots and gloves.

WARNING

Cutter shall take care when removing protective coat so as not to remove doffee's protective gloves at the same time.

- Doffee then moves to Position #2 and stands in front of stool facing cutter (second cutter in a two-cutter CCA).

NOTE

In the two-cutter process, the second cutter takes over subsequent steps. The basic procedures are the same as the one cutter process, except that Cutter #1 cuts and removes smock; Cutter #2 cuts and removes the trousers and boots and outer gloves.

- Cutter pulls one CPO trouser leg away from boot and cuts up front all the way through to the top, **outside of suspender loops** , taking care to keep scissors away from inner clothing. Cutter repeats this procedure on other trouser leg.

- Cutter pulls top of trousers away from doffee's body so suspenders can be cut without touching doffee's shirt. Cutter places scissors in 9 percent calcium hypochlorite solution while continuing to hold front of CPO trousers away from doffee's body with one hand. Then, with other hand, cutter grasps CPO trousers in crotch area and removes them by pulling them down and away. Cutter places trousers in first trash can.

- Cutter directs doffee to sit on bench or stool and to take care not to touch it with his gloves. Cutter cuts laces on both boots. Doffee raises foot closest to raised grating at Position #3. Cutter grasps heel of overboot and pulls overboot off, taking care to avoid touching doffee's work shoes. Overboot may be cut off if necessary. Doffee places this foot into Position #3. Doffee remains seated. Procedure is repeated with other foot. Cutter places boots in second trash can.

- Cutter instructs doffee to loosen but not remove rubber gloves. Cutter pulls off doffee's gloves and drops them in second trashcan, leaving cotton liners on. It is

not a problem if cotton liner is inadvertently removed during this process, in which case it would be placed in trash can with glove.

- Cutter decons his gloves.

- Cutter opens inboard door, doffee exits CCA and cutter closes door behind him. At this point, doffee is wearing only his regular clothing and shoes, glove liners (possibly) and mask.

WARNING

The mask is NOT to be removed until the all clear is passed, as specified in the ship's CBR Bill, meaning that no agent vapor is present in the ship.

- Corpsman or an individual who has received training from medical department examines doffee for signs of agent exposure (pinpoint pupils, feelings of nausea, difficulty breathing, etc.) or heat stress and recommends action. Healthy personnel are sent to decon station. Individuals exhibiting symptoms of exposure to chemical agents or heat stress are treated and sent to casualty collection stations.

NOTE

If the CCA is collocated with the decon station, the medical examination takes place at the exit from the decon station.

- When cutter is ready for next doffee, he opens outer door, doffee enters bootwash and process is repeated.

(6) Proceeding Through the Contamination Control Area for Removal of the ACPG. After completing gross decontamination, individuals proceed through the CCA when directed.

NOTE

CCA door may be kept open for short periods of time to allow accumulated agent vapors to dissipate from CCA to weather.

- When door to CCA is open and cutter signals ready, doffee steps into bootwash and gently scrubs his boots with brush for approximately 10 seconds. Doffee then enters CCA without touching door with his gloves, which have already been decontaminated, and stands on Position #1, as shown in NSTM/470/Figure-470-7-1 or NSTM/470/Figure-470-7-2. Cutter closes door and begins doffing procedures.

WARNING

Contact with doffee's protective garment contaminates cutter's gloves. Cutter shall not touch doffee's skin or inner clothes, and should rinse his own

gloves in 9 percent HTH, without removing them, whenever possible.

- While doffee is facing cutter, cutter releases hook and pile fasteners on legs and sleeves of protective overgarment. He also unsnaps coat retention cord from webbing strip on bottom front of protective coat.

- Cutter instructs doffee to place two fingers on voicemitter on his protective mask. This prevents seal of doffee's protective mask from being broken while cutter loosens barrel lock on hood of doffee's protective overgarment. Cutter releases tension on cord of barrel lock assembly. Cutter then releases hook and pile fastener on front of protective coat and opens slide fastener.

NOTE

When trash can becomes full, cutter lifts plastic bag from can and places it outside CCA when ready for another doffee to enter. Cutter then lines trash can with another plastic bag. Bags can hold about five overgarments or 10 sets of boots and gloves.

WARNING

Cutter shall take care when removing ACPG coat so as not to remove doffee's protective gloves at the same time.

- Cutter instructs doffee to **about face.** Cutter ensures that smock is not snagged on doffee's mask. Cutter instructs doffee to place two fingers on mask voicemitter while hood of ACPG coat is being removed. Cutter then removes hood from doffee's head. Cutter tells doffee to place his arms by his sides and toward his back with his fists clinched. It is useful if the cutter mimics this sequence for the doffee. When doffee has his arms in proper position, cutter grasps shoulder's of doffee's ACPG coat and starts removing coat from doffee by pulling down and away from doffee's body. After ACPG coat is removed, it is placed in a plastic bag in first trash can in CCA.

- Doffee moves to Position #2 and stands in front of stool facing cutter (second cutter in a two-cutter CCA).

NOTE

In the two cutter process, the second cutter takes over subsequent steps. The basic procedures are the same as the one cutter process, except that Cutter #1 cuts and removes smock; Cutter #2 cuts and removes the trousers, boots and outer gloves.

- Cutter rinses his hands in 9 percent HTH solution and instructs doffee to **about face.** Cutter then opens slide fastener and snaps at fly. Cutter again rinses his gloves in 9 percent HTH solution. Cutter pulls top of trousers away from doffee's body so suspenders can be released without touching doffee's shirt. While holding

front of ACPG trousers away from doffee's body with one hand, cutter, with other hand, releases suspender clips. Cutter then grasps trousers at hips and pulls them down to just above doffee's knees. Holding trousers firmly, cutter instructs doffee to sit down carefully on bench or stool. **Doffee may steady himself by touching bulkhead but shall not touch stool with his gloves. Cutter ensures that doffee's trousers do not touch stool.** Cutter instructs doffee to lift one leg, bend knee and point toe downward. Cutter removes trouser leg over protective boot, which remains on doffee's foot. Procedure is then repeated for other leg. Cutter places trousers in first trash can.

- Doffee remains seated on stool while cutter uses scissors to cut laces on protective overboot. Doffee then lifts his foot closest to raised grating at Position #3. Cutter grasps heel of overboot and pulls overboot off, taking care to avoid touching doffee's work shoes. Overboot may be cut off if necessary. Doffee places this foot onto Position #3. Doffee remains seated. Procedure is repeated with other foot. Cutter places boots in second trashcan.

- Cutter instructs doffee to loosen but not remove rubber gloves. Cutter pulls off doffee's gloves and drops them in second trashcan, leaving cotton liners on. It is not a problem if cotton liner is inadvertently removed during this process, in which case it would be placed in trash can with glove.

- Cutter decons his gloves.

- Cutter opens inboard door, doffee exits CCA and cutter closes door behind him. At this point, doffee is wearing only his regular clothing and shoes, glove liners (possibly) and mask.

WARNING

The mask is NOT to be removed until the all clear is passed, as specified in the ship's CBR Bill, meaning that no agent vapor is present in the ship.

- Corpsman or an individual who has received training from medical department examines doffee for signs of agent exposure (pinpoint pupils, feelings of nausea, difficulty breathing, etc.) or heat stress and recommends action. Healthy personnel are sent to decon station. Individuals exhibiting symptoms of exposure to chemical agents or heat stress are treated and sent to casualty collection stations.

NOTE

If the CCA is collocated with the decon station, the medical examination takes place at the exit from the decon station.

- When cutter is ready for next doffee, he opens outer door, doffee enters bootwash and process is repeated.

(7) Proceeding Through the Decon Station. Doffees proceed from the CCA to the decon station by the designated route.

WARNING

The mask canister shall not be exposed to direct water spray or the filter will clog. The doffee shall shield the canister to keep water spray out. The doffee shall not touch the mask with unprotected hands.

- When doffee arrives at decon station, he removes work shoes and all inner clothing except mask and pullover shirts and places it in a plastic bag. He cuts off all pullover shirts (tee shirts, flight deck jerseys, etc.) down front from top to bottom so he can remove them without disturbing mask seal. The doffee removes the cotton gloves last. He enters station and showers with sea water. Shower can last until next person arrives.

- Personnel manning decon station shall ensure orderly traffic flow and that clothing is sealed in plastic bags to be checked later with an M256A1 detector kit. Monitor also looks for delayed signs of personnel exposure to agent.

NOTE

Complete monitoring of individuals for contamination is not feasible or reliable with current detectors. Strict adherence to proper procedures and screening for symptoms of exposure are the best precautions.

- Upon completion of shower, personnel don clean clothing and proceed to assigned areas to await assignments. Ensure clean clothing is staged at decon station exit.

NOTE

The purpose of the clothing at the decon station is simply to allow individuals to return to their lockers to obtain their own. Organizational clothing such as coveralls
is adequate. Disposable clothing may be used if available.

(8) Post-Attack Procedures. When monitoring teams can no longer detect agent vapor throughout the ship, unmasking procedures are executed in accordance with NSTM/470 paragraph 470-4.4.6. When the all clear is given, all personnel doff masks. Personnel who may have been exposed to liquid agent (those who were processed through personnel decon) shall remove the mask by placing a plastic bag over the head and then removing the bag and mask together. These individuals must not touch their masks with their bare hands. Masks are returned to designated collection points in accordance with the ship's CBR bill for final decon and reissue. A designated decon team, in full chemical protective ensemble, shall decon the CCA using the following procedures:

- Dump bootwash calcium hypochlorite solution on deck surrounding bootwash.

- Remove scissors from scissors wash, seal in a plastic bag, and return to designated collection point for final decon and reissue. Dump scissors wash calcium hypochlorite solution on CCA deck.

- Mix sufficient fresh 9 percent calcium hypochlorite solution in sea water to decon the entire CCA.

- Scrub down area with the new solution and rinse with sea water. If CCA does not have a drain, minimize rinse water and push contamination toward center of contaminated area. Mop up contaminated water with cloth or paper and dispose of residue in containers.

- Scrub down area with detergent solution (at ratio of 1 ounce detergent to each gallon of sea water). Rinse thoroughly with sea water.

- Check for residual contamination using M8/M9 paper for liquid and M256A1 for vapor. If problem persists, decon team members shall wash their boots and gloves with detergent solution and rinse them thoroughly, then check again for residual contamination.

NOTE

The M256A1 detector may give false positive readings in the presence of a calcium hypochlorite solution.

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- When decontamination of CCA is complete, a relief cutter wearing a chemical protective ensemble that has not been exposed to liquid agent shall remove outer garments of decon team members in CCA. Last doffee from decon team shall assist cutter to remove his outer garments. Plastic bags of protective clothing are placed outside CCA for decon or disposal.

d. PERSONNEL DECONTAMINATION PROCEDURES ON CPS SHIPS. Decontamination procedures for processing personnel into CPS spaces are very similar to those for conventional decon stations. The major difference is the uses of an air sweep in either a Type I air lock or the Contamination Purge Lock (CPL) in a CPS decon station. This allows removal of the mask without risk to the doffee. There is a continuous sweep of clean air from the Toxic free area (TFA) through the decon station or Type I air lock.

(1) Basic Functions of Personnel Decontamination in a CPS Decon Station. The layout of a CPS decon station is described in NSTM/470 paragraph 470-7.2.1.3. This paragraph describes where the basic functions discussed in NSTM/470 paragraph 470-7.1.5 is performed in a CPS decon station. Stage 1, gross decontamination, takes place outside the ship because of the danger of spreading liquid contamination into the ship. Stage 2, removal of contaminated outer clothing, is completed in the Outer Clothing Undressing Area (OCUA), which is equivalent to the CCA. Stage 3 takes place in the

Inner Clothing Undressing Area (ICUA). Stage 4 is performed in the shower. The CPS decon process has an additional step after the shower. A final air sweep for any remaining vapor is performed in the Contamination Purge Lock (CPL), where the mask is removed. Stage 5, medical review, is at the exit from the station.

(2) Decon Station Manning. The decon station team will consist of four or five members with the following responsibilities:

- Team leader posted outside the entrance, to direct personnel in removal of battle dress equipment, use of the M291kit to decon mask and gloves, and boot decon. Team leader also ensures that personnel enter the decon station in an organized manner.

- One or two cutters (depending on OCUA size) posted in the OCUA to doff protective clothing from exposed personnel and instruct them in the proper procedures during processing. Relief cutter(s) shall be readily available.

- Station assistant posted in the passageway adjacent to the CPL to operate the shower area controls.

- Medically trained person to monitor personnel for symptoms of agent exposure and heat stress and to take appropriate action. A second decon team of four or five relief personnel shall be standing by ready to don protective clothing and relieve the first decon team. This is dependent on the number of personnel expected to be processed through the CCA.

(3) Preparation of CPS Decon Station.

- Prepare calcium hypochlorite solutions in accordance with NSTM/470 paragraph 470-7.2.3.1.1 as described in NSTM/470 paragraph 470-7.5.3.3. Set up equipment and calcium hypochlorite solutions as described in NSTM/470 paragraphs 470-7.5.3.2 and NSTM/470 paragraph 470-7.5.3.3 in locations that correspond to designated locations in a conventional decon station and CCA. The bootwash goes outside entrance to OCUA. The OCUA corresponds to the CCA. The ICUA and shower correspond to the conventional decon station.

- Check drain system to ensure drain traps are full of water and free running, specifically the shower drain (30 second test). **Lack of proper maintenance may result in dirt clogging decontamination station drains.** Check station lighting and emergency lamps.

- Place trashcans for battle dress items outside entrance to OCUA. Place plastic bags for masks in the purge lock. Place large plastic bags for doffed protective clothing in OCUA and 10 pairs of scissors for the cutters' use.

- Ensure ventilation air sweep is flowing. Decon station assistant shall check shower and purge lock timers.

- All doors in the decon station shall be secured prior to opening the decon station entrance door.

(4) Processing Personnel Through CPS Decon Station.

- Proceed with the steps for gross decontamination in NSTM/470 paragraph 470-7.5.3.4 outside the Outer Clothing Undressing Area (OCUA).

WARNING

The notes in NSTM/470 paragraphs 470-7.5.3.5 and 470-7.5.3.6 concerning opening the CCA door for short periods to allow accumulated agent vapors to dissipate do not apply to a CPS decontamination station.

- Proceed with the steps for removal of overgarment, substituting OCUA for CCA, in NSTM/470 paragraph 470-7.5.3.5 (CPO) or paragraph 470-7.5.3.6 (ACPG) as appropriate. Omit step k in these two paragraphs. It is performed later in the process in a CPS decon station.

WARNING

Cutter shall ensure OCUA door to weather is secured before opening door to Inner Clothing Undressing Area (ICUA) to allow doffee enter.

- Doffee enters ICUA. Cutter closes door to OCUA. Doffee removes work shoes and all inner clothing except mask and pullover shirts. Doffee cuts all pullover shirts (tee shirts, flight deck jerseys, etc.) down the front from the top to the bottom so he can remove them without disturbing mask seal. The cotton gloves are removed last. Clothing is placed in plastic bag.

- Doffee enters shower when directed, removes mask bag that has been left from previous doffee and places this bag in ICUA. Doffee ensures that door to ICUA is secured and shields mask canister with hands. Station assistant activates shower.

- Upon shower completion, station assistant indicates when the Contamination Purge Lock (CPL) is empty. Doffee enters CPL, picks up mask bag left by previous doffee and places it in shower compartment. Doffee secures door between shower and CPL.

- At end of the two-minute purge cycle, doffee picks up a plastic bag. He places bag over his head, grasps mask by canister through the bag, and pulls off mask, letting it fall into bag. He secures bag with a tie provided, and leaves it in CPL. Doffee exits CPL and closes door.

- A medically trained person monitors doffees in passageway outside CPL in accordance with step k in either NSTM/470 paragraph 470-7.5.3.5 or 470-7.5.3.6, as appropriate. He looks for delayed signs of personnel exposure to agent, heat stress, or other injury.

WARNING

In the absence of a reliable way to monitor contamination on personnel or their clothing, strict adherence to proper procedures and screening for symptoms of exposure are the best precautions.

- Upon completion of shower, personnel don clean clothing and proceed to assigned areas to await assignments. Ensure clean clothing is staged at decon station exit.

NOTE

The purpose of the clothing at the decon station is simply to allow individuals to return to their lockers to obtain their own. Organizational clothing such as coveralls is adequate. Disposable clothing may be used if available.

NOTE

When too many masks accumulate in the ICUA, they can be transferred to the OCUA.

(5) Post-Attack Procedures for the CPS Decon Station. When the decon station is ordered to secure, a designated decon team of two or three people, in MOPP level 4 gear, shall decontaminate the decon station using the following procedures.

- Place remaining bags of contaminated garments and masks on the weather deck outside the station entrance.

- Dump scissors wash calcium hypochlorite solution on deck of OCUA.

- Mix enough fresh 9 percent calcium hypochlorite solution with detergent and sea water to decontaminate entire station.

- Starting in the CPL and moving to OCUA, scrub down bulkheads, doors, handles, fixtures and decks with the calcium hypochlorite solution. Rinse with seawater.

- Prepare sufficient detergent solution (at the ratio of one ounce of detergent to each gallon of sea water). Scrub down the area with detergent solution. Rinse thoroughly with seawater. *Secure* the door to each compartment as decontamination is completed.

- Check for residual contamination using the M256A1 kit. If contamination is found, repeat the decon procedure.

NOTE

The M256A1 sampler-detector may give false positive readings in the presence of strong calcium hypochlorite vapors.

- When the decontamination of decon station is complete, a relief cutter wearing a chemical protective ensemble that has not been exposed to liquid agent shall remove the outer garments of decon team members in OCUA. Last doffee from decon team shall assist cutter to remove his outer garments. Plastic bags of protective clothing are placed outside CCA for decon or disposal.

- Personnel shall process through the CPL one at a time before removing masks into plastic bags, and then enter TFA. Use of an Air Lock for Purging. In a CBR environment, personnel within an enclosed area of the ship, but outside a TP zone may enter a TP zone through a Type II airlock if liquid or solid agents have not contaminated them. Under these circumstances, the airlock effectively performs the same function as the contamination purge lock of a CPS decon station. **The protective mask shall not be doffed until the purge is complete.**

(6) Back-Up Personnel Decontamination Arrangements After Loss of CPS Decon Station. Access to a TP zone from the weather through the zone's decontamination station may become impossible due to battle damage. If this occurs, the preferred alternative is to enter an adjacent TP zone through its CPS decon station and proceed to the other zone through a Type III air lock. If there is no adjacent TP zone with an accessible CPS decon station, topside personnel may enter the ship through a conventional decon station and its associated gross decon area and CPA, then enter the TP zone through a Type II air lock. If all the decontamination stations of either type are inaccessible, an emergency decon arrangement shall be provided. Preferably, a CCA would be established in an unpressurized compartment with a weather access and a gross decon area outside. A Type II air lock or a Type III air lock with the air sweep activated would then provide access to the TP zone. As a last resort, a CCA can be established outside a Type I air lock, preferably under an overhang, with a gross decon area nearby. The decontamination procedures outlined for non-CPS ships in NSTM/470 paragraph 470-7.5.3 and its subordinate paragraphs provide guidance for this modified decontamination process. In any case, each individual shall complete gross decontamination and cutters shall remove the person's outer clothing before entering any kind of airlock. If necessary, inner clothing may be removed in the airlock. The protective mask can be removed after a complete purge cycle in the air lock. The doffee shall then follow a designated route to the nearest shower. Methods of implementing this procedure vary depending on the ship configuration and the circumstances of the CBR threat. Planning and ingenuity will be required to develop the optimum backup decontamination procedure.

e. PERSONNEL DECONTAMINATION - BIOLOGICAL. Personnel decontamination procedures for biological agent contamination are the same as for chemical agent contamination with a few exceptions.

(1) If there is only a biological threat and not a chemical threat, outer clothing may be some sort of utility clothing instead of a CPE.

(2) Disinfectant soap is used in the shower.

E-34. CHEMICAL DECONTAMINATION OF UTILITY CLOTHING AND INDIVIDUAL PROTECTIVE EQUIPMENT

a. GENERAL COMMENTS ON DECONTAMINATION OF UTILITY CLOTHING AND PERSONNEL PROTECTIVE EQUIPMENT. Some of the equipment that is removed during the personnel decontamination process for chemical agents can be decontaminated and reissued. Areas shall be designated for the storage and decontamination of contaminated equipment. These areas should be well-ventilated and as far aft as possible.

b. WET WEATHER CLOTHING. The procedure for decontaminating wet weather (rubberized) clothing is to wipe off all visible agents, using a cloth moistened with nine percent calcium hypochlorite, prior to removal. After removal, the garments are then dipped in nine percent hypochlorite, rolled up while wet, allowed to stand for ten minutes, rinsed in fresh water, and dried. The initial need for decontamination and the effectiveness of any decontamination can be determined by the following procedure. Place one or more garments in a tightly covered metal container in a warm location for four hours, and then use an M256A1 detector kit to test the air in the container.

c. PROTECTIVE MASK. If the mask has been exposed to blood agents, the canisters shall be discarded in accordance with the guidance in NSTM/470 paragraph 470-5.2.6.2. If the mask has been exposed to persistent chemical or biological agents, the exposed surfaces of the canister shall be thoroughly cleaned of all agent residue with a damp cloth, which has been dipped in a nine percent solution of warm calcium hypochlorite. The canister shall be removed from the mask and a contaminant-free protective cover shall be placed over the canister's outlet port (including the threads on the canister) and the canister should be placed outlet side up to dry. The out-let side of the canister is the side that attaches directly to the mask. For the rest of the mask, two alternative decon procedures are available, described in the following paragraphs. Insert fresh canisters once the mask has been decontaminated and is to be used again. Use decontaminated canisters once the stock of fresh canisters has been depleted. Wearers of decontaminated masks and canisters should notify medical personnel if eye irritation or other symptom of chemical agent toxicity (such as tightness of the chest, nausea, etc.) occurs.

(1) Wet Method. Remove the outsert and dip the outsert and the complete facepiece of the mask, including the head harness, in a warm nine percent calcium hypochlorite solution. Leave them wet or immersed for five minutes, rinse thoroughly in warm fresh water, and then rinse in cool fresh water. Dry completely and test for agent residue with M8 and M9 paper. Any cloudy condition of the facepiece should gradually disappear as water evaporates. Test facepieces for CW agent by placing one or more in a tightly closed metal container and leaving in a warm area (100°F to 140°F) for four hours. The storage area shall be marked with warning signs. Standard

contamination markers, described in NSTM/470 paragraph 470-7.2.3.3, shall be used. After four hours, take the container outside the skin of the ship and sample the air in the container using an M256A1 detector kit. This test shall not be conducted inside the ship.

(2) Air Dry Method. If an alternate method is required due to a shortage of calcium hypochlorite or lack of time to perform the foregoing procedure, masks can be air dried from two days to one week. Outserts shall be removed. Masks shall be supported so as to minimize stretching or distortion and should not be allowed to come in contact with oil or grease. An unoccupied area with exhaust ventilation shall be used for this method and it shall be marked with warning signs. Standard contamination markers, described in NSTM/470 paragraph 470-7.2.3.3, shall be used.

d. CHEMICAL PROTECTIVE GLOVES AND CHEMICAL PROTECTIVE FOOTWEAR COVERS (CPFC's). The chemical protective gloves and Chemical Protective Footwear Covers shall be decontaminated as follows. Wipe off all visible agent from the gloves with the M291 skin decontaminating kit prior to entering the CCA or decon station. Wipe off all visible agent in the bootwash prior to entering the contamination control area or decontamination station. After removal, discard cut laces. Each pair of CPFC's comes with an extra pair of laces to replace those discarded in the decontamination process. Dip the gloves and CPFC's into nine percent calcium hypochlorite solution, roll up wet, and allow to stand for 10 minutes, rinse in fresh water, and dry. The initial need for decontamination and the effectiveness of decontamination can be determined by placing one or more gloves or boots in a tightly covered metal container in a warm location for four hours. Use the M256A1 detector kit to test the air in the container. If the test is positive, repeat the decontamination procedure. If, after the second time CPFC's and gloves are decontaminated, a positive test results, the CPFC's and gloves shall be considered heavily contaminated, sealed in plastic bags and disposed of.

e. SELF AID AND BUDDY AID ITEMS. Atropine injectors, pralidoxime chloride auto injectors (2-PAM chloride) injectors and Nerve Agent Pre-treatment Pyridostigmine (NAPP) shall be washed with soap and water to remove any of the black powder from the M291 kit that remains from gross decon. These items shall be washed before reissue regardless of whether any powder is seen or not.

f. UTILITY CLOTHING. Utility clothing and work uniforms that were protected by CPE or other outer garments can be laundered with bleach and reused.

E-35. CHEMICAL DECONTAMINATION OF PERSONNEL WEARING AIRCREW OR ARMY PROTECTIVE CLOTHING AND EQUIPMENT

a. GENERAL. It may be necessary to process contaminated aircrew, beach master, Construction Battalion (CB), Army or Marine Corps personnel through the decontamination process when they arrive on a ship from a beachhead or battle zone. Some modifications to the shipboard personnel decontamination process may be necessary to accommodate the differences between shipboard protective clothing and equipment and the corresponding

items used by these other organizations. Shipboard decon station personnel need to be aware of the differences.

b. CHEMICAL PROTECTIVE CLOTHING AND EQUIPMENT USED BY NAVY AND MARINE CORPS AIRCREW PERSONNEL. The features that differentiate the protective equipment used by Navy and Marine Corps helo crews include the following.

(1) The MCK-3/P protective mask is designed to be compatible with the standard aircrew helmet.

(2) Blown, filtered air is provided to the mask by a battery powered tactical ventilator on a shoulder strap. The ventilator contains a filter and fan.

(3) The MK-1 chemical protective undercoverall is a one-piece, impregnated garment with a charcoal layer. It is worn under the flight suit. It is not decontaminable.

(4) A disposable plastic cape may be worn over the flight suit for protection from liquid agent.

(5) Chemical protective socks are worn under the standard aircrew flight boot. Disposable plastic overboots may be worn over them.

(6) The chemical protective gloves worn by aircrew personnel are similar to the shipboard item.

c. MODIFICATIONS TO THE SHIPBOARD PROCEDURES FOR DECONTAMINATION OF PERSONNEL, CLOTHING AND PORTABLE EQUIPMENT WHEN PROCESSING NAVY HELICOPTER AIRCREW PERSONNEL. Procedures for decontamination of navy helicopter aircrew personnel are provided in the **Naval Aviation Nuclear, Biological and Chemical (NBC) Defense Resource Manual** (NAVAIR A1-NBCDROPM-000). There are some inconsistencies between the procedures in the NAVAIR manual and the procedures in this manual. They shall be resolved by damage control and air wing or air det personnel before the ship enters a CBR warfare threat area.

(1) The buddy procedures in the aircrew decon process are roughly analogous to the gross decon procedures in NSTM/470 paragraph 470-7.5.3.4 but the aviation life support equipment (ASLE) and individual protective CBR equipment that are removed in this stage are different. A separate plastic bag for the equipment of each aircrewman is required. The decon team leader directs this process and shall be prepared to assist any aircrewman that is not matched with a buddy.

(2) It may be necessary to provide MCU-2/P series masks to aircrew personnel during gross decon. The tactical ventilator that provides blown, filtered air to the MCK-3/P mask is battery powered. The directions in the NAVAIR manual specify that each individual remove the mask and set the mask and ventilator aside prior to entering the

CCA or OCUA. Quick-don gloves are used in this process to prevent the spread of contamination.

(3) To facilitate removal of the undercoverall, scissors are used to make a cut from the waist up the back and through the collar.

(4) Bootlaces are not cut in the aircrew doffing procedure.

(5) Shelves or hooks are called for in CCA's for temporary stowage of aircrew field masks.

d. ARMY CHEMICAL PROTECTIVE CLOTHING AND EQUIPMENT. The Army publication that describes Army protective clothing and equipment is FM 3-4, **NBC PROTECTION.** These items may be worn by Marine Corps, Navy beach master and construction personnel as well. The following items differ from the shipboard counterparts as indicated.

(1) The battledress overgarment (BDO) is a two piece ensemble with slide fastener closures used by ground forces. It is not decontaminable. The newer Saratoga suit is similar.

(2) The Army M-40 series masks are worn by ground forces with a hood that extends downward over the shoulders. The hood is not part of the overgarment.

(3) Green or black vinyl overshoes (GVO/BVO) are used with the BDO or Saratoga suit with combat boots for chemical protection. They are decontaminable.

(4) The Army and Marine Corps have a Contamination Avoidance and Liquid Protection Suit (SCALP) that may be worn over the BDO for up to one hour for protection from gross liquid decontamination. The SCALP is a lightweight, disposable suit consisting of a jacket, trousers and footwear covers.

(5) Army aircrew members may wear the aircrew uniform integrated battlefield (AUIB), a two-piece uniform with hook-and-pile closures. In addition to providing CBR protection, it also provides flame protection, so it replaces both the standard flight suit.

(6) The chemical protective gloves used by these personnel are similar to the shipboard item.

WARNING

Hasty decontamination procedures for contaminated ground force personnel are not adequate to allow them to enter the ship.

e. SHIPBOARD DECONTAMINATION OF GROUND FORCE PERSONNEL. In general, the best approach to decontaminating contaminated ground force personnel is to provide them

support and a suitable location to execute their standard change out procedures. Personnel from these units shall be assigned to process decontaminable items with shipboard facilities.

SECTION IV B.
DECONTAMINATION OF PATIENTS RECEIVED ABOARD A HOSPITAL SHIP

E-36. General Description of the Decontamination Process

a. Contaminated patients are to be processed only through the flight deck DECON station. This station has three pairs of DECON compartments (three parallel lanes) that allow up to three patients to be processed concurrently. A station diagram is shown in Figure E-10.

b. The DECON station acts as a transition area, allowing undergarment removal, skin decontamination and chemical agent monitoring to take place in the controlled environment of the ship without releasing contaminants into the ship's ventilation system.

c. The initial steps of the procedures, removing patients' outer garments, are done in the open air of the flight deck. The remaining steps are performed inside the DECON station. The first compartment of each lane is designated the skin DECON compartment, and the second is designated the monitoring compartment.

d. This section is written for litter-borne patients. If contaminated ambulatory patients are received, the steps of decontamination, clothing removal and monitoring are performed in the same order. The patient is escorted and assisted through the process by a member of the DECON team.

e. The ventilation system of the flight deck DECON station maintains the entry passageway at a negative pressure and provides a flow of clean air from the elevator passageway (03-37-1), through the DECON compartments, and out an exhaust fan in the entry passageway (03-39-4). The vents are sized for proper flow velocity to prevent the release of airborne contaminants to the rest of the ship.

f. The airflow rate of the ventilation system produces one air change every 1.5 minutes in each compartment, so airborne contaminants will be purged rapidly, preventing release of contaminants to the staging area when doors are opened for moving patients.

g. The Chemical Agent Monitor (CAM) is employed in the DECON station to ensure that the patient is free of chemical contaminants when ready to enter the medical treatment facility. A secondary use of the CAM is to monitor DECON team personnel, equipment and the area of the flight deck used for decontamination after the processing is completed.

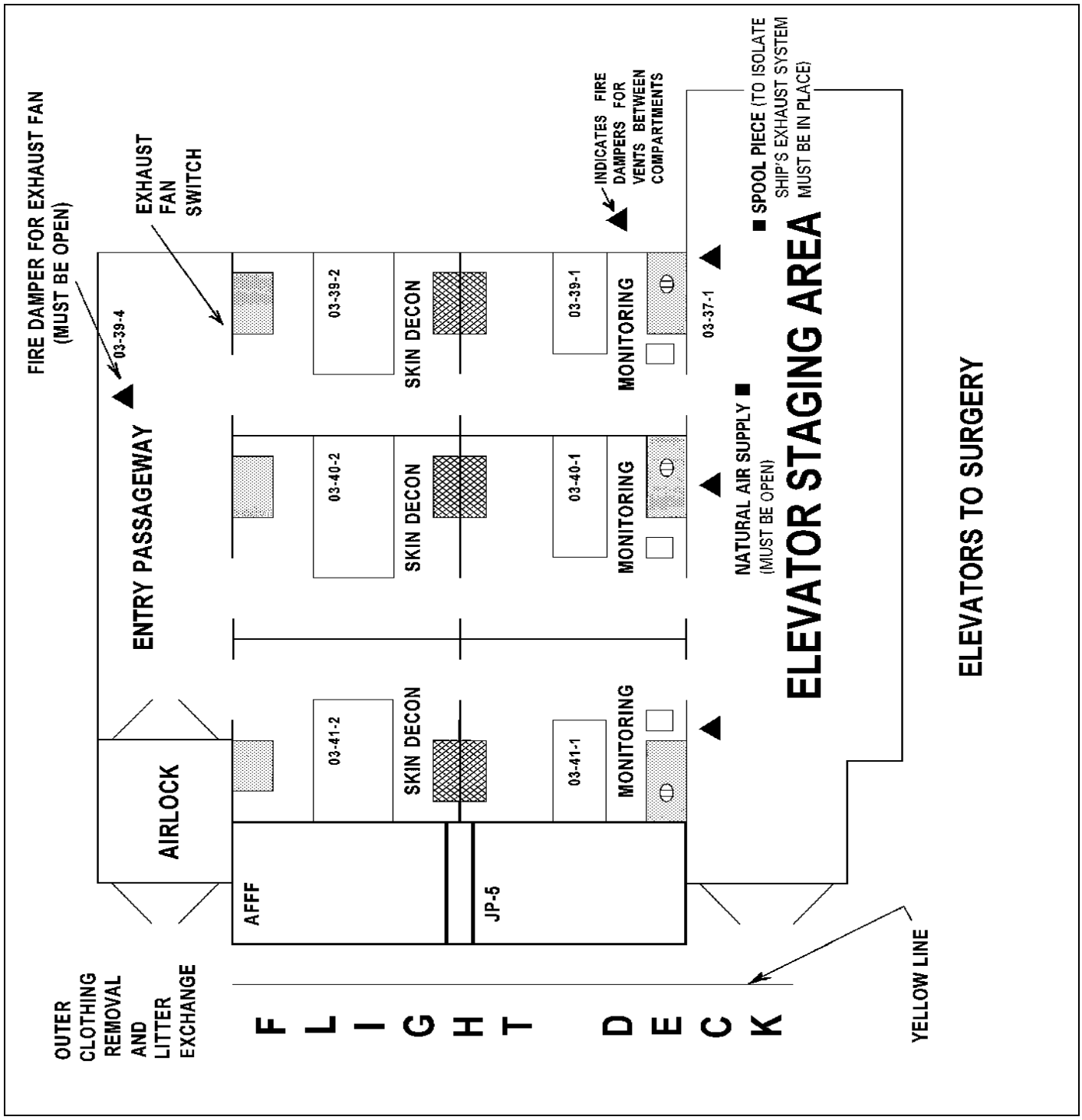

Figure E-10 Diagram of the Flight Deck DECON Station

E-37. Personnel Requirements of the Decontamination Team

a. To process three patients concurrently, that is, to operate all three lanes, the DECON team must have 34 members. Each lane requires 4 individuals on the flight deck, 4 in the first compartment and 2 in the second compartment. A CBR-D Coordinator and Medical Director of DECON oversee the operation, and two masters-at-arms (MAA) are responsible for the safe removal of weapons or ammunition brought onboard with the patients. Thus, the DECON team requires 14 people to receive one patient, 24 people for two patients and 34 for three or more patients arriving at one time, as the following table summarizes:

Location	Required for One Lane	Required for Two Lanes	Required for Three Lanes
Flight deck			
DECON team members	4	8	12
CBR-D Coordinator	1	1	1
Medical Director of DECON	1	1	1
Masters at Arms	2	2	2
Skin DECON Compartments			
Team members	4	8	12
Monitoring Compartments			
Team members	2	4	6
Total	14	24	34

b. One team member in each compartment or location is designated the team leader. At least one team member in each skin DECON compartment will be a nurse.

c. The Medical Director of DECON is an internal medicine specialist with a background in CBR-related medicine (i.e., infectious disease). He/she conducts triage and directs medical care for all contaminated patients throughout the decontamination process. He/she is responsible for the overall functions of the DECON team and the success of the patient decontamination process onboard the hospital ship. The individual filling this billet must receive appropriate specialized training in the medical management of CBR patients.

d. The CBR-D Coordinator is responsible for coordinating the functions of the DECON team, for training the team and for managing Authorized Medical Allowance List (AMAL) #8120 (Patient Decontamination). The CBR-D Coordinator may also direct the patient medical care at the discretion of the Medical Director of DECON.

E-38. Important Precautions.

a. **CAM Maintenance**. The CAMs employed in the DECON station must be operated 6 to 8 hours every 2 weeks to maintain acceptable performance. This regular operation should be achieved using the alternating current power supply with D-Cell adapter. Alkaline D-Cell batteries (four per CAM) should be checked/replaced at regular intervals.

b. **Exhaust Fan.** The exhaust fan overhead in passageway 03-39-4 (described further below) must be operating for DECON operations and for using the DECON station for screening/holding patients who may have infectious diseases. The airflow induced by this fan is critical to contamination containment. This fan is not used during other operations.

c. **Litters.** Only Decontaminable Litters (NSN 6530-01-380-7309), which have a mesh material that can be readily decontaminated, are to be used for transporting the patient into the DECON station. The patient must be transferred to the Decontaminable Litter on the flight deck once the outer clothing has been cut off.

d. **Decontaminant**. Chlorine solution (bleach) mixed with detergent is used for decontamination throughout the process. Immediately before the DECON operation begins, the DECON team must place 5% bleach (the strength of normal household bleach) in pails and prepare 0.5% bleach in other pails by diluting it with 10 parts water to 1 part bleach. The weaker solution is used for decontaminating skin, and the stronger solution for decontaminating equipment items. General-purpose detergent (NSN 7930-00-282-9699) is added to both solutions of bleach (0.5% by weight).

e. **Control of Doors**. At no time should two doors of the same compartment be open simultaneously, nor should the forward and aft doors of the airlock in the entry passageway be open simultaneously when processing contaminated patients. Failing to observe this precaution will result in an interruption of the airflow and possible release of contaminants. Doors leading into the elevator passageway are controlled by the DECON team in the compartments adjacent to the passageway and will be opened only when the CAM indicates it is safe to do so.

f. **Dwell Time in Compartments**. The compartments are designed for a residence time of 10 minutes; that is, the time between closing the first door and opening the second door of each compartment should be 10 minutes when contaminated patients are being processed.

g. **Communication**. Doors should be opened only for movement of patients. Communication among the compartments should be made with radios, an intercom system or by writing notes (e.g., with grease pencil on writing board) visible through the windows between compartments.

h. **Heat Stress**. DECON team members must recognize the potential for heat injury when wearing their protective clothing for extended periods. Compartments may become warm during DECON operations, and the team leader must ensure that members drink liquids before, during and after the operations. Canteens with drink tubes should be placed in the compartments to allow team members to drink through the mask during the operations.

i. **Ship's Course**. To receive contaminated patients, the ship will steer into the wind, as normally occurs during helicopter operations. This is necessary because the main air intakes of the ship's ventilation system are not filtered and are forward of areas where decontamination will occur.

j. **Oxygen Generation Station**. Compressors in the oxygen generation station, located immediately aft of the flight deck, must be turned off during the DECON operation and remain

off for a period of 1/2 hour after the DECON operations end.

E-39. Preparations.

a. **Preparing the Ship for Receiving Contaminated Patients**

(1) Immediately upon notification that contaminated patients are to be received, the CBR-D Coordinator will activate the ventilation system of the DECON station and ensure that general ship preparations are being made for receipt of contaminated patients (windward direction, securing the oxygen generation station).

(2) The ventilation system of the DECON station is activated by turning on the switch near the forward end of passageway 03-39-4. The exhaust fan is located overhead in this passageway, and the fire damper for the fan must be in the open position for air to be drawn through the DECON station. This should be checked visually by examining the fan. Excessive noise of the fan is an indication that the fire damper is in the wrong (closed) position. Other preparations of the DECON facility are as follows:

- In the elevator passageway (03-37-1), check to ensure the spool piece is removed and blanks are mounted in the exhaust system overhead. The ceiling panels normally conceal this duct.

- In the elevator passageway, close the fire damper in the exhaust system E03-37-5. Open fire damper and the watertight closure for the natural supply duct.

- In the compartments, ensure that the dampers (three total) located in the vents between each set of compartments are open. These are located in the centerline bulkhead of the DECON station, about 5 ft above the floor. The damper handles are located in the elevator passageway on the portside bulkhead.

- Check that supplies and equipment specified below, are available in each compartment.

- Check that floor drains in the DECON compartments are open/unclogged.

- Close all doors of the DECON station.

b. **Preparing Supplies and Equipment**

(1) **CAMs**. Turn on the Chemical Agent Monitors (CAMs) in each of the three monitoring compartments. These will be operated on alternating current and will have four batteries in each of the D-cell adapters to which the AC power is connected. Once the CAMs are warmed up, perform confidence checks on each CAM per the technical manual.

(2) **Decontaminant**. Prepare pails of decontaminant (chlorine solution with detergent) in two strengths: 5% and 0.5%. The 5% bleach is full-strength household bleach. The 0.5% bleach is prepared by diluting this with 10 parts water to 1 part bleach. General purpose detergent (NSN 7930-00-282-9699) is added to both solutions of bleach (0.5% by weight). The pails will be marked with tape to differentiate between the two solutions and will be allocated as follows:

(3) **Flight Deck**: Two pails per station--one 5% and one 0.5% (maximum 6 pails).

(4) **Skin DECON compartment**: Two pails per compartment--one 5% and one 0.5%.

(5) **Monitoring compartment**: One pail per compartment--0.5% solution

(6) **Supplies for Flight Deck**: Position the equipment listed in Section 6 below inside the entry passageway. It will not be taken onto the flight deck until the Flight Deck Director so directs. Two types of cutting instruments will be used: the V-Blade Safety Rescue Knife (5110-00-524-6924) will be used for rapidly cutting most areas of the garments. The blades of these knives will be checked for sharpness before the operation and will be replaced as necessary. The bandage scissors will be used to cut shoelaces, hoods and other areas not appropriate for the V-blade knife. The team leader will ensure that these supplies and those listed for each compartment are in place.

(7) **Wet the Flight Deck.** To minimize the possibility of agent absorption into the surface of the flight deck, pre-wet the flight deck (from the entrance of the DECON station to 15 feet aft of the yellow line) with the fire hose 5 to 10 minutes before the contaminated patients arrive by helicopter.

c. **Preparing the DECON Team and Flight Deck Personnel**

(1) Overgarments and protective masks of the DECON team will be stored in a readily accessible area and will be marked with the name of each team member for rapid access.

(2) The flight deck personnel will wear the protective mask and protective gloves when supporting the landing and takeoff of the helicopter and when transporting the patient to the deck area forward of the yellow line.

(3) DECON team members will dress in the protective ensemble (MOPP4 except for the monitoring compartment) listed for each station below. They will await the arrival of the helicopter in the DECON station. Those who are to perform procedures on the flight deck will wait in the entry passageway. Mask carriers will not be worn but will be left inside the DECON station. All personnel will wear voice amplifiers on their protective masks. They will check that each amplifier has a working battery installed before operations begin.

(4) The CBR-D Coordinator or his/her designee will check each team member to ensure that the mask and protective clothing are donned and fitted properly.

(5) The Medical Director of DECON and the CBR-D Coordinator each will wear a white band with red cross on the left arm. Each team member will wear a strip of tape on the front of the uniform with his/her name marked on it.

(6) All other ship's personnel will remain inside enclosed areas of the ship during and for 1/2 hour after the end of decontamination operations.

E-40. Procedures to be performed on the Flight Deck.

a. **Objective**: Remove outer garments and place patient on a clean litter.
Setup: Up to three stations for concurrent processing of patients.
Staffing: Per station: 4 persons (at least one nurse per station)
Protective level: MOPP4 with decontamination apron (voice amplifier on mask).

Equipment and Supplies	Per lane	For three lanes
Trash can with trash bag inserted, (extra bags placed beneath first bag)	1	3
Pail of decontaminant, 5% chlorine solution	1	3
Pail of decontaminant, 0.5% chlorine solution	1	3
Bandage scissors	4	12
V-blade rescue knife	2	6
Zip-lock bags for field medical card	2	6
Sponges	2	6
DECON apron	4	12
Canteens of water (in passageway)	4	12
One Decontaminable Litter for exchange	1	3
3x5 card and pen (to mark personal effects)	3	9
Zip-lock plastic bag for field medical card and for personal effects found in outer garments	6	18
Fire hose, 1.5-in diam., multipurpose nozzle		1

(1) Equipment should be staged in the entry passageway. When the helicopter landing operation is complete, and the patients have been checked for ordnance, take the equipment onto the flight deck and position the pails of DECON solution containing scissors and cutters at the yellow line near the entrance to the DECON station. (Up to three stations are set up, one station for each patient requiring decontamination, so that three can be processed concurrently.)

(2) The flight deck personnel carry the patient from the helicopter across the yellow line and secure the litter on the deck. They return a folded clean litter (obtained from the ramp area) to the helicopter immediately, leaving the contaminated litter to be decontaminated and retained on the ship.

(3) The MAA removes all battle dress items, ordnance and weapons. The patients'

weapons must be checked with the CAM before being placed into the weapons storage area (done after patients have been processed). Weapons should be secured outside the skin of the ship or within the entry passageway of the DECON station until they can be monitored to determine that they are free of chemical contamination.

(4) The Medical Officer performs triage once ordnance is cleared. All procedures on the flight deck will be done with litters resting on the deck. Litter stands will *not* be used.

(5) The following procedures are based upon the assumption that patients will arrive wearing protective mask, overgarment, gloves and overboots.

(6) *If the patient does not have a complete protective ensemble*, the processing will be performed in the same order specified: removal of outer layer of clothing followed by inner layer of clothing. *If the patient has no protective mask*, he will be positioned with the head toward the bow of the ship, into the wind, while his clothing is removed on the flight deck.

b. **Removing and securing personal articles from the overgarment pockets**

- Remove the patient's personal articles from pockets. Destroy all non-decontaminable items. Decontaminate the other items in 5% chlorine solution and place them in plastic bags. Label the bags with the patient's name and social security number (information will be written on a 3x5 card or piece of paper and then the card will be placed into the plastic bag). Seal the bags then wipe with 5% chlorine solution.

c. **Decontaminating and cutting off the patient's hood**

- Hoods are of two general types: Those that attach to the mask and those that attach to the overgarment.

(1) **For hoods attached to the mask**

- Cover mask air inlet briefly with your hand as you decontaminate around it so that decontaminating solution will not get into the mask filter.

- Dip the sponge in 5% chlorine solution, partially wring it out, and wipe off the front, sides, and top of the hood with the sponge. Dip scissors in 5% chlorine solution.

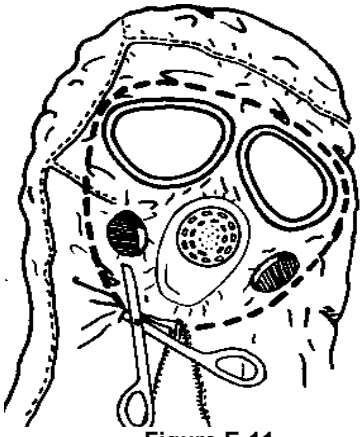

Figure E-11
Cutting pattern for hood attached to mask

NOTE: Dip and scrub the scissors in the DECON solution frequently as you cut.

- Cut the neck cord, zipper cord, hood straps and draw string. Open the hood zipper.

- As shown in Figure E-11, begin cutting at the zipper and proceed upward, close to the filter inlet covers and eye lens outserts. Cut upward to the top of the eye lens outserts and across the forehead to the outer edge of the next eye outsert. Cut downward toward the shoulder,

staying close to the eye lens outserts and filter inlet covers, and cut across the lower part of the voicemitter to the zipper.

- Cut from the center of the forehead, over the top of the head to the bottom of the head so that the hood will lay flat on the litter. Fold the left and right sides of the hood to the sides of the patient's head, laying the sides of the hood on the litter.

(2) **For hoods attached to the overgarment**

When decontaminating a patient wearing an overgarment with integral hood (such as the U. S. Navy garment), the hood is removed by cutting it from the top center toward the rear (or unzipping it) so that the hood material will lie flat on the litter. No decontamination of the hood is necessary.

(3) Decontaminating the patient's mask and exposed skin around the mask

(4) Decontaminate the exterior of the mask: Cover the mask inlets with your hand. Wipe off the front, sides and top of the mask with a cellulose sponge soaked with 5% chlorine solution. Uncover the air inlets.

Decontaminate exposed skin: Using the 0.5% chlorine solution, wipe down all exposed skin areas, to include the neck, hair, back of the head and the back of the ears.

(5) **Placing the Field Medical Card (FMC) in a plastic bag**

Cut the FMC tie-wire, allowing the FMC to fall into the plastic bag. Seal the plastic bag and rinse it with the 0.5% chlorine solution. Secure the plastic bag to the patient by placing it under the protective mask head harness.

(6) **Removing patient's overgarment jacket**

Using the V-blade cutter, cut the sleeves from the cuff to the shoulder of the jacket and then through the collar, as shown in Figure E-12. Keep the cuts close to the inside of the arms so that most of the sleeve material can be folded outward.

NOTE: Dip and scrub the cutter in 5% chlorine solution before and after each continuous cut. *Do <u>not</u> apply decontaminant to the overgarment.*

Unzip the jacket (or cut alongside the zipper). Roll the chest sections to the respective sides with the inner black liner facing outward (toward patient). Carefully tuck the cut jacket between the arm and chest. Roll cut sleeves away from the arms, exposing the black liner.

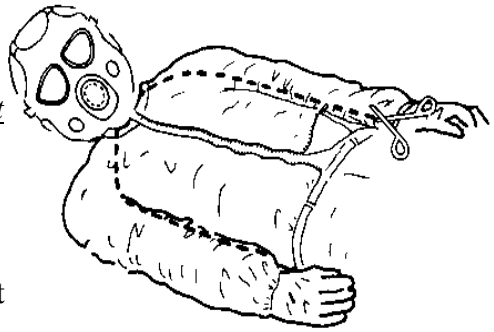

Figure E-12
Cut pattern for jacket

NOTE: Medical items will usually be removed in the skin DECON compartment, rather than at this stage. *Upon direction of the Medical Director of DECON, bandages, splints and tourniquets may be cut while removing the overgarment or be cut around depending upon on the wounds.* The team leader will assess the type and extent of injuries and the need to replace bandages and tourniquets. If they are to be replaced:

a. For tourniquets, place a new tourniquet 2 to 1 inch proximal to the old one. Remove old tourniquet. DECON the skin around the wound with 0.5% solution.

b. For bandages, cut off old bandage. DECON the skin with 0.5% solution. Replace bandage if necessary to control bleeding.

c. For splints and backboards, remove and maintain body position, except in the case of wire splints, which may be left in place and decontaminated, as determined by the team leader or medical officer.

d. For IVs, removal of IV bags and tubing is at the discretion of the Medical Director of DECON. Removal may be necessary for complete removal of the overgarment if the patient can be disconnected temporarily without being placed at greater risk.

NOTE: Old tourniquets, bandages and splints are bagged with contaminated clothing.

(7) **Removing the overgarment trousers**

- Using the V-blade cutter, cut the trouser legs from the ankle to the waist, as shown in Figure E-13.

- Keep the cuts near the inside of each leg, along the inseam, to the crotch. Avoid cutting through pockets.

- Cut up the right leg and across the crotch of the trousers.

- Cut up the left leg, cross over the crotch cut, and continue to cut up through the waistband.

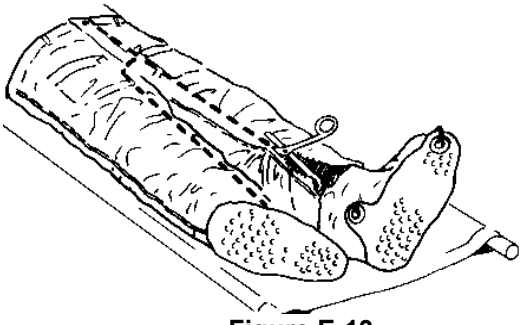

Figure E-13
Pattern for cutting the trousers

NOTE: Dip and scrub the scissors in the 5% chlorine solution before doing each cut to avoid contaminating the inner garment or the patient's skin.

- Fold the cut trouser halves onto the litter with the contaminated sides away from the patient. Make sure the outer side of the protective overgarment does not touch the skin or undergarments of the patient.

- Roll the inner leg portion under and between the legs.

(8) **Removing the patient's rubber gloves**

Decontaminate your own gloves in 5% chlorine solution and kneel with one person on either side of the litter.

Lift the patient's arm up and out of the cutaway sleeve making sure that the outer side of the protective suit does not touch the patient's skin. (Lifting the arm may be contraindicated due to injury.)

Pull the rubber gloves off by rolling the cuff over the fingers, turning the gloves inside out. Alternately, grasp the glove at the fingertips and pull straight off. Do not yet remove the white glove liners, which are to be removed in the first compartment; however if the gloves fall off inadvertently, leave them off.

Lower the patient's arms and fold them across the chest. **NOTE**: Do not allow the arms to come into contact with the exterior of the overgarment.

Decontaminate your rubber gloves in the 5% chlorine solution.

(9) **Removing the patient's protective overboots**

Kneel at the foot of the litter facing the patient and remove the overboot fasteners and first try to remove the overboot without cutting. If this is not possible, cut the front of the overboot from the top of the boot to the top of the foot.

Grasp the heel of the overboot with one hand and the toe of the boot with the other hand. Pull the heel downward and then toward you until the overboot is removed.

Using the 5% chlorine solution, wipe down the end of the litter before lowering the patient's leg. Remove the second overboot. **NOTE**: If possible, remove both overboots simultaneously to decrease the chance of contaminating the exposed combat boot. Decontaminate your own gloves using the 5% chlorine solution.

(10) **Transferring the patient onto a decontaminable litter**

This transfer is performed with three persons kneeling on one side of the litter, placing their arms beneath the patient and rolling him toward them to lift him off the litter. A fourth person kneels opposite to remove the original litter, with all the cut overgarment material, and to place a clean decontaminable litter beneath the patient.

The first step is to DECON the lifters' aprons and gloves in 5% chlorine solution.

One lifter slides his arms under the patient's head/neck and shoulders, one under the back and buttocks, one under the thighs and calves. Care should be taken not to lift the cut overgarment material with the patient. On the command of lifter No. 1, lift the patient. ("Prepare to lift, lift.")

Once the patient has been lifted from the litter, all three lifters straighten up and roll the patient inward against their chests. **CAUTION:** Proper lifting procedures must be observed to prevent back injury.

While the patient is being held, the fourth person quickly removes the contaminated litter and replaces it with a clean litter. The patient is then lowered to the clean litter.

After the transfer is completed, the dirty litter is rinsed with 5% chlorine solution and placed aside to air dry. Decontaminate your gloves with the 5% chlorine solution.

(11) Transporting the patient to the first compartment of the DECON station

DECON team members on the flight deck gather contaminated equipment, clothing and other items, placing them in a plastic bag for removal. They decontaminate their rubber gloves in preparation for the next patient.

Once all patients have been taken into the passageway, all equipment and DECON supplies are placed inside the first set of doors of passageway 03-39-4. Handles of the doors leading into the DECON station are also decontaminated. Outer garments from the patients are gathered up, along with discarded bandages and are placed in plastic bags. These bags are secured temporarily in the passageway so that helicopter operations can resume. Cutting teams decontaminate their own gloves, aprons, hoods and masks.

E-41. Procedures to be performed in First Compartment

a. **Objective:** Remove inner garments to the skin and decontaminate the skin.
Staffing: 4 (at least one nurse per compartment)
Protective level: MOPP4 with decontamination apron (voice amplifier on mask)

Equipment and Supplies	Per compartment	For three lanes
Trash can with trash bag inserted, extra bags	1	3
Pail of decontaminant, 0.5%	1	3
Pail of decontaminant, 5%	1	3
Containers of bleach	2	6
Measuring cup for dilution of bleach	1	3
Bandage scissors	2	6
V-blade rescue knife	2	6
Zip-lock bags for field medical card	2	6
Sponges	2	6
DECON apron	4	12
Zip-lock plastic bags (for personal effects)	One per patient	
Canteens of water (in compartment)	4	12
Sharps container	1	3
Pad of paper and ball point pen	1	3
Clock or timer for 10-minute dwell time	1	3
Felt marker/grease pencil with writing board (for		

communicating through window)	1	3
Supplies to replace bandages, tourniquets, splints if necessary		

b. **Preparations**

(1) All cutters have decontaminated their gloves, scissors, and work stands with DECON solution. All clothing from previous patient has been bagged for return to the entry passageway.

(2) Flight deck team leader passes patient's treatment status and injuries to leader of team in first compartment.

(3) Patient remains on the decontaminable litter as he is placed on the stainless steel table in the first compartment. Doors to the compartment are closed, and the following procedures are performed.

c. **Removing the boots or shoes**

(1) Cut the bootlaces along the tongue of the boot. If necessary, cut the tongue from the top of the boot to the top of the foot.

(2) Grasp the boot heel with one hand and the boot toe with the other hand. Pull the heel downward and towards you until the boot is removed.

(3) Use 5% chlorine solution to wipe down the end of the litter.

(4) Lower the patient's leg, and remove the other combat boot.

(5) Place all clothing into a disposal container and decontaminate your gloves using the 5% chlorine solution.

d. **Removing inner garments by cutting**

(1) Cut off all remaining clothing. Remove the socks either by cutting or by rolling them down over the foot, turning them inside out. Log roll the patient to one side to remove the pieces of clothing once the clothing has been cut.

(2) Apply bandages, splints and tourniquets either before or during the inner garment cutting process depending on their location, nature of injury and the team leader's judgment.

e. **Removing and securing personal effects from pockets**

- Remove the patient's personal articles from the pockets and place them in plastic bag(s). Label the bags with the patient's name and social security number (SSN) (information will be written on a 3x5 card and will be placed into the bag). Seal the bags and wipe with 5% chlorine

solution.

f. **Decontaminating the patient's identification tags**

- The identification (ID) tags should be decontaminated in place with 0.5% chlorine solution and will not have to be removed. If the ID tags have plastic covers, cut away the covers with bandage scissors by slipping the flat edge of the scissors between the plastic cover and the ID tag and cut.

g. **Cleaning the wounds**

- Clean wounds with sterile saline, betadine solution or soap and sterile water.

h. **Decontaminating the skin, hair and litter**

- Sponge 0.5% chlorine solution over the patient's body, including his hair, as the hair readily absorbs agent if it is exposed to agent vapor. Exercise care not to get decontaminant in the patient's eyes. Log roll the patient to one side to apply the decontaminant to his back. Apply the decontaminant thoroughly to the litter while the patient is rolled to the side. Rinse the patient and litter completely with the spray device.

i. **Transferring the patient to next compartment**

(1) DECON team members check to see that the next compartment is ready (outer door closed and compartment not occupied by another patient) before opening door and taking the patient into next compartment for monitoring. **CAUTION**: A period of 10 minutes is required for a complete purge of airborne contaminants in the compartment; that is, the door into the monitoring compartment cannot be opened until 10 minutes after the door into the skin DECON compartment was last opened.

(2) Discarded clothing is bagged. It is passed back to the passageway only after the patient has been taken to the next compartment and the door has been closed. Wash off the table with 5% chlorine solution before the next patient enters.

E-42. Procedures to be performed in Second (Monitoring) Compartment

a. **Objective:** Monitor with CAM and remove mask.
Staffing: 2
Protective Level: Mask only (voice amplifier on mask), with gloves (7-mil thickness) and apron.

Equipment and Supplies	Per compartment	For three lanes
CAMs with D-Cell Adapter and alternating current power supply	2	6
Spare D-Cell batteries	8	24
AN-PDR 27 Low Survey Meter, Radiac	1	3

Small trash bag (to contain mask)	one per patient	
Pail of 0.5% decontaminant with sponge	1	3
Containers of bleach solution with measuring cup for dilution	2	6
Canteens with drinking water	2	6

Equipment and Supplies	**Per compartment**	**For three lanes**
Cloth sheets	one per patient	
Clock or timer for 10-minute dwell time	1	3
Felt marker or grease pencil w/ writing board (communication through window)	1	3
Supply of IVs		

b. **Preparations**

(1) Monitoring for chemical contamination will be performed with the CAM, and for radiological contamination, the AN-PDR 27 Radiac, which is currently available on the ship (4 each per ship). There is no real-time monitoring capability for biological agents.

(2) For chemical monitoring, the CAM should be turned on as soon as the team is alerted that a chemically contaminated patient is to be received. Pressing the on/off switch on its left side and waiting for the display to clear in the H mode turns it on. It should be warmed up, preferably for 30 minutes, using its AC adapter. It must be warmed up and cleared before it can be used effectively for monitoring. Information on using the CAM is found in Technical Manual SW073-AD-MMO-010/43092, *Shipboard Chemical Agent Monitor (CAM) System.*

(3) The CAM must be turned on or off in the H mode only. If it is not in the H mode when you turn it on, turn it off momentarily, change modes and turn it back on. The CAM's computer must be in the H mode to perform its automatic initialization routine.

(4) Perform confidence checks on both modes. Also perform confidence checks *after* monitoring each patient.

- Apply the confidence tester to the CAM inlet for *only 1 second*, then pull it away. Longer than this will require much longer for the CAM display to clear.

- If the CAM is working properly, the confidence check should cause a response of at least 3 bars, preferably 5 bars. If not, try the confidence test again. If a minimum of 3-bar response is not obtained, the CAM should be replaced (or be run for an extended period to improve its response).

(5) Before the patient arrives, unplug the CAM so that it operates on battery power and the length of the alternating current power cord does not restrict its movement. Unplugging causes a momentary interruption in power and requires about 1 minute to initialize the CAM

again. The CAM can be operated in the battery power mode either with the D-Cell adapter (which allows for alternating current operations) or with the special lithium battery (NSN 6135-01-362-1368). Monitoring should be initiated with fresh batteries to prevent interruptions.

c. **Monitoring the patient and his personal articles**

(1) Monitor with the CAM in each mode. If two CAMs are available, set one on the H mode and one on the G mode and monitor with both concurrently. Or if there is certainty of the type of agent the patient was exposed to (based upon M8 detector paper readings, for example, prior to patients' arrival onboard the ship), monitor with both CAMs on the same mode. Monitor the:

- Person
- Litter, particularly the handles
- Bag of personal effects
- Field medical card
- Identification tags
- IV bag and tubing

(2) Keep the CAM inlet about 1/2 inch from the skin as you monitor. The greater the distance, the less likely it is to respond to the contamination.

(3) Move the CAM slowly over the surface, about 1 foot every 2 seconds, and follow a pattern that ensures you monitor the person thoroughly.

(4) As soon as any bar readings appear, pull CAM away and/or put on cap.

(5) Check first the areas that would most likely be contaminated: near wounds where the garment was broken, at the neck, ankles and waist. Also monitor the areas that might adsorb agent vapor, such as the hair.

(6) If you find contamination, stop monitoring and note the general location. Use the decontaminant to spot DECON where the CAM indicates there is contamination.

(7) Replace the black cap on the CAM nozzle between patients, even though the display may be showing no bars.

(8) Before switching channels (or turning off the CAM), *always clear it* by putting on the inlet cover and waiting for a zero bar reading. Note: It is acceptable to switch from G to H with one bar showing, but to switch from H to G, the display must first show no bars.

(9) If the letters "BL" appear on the display, it means the battery is low; replace the D-cell batteries if this occurs. Three dots means it is momentarily confused by what it is sensing.

d. **Removing the mask**

(1) Once monitoring is complete and there is no contamination present, remove the patient's mask. Place the mask in a small trash bag and close it by knotting the neck. This mask does not proceed into the medical treatment facility with the patient.

(2) After removing mask, clean the face. Pass the bagged mask back to the first compartment when the door is opened for the next patient to enter.

e. **Transporting the patient from the DECON station**

- Cover the patient with a clean sheet and transport him to the clean staging area in the elevator passageway 03-37-1. **CAUTION**: A period of 10 minutes is required for a complete purge of airborne contaminants in the compartment; that is, the door into the clean staging area cannot be opened until 10 minutes after the door from the skin DECON compartment was last opened.

E-43. Procedures for decontaminating the Facility and the Decontamination Team

a. Once all patients have been processed through the DECON station, the CBR-D Coordinator will direct the team members in decontaminating themselves, the DECON station and the flight deck.

b. Team members from the flight deck will begin decontaminating first, as their portion of the process ends first. They will apply 5% chlorine solution to areas of the flight deck upon which litters were placed during the processing. They will place all discarded material in bags, seal them by double knotting the necks of the bags and make sure all debris is removed from the flight deck. They will decontaminate scissors, V-blade rescue knives and aprons and place these reusable items in the entry passageway.

c. They will then decontaminate their gloves and overboots and proceed into the entry passageway to remove overgarments. The team members will remove their overgarments in the passageway as follows:

d. Using the buddy method, each will cut the back of the overgarment smock with a V-blade knife by cutting upward from the waist through the hood. They will turn the arms inside out as the smock is removed, roll the cut smock inside out and place it in a plastic trash bag.

e. Each will then remove the overgarment trousers by cutting each leg from the back, starting at the ankle and proceeding through the waist. The cut trousers will also be sealed into plastic trash bags.

f. As soon as the last patient has been transported out of the skin DECON compartment, the team members in that compartment will bag all discarded items, then decontaminate (with 5% chlorine solution) the patient table, cutting devices, bulkheads and deck. These items and the room will then be rinsed with water.

g. The team members will then decontaminate the exposed areas of their masks, aprons, overboots and gloves in order. Once this is done, and once the patient is out of the next

(monitoring) compartment, the team members will then remove their overgarments as described above. They will remove overboots last and leave them in the room to aerate.

h. While still wearing mask and gloves, they place the bagged overgarments near the entrance to the compartment and proceed into the monitoring compartment to undergo a CAM check.

i. Once the CAM check shows they are clean, the team members will remove their masks, then their gloves, leaving both in the compartment to aerate, and proceed into the clean staging area. Note: Scrubs may be prepositioned here for team members to change into upon completion of the decontamination process.

j. Once the team members from the skin DECON station have moved into the monitoring compartment, the flight deck team members move from the entry passageway to the skin DECON compartment wearing their masks, gloves and overboots. They first place the bagged garments left in the compartment into the entry passageway and shut the door.

k. They next remove their overboots and leave them in the compartment to aerate. Wearing mask and gloves they proceed into the monitoring compartment once the preceding team members have vacated it.

l. Once monitoring has found each team member to be clean, he/she removes the mask, then gloves, leaves both items on the patient table to aerate and exits into the clean staging area.

m. Once CAM operators have monitored all personnel and cleared them to exit the DECON station, they will move backwards through the DECON station, making CAM checks to ensure the areas and equipment have been decontaminated. On the flight deck, they will monitor areas of the deck that have been decontaminated and the weapons that have been taken from the patients.

Note: When monitoring with CAM on the flight deck, strong winds can affect the CAM's ability to detect. The CAM nozzle must be held the proper distance from the surface, about 1/2 inch, and must be swept over the surface at a slow rate (about 1/2 foot per second) to monitor most effectively. The CAM is also susceptible to false positive readings in the presence of Aqueous Film Forming Foam (AFFF) and JP-5 fuel.

n. Once all monitoring outside the DECON station is completed, CAM operators will unmask and secure the CAMs.

E-44. Disposal of contaminated garments

Contaminated garments, bandages, splints, etc. removed from patients in the DECON process will be placed in double plastic bags and be sealed by double knotting the necks of the bags. Once the DECON operations are completed and the flight deck has been cleared, these bags will be taken aft, remaining outside the skin of the ship, to the biological materials incinerator, where they will be burned.

Appendix F

Health Service Support NBC Mission Essential Task List

F-1. Purpose

The Universal Joint Task List (UJTL) serves as a common language and common reference system for joint force commanders, combat support, agencies, operational planners, combat developers, and trainers to communicate mission requirements. It is the basic language for development of a joint mission essential task list (JMETL) or service mission essential task list (SMETL), which identifies required capabilities for mission success. Joint Force Commander/ Services develop METLs based on results and objectives attain from missions analyses. The UJTL and METLs are used in development of NBC related METLs.

F-2. General

a. The UJTL, when augmented with the Service task lists, is a comprehensive integrated menu of functional tasks, conditions, and criteria supporting all levels of the Department of Defense in executing the National Military Strategy.

b. The UTJL is a key element of the requirements-based, "mission-to-task" Joint Training System (JTS). In implementing this system, all users conduct mission analysis, identify specified and implied tasks, use the UJTL to describe these tasks (including supporting and command-linked tasks), apply guidance to determine essential tasks, select conditions that impact the tasks, and select measures and criteria that form the basis for standards. They document these essential tasks, conditions, and standards as their warfighting requirements in a JMETL/SMETL. The JTS and JMETL/SMETL development process are described in detail in CJCS Manual (CJCSM) 3500.03A, "Joint Training Manual of the Armed Forces of the United States".

F-3. JMETL/AMETL Development Process

a. A command or combat support agency can develop a JMETL/SMETL based on an analysis of assigned missions and application of the JMETL/SMETL development process. The development process can be used by non- Defense organizations to analyze assigned missions and develop their own METLs. Service components use Service doctrine to develop their METL. The CJCSM supports the JMETL/SMETL development process in the Requirements Phase of the four-phased JTS.

b. JMETL/SMETL are developed by joint force commands/agencies and are reviewed annually for modification and revised when mission change. The JMETL/SMETL is documented in the organization's joint training plan. It provides, among other things, the basis for linking mission requirements to training that is needed to ensure mission to ensure mission success.

c. Combatant commanders are assigned missions and tasks based on their geographic areas of responsibility or on their functional capabilities. The Joint Strategic Capabilities Plan (JSCP)

provides guidance to the combatant commanders and the Services to accomplish missions and tasks based on current military capabilities. The JSCP provides a coherent framework for capabilities-based military tasks assigned by the National Command Authorities (NCA), treaty obligations, or other documents supporting the Unified Command Plan (UCP).

d. Through careful analysis of assigned missions, the combatant commander will develop a concept of the operation and identify a set of mission-based tasks (including supporting and command-linked tasks). Using the JMETL/SMETL development process, these mission-based tasks are then screened against the JMET/SMET selection criteria to determine which tasks are essential to mission success. Once the JMETs/SMETs and their supporting and command-linked tasks are selected, the commander selects conditions and standards for each task based on the concept of operations. As an exception to the process, conditions and standards for command-linked tasks are mutually derived between commanders. The combination of these tasks, conditions, and standards form the JMETL/SMETL for the mission.

e. Each command/organization JMETL/SMETL, while showing overall mission capability may be separated into specific mission/operation required capability. For example, a commander of combatant command develops a commander of combatant command's JMETL that focuses on the essential tasks that he believes must be performed to ensure success of all missions. Each mission in turn should have a respective JMETL that indicates what must be done for individual mission success. The commander of combatant command may direct, as part of the JMETL development strategy, that each joint staff directorate, functional component, commander combined joint task force CCJTF), and Service component develops their JMETL/METL respectively, which indicates what essential tasks they must perform for mission success. The result is a pyramid effect with the commander of combatant command's JMETL at the pinnacle supported by staff, functional component, and combined joint task force CJTF JMETL and Service component METL.

F-4. Applicability to other Processes. The JMETL/SMETL have uses beyond the JTS

a. The JMETL structure can be used to focus requirements for joint simulations (i.e., Joint Simulation System (JSIMS). JMETL assessments can assist in the Joint Monthly Readiness Review (JMRR) process.

b. The Joint Warfighting Capability Assessments (JWCA) can be indexed to multicommand JMETL assessments that indicate long-term, systemic issues that can be addressed in terms of doctrinal, training, organizational, or material improvements.

c. Institutions providing joint professional military education (JPME) may cross-reference learning objectives to the UJTL tasks to better align the joint training and education systems.

d. The Joint Chiefs of Staff (JCS) Joint Information Exchange Requirements (JIER) and the Assistant Secretary of Defense (ASD) command, control, communications and intelligence (C31) command, control, communications, computers and intelligence, surveillance, and reconnaissance (C41SR) Architecture Framework Document require the JIER and Joint Operational Architecture be mapped back to the UJTL which directly relates C41SR

requirements to the warfighter's training and operational environment. This is an integral component to office of secretary of defense/joint chiefs of staff (OSD/JCS) policy in the generation of joint operational architectures and C41SR requirements.

e. Joint Vision (JV) 2010 uses the UJTL in describing capabilities required to execute the National Military Strategy found in the Joint Strategy Review and JV 2010 Concept for Future Operations.

F-5. Listing of Nuclear, Biological, and Chemical JMETL that Impact or Support HSS

Chapter 2 of the Chairman of the Joint Chief of Staff Manual 3500.04C (CJCSM 3500.04C) contains a comprehensive hierarchical listing of the tasks that can be performed by the Joint Staff, Services, combatant commands and components, activities, joint organizations, and combat support agencies responsive to the Chairman of the Joint Chief of Staff. The following task listing includes several tasks that may be considered as missions or operations, which will involve HSS for a NBC environment.

SN 4.3.3 Coordinate Defensewide Health Services
SN 4.3.4 Develop and Maintain a Medical Surveillance Program
SN 6.6.4 Expand Health Service Support
SN 8.1.5 Conduct Foreign Humanitarian Assistance and Humanitarian and Civil Assistance
SN 8.2.2 Support other Government Agencies
SN 8.1.4 Support Military Civic Action

ST 4.2.2 Coordinate HSS
ST 4.2.2.1 Manage Theater Joint Blood Program
ST 4.2.2.2 Coordinate Patient Evacuation From Theater
ST 4.2.2.3 Manage Medical, Dental, and Veterinary Services and Laboratories and Supply
ST 4.2.2.4 Coordinate Joint Comprehension Medical Surveillance
ST 6.2.8 Establish NBC Defense in Theater
ST 8.2.3 Coordinate Foreign Humanitarian Assistance
ST 8.2.4 Coordinate Foreign Humanitarian Assistance and Civic Assistance Programs
ST 8.2.6 Coordinate Military Civic Action Assistance
ST 8.4.5 Coordinate Civil Support the United States

OP 4.4.3 Provide for Health Services in the Joint Operations Area (JOA)
OP 4.4.3.1 Manage the Joint Blood Program in JOA
OP 4.4.3.2 Manage Flow of Casualties in the JOA
OP 4.4.3.3 Manage Health Services Resources in the JOA
OP 4.7.2 Conduct Civil Military Operation in the JOA
OP 4.5.3 Recommend Evacuation Policy and Procedures for the JOA
OP 4.6.2 Provide Civil- Military Engineering
OP 7.2 Coordinate Active NBC Defense in the JOA
OP 7.3 Coordinate Passive NBC Defense in the JOA

While these may not be " pure tasks", they provide a framework for mission analysis and structuring training events.

Appendix G

Required Data Collection and Reports

G-1. Introduction

a. It is crucial that the lessons from the Gulf War experience be applied in improving protection of troops, responding to health concerns, and assisting veterans and their family members through difficult transitions. A comprehensive, coordinated set of interagency plans is necessary to build upon what we have learned and ensure that the burden borne by those who risk their lives and well being to protect our country's interests is minimized.

b. The President directed the Secretary of Veterans Affairs, the Secretary of Health and Human Services, the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, and the Services to aggressively pursue unified Force Health Protection (FHP) strategies. These strategies were to protect Service members, veterans, and their families from health hazards associated with military service [Presidential Review Directive 5 (PRD 5), Force Health Protection Vision Document, DoD Directive (DoDD) 6490.2, and DoD Instruction (DoDI) 6490.3]. Meeting these FHP challenges will take a long-term sustained commitment to excellence—excellence in doctrine, training, leaders, organizations, materiel, and personnel to perform the mission in a global environment of multiple regional military threats and potential health hazards. The US military increasingly performs operations in joint, multinational, and interagency environments. The President, and Secretary of Defense clearly recognizes the importance of projecting a healthy and fit force and protecting the members of US forces in every operation and throughout their military service.

c. Service reporting requirements are described in the service specific appendix above.

G-2. DoD Directives and Instructions, North Atlantic Treaty Organization Standardization Agreements (NATO STANAGs), and Department of Defense (DD) Forms

a. **DoD Directive 6490.2 and DoD Instruction 6490.3**

1. DoD Directive 6490.2 and DoD Instruction 6490.3 require all services to collect, analyze, and report Medical Surveillance data on a continuing basis. The Medical Surveillance program will encompass:

a) Environmental, occupational and epidemiological threats and stressors.

b) Disease and non-battle injuries, stress-induced casualties, and combat casualties, including those produced by chemical and biological and nuclear weapons.

c) Collection and storage of serum for medical surveillance to be used in clinical diagnosis and epidemiological studies. The repository shall be used exclusively for the identification, prevention, and control of diseases associated with operational deployments of military personnel.

d) Environmental and Occupational Exposure Data

e) Predeployment Health Assessment

f) Post deployment Health Assessment

g) DNBI, Medical Situation Reports,

2. Timely receipt, assessment, and transfer of essential operational health-risk information in hours (versus days or weeks) will define successful OEHS performance. *Refer to DoDI 6055.5 Industrial Hygiene and Occupational Health; DoD Directive 4715.1 "Environmental Security" for additional information.*

b. **MEDICAL RECORD ADMINISTRATION AND HEALTH CARE DOCUMENTATION**

- Prescribes policies for preparing and using medical reports and records in accordance with North Atlantic Treaty Organization standardization agreements (NATO STANAGs) 2348 and 2132 and quadripartite standardization agreement (QSTAG) 470. Set policies and procedures for the preparation and use of medical and dental records and other health care documentation.

c. **DD FORM 2795 PRE-DEPLOYMENT HEALTH ASSESSMENT**

1. The Department of Defense policy shall be to use the attached Pre-Deployment Health Assessment and Post-Deployment Health Assessment for all deployment health assessments conducted pursuant to the requirements of DoD Instruction 6490.3, "Implementation and Application of Joint Medical Surveillance for Deployments," August 7, 1997, and this policy memorandum. These health assessments document the general health status of deploying and redeploying military members. Deployment-related mental health screening will be addressed in a separate policy memorandum.

2. Pre-Deployment Health Assessments shall be administered at home station or at mobilization processing stations before deployment.

3. The objective of pre- and post-deployment health assessments will continue to be quick confirmation and documentation of a service member's health readiness for deployment or redeployment and to determine if there is a need for a clinician's evaluation before deployment or redeployment.

4. A copy of any completed Pre-Deployment Health Assessment or Post-Deployment Health Assessment shall be mailed within 30 days of completion to the Deployment Surveillance Team, 5113 Leesburg Pike, Suite 701, Falls Church, VA 22041.

5. The original assessment shall be placed in the medical treatment record.

d. **DD FORM 2796 POST-DEPLOYMENT HEALTH ASSESSMENT**

1. The Department of Defense policy shall be to use the attached Pre-Deployment Health Assessment and Post-Deployment Health Assessment for all deployment health assessments conducted pursuant to the requirements of DoD Instruction 6490.3, "Implementation and Application of Joint Medical Surveillance for Deployments," August 7, 1997, and this policy memorandum. These health assessments document the general health status of deploying and redeploying military members. Deployment-related mental health screening will be addressed in a separate policy memorandum.

2. Post-Deployment Health Assessments shall be administered in the theater of operation before redeployment to either home station or a mobilization processing station.

3. The objective of pre- and post-deployment health assessments will continue to be quick confirmation and documentation of a service member's health readiness for deployment or redeployment and to determine if there is a need for a clinician's evaluation before deployment or redeployment.

4. A copy of any completed Pre-Deployment Health Assessment or Post-Deployment Health Assessment shall be mailed within 30 days of completion to the Deployment Surveillance Team, 5113 Leesburg Pike, Suite 701, Falls Church, VA 22041.

5. The original assessment shall be placed in the medical treatment record.

e. **DoD Directive 6205.3, DoD Immunization Program for Biological Warfare Defense**

- DoD Directive 6205.3, DoD Immunization Program for Biological Warfare Defense requires all personnel to have received immunizations prior to deployment and immunizations be maintained during the deployment.

- The Secretary of the Army, who is the DoD Executive Agent for the Immunization Program for Biological Warfare Defense, will--

  - Report annually to the Secretary of Defense the capability to carry out: Vaccine Research and Development, and Vaccine Acquisition and Stockpiling.

  - The Secretary of the Army will also serve as the focal point for the submission of information from the Services and monitor the Services' implementation of the DoD Immunization Program for Biological Warfare Defense.

  - Report to the Secretary of Defense annually on the Immunization Program for Biological Warfare Defense.

f. **Medical Situation Report**

- Each service is responsible for reporting to the chain of command those events, which have an adverse impact on force health protection and operational readiness.

Appendix H

SAMPLE/SPECIMEN COLLECTION AND MANAGEMENT

Section I. INTRODUCTION

H-1. General

a. Critical elements for accuracy in analysis of NBC samples and physiological specimens are correct collecting, packaging, handling, and transporting techniques. The quality of any analytical evaluation is directly related to the quality of the sample/specimen and the degree of post collection degradation that occurs prior to testing. Health service support personnel collect and submit specimens for suspect NBC hazards/agents involving humans and animals. Medical and nonmedical units collect and submit environmental (air, plant, and soil) samples for suspect NBC hazards/agents. Preventive medicine personnel collect and submit water and ice samples for suspect NBC hazards/agents. Veterinary personnel collect and submit food samples, such as fruits and vegetables, and specimens from animals for suspect NBC hazards/agents. Specimens collected from patients that are suspect of being exposed to a biological agent are forwarded to the supporting medical laboratory (such as the TAML, AML or US Navy Forward Deployed PVNTMED Unit) for analysis.

b. Essentially all military operations from war to stability operations and support operations may generate supporting laboratory testing requirements. Each scenario, geographical region, population base, and suspect agent will impact on the type and amount of samples/specimens required and the collection process. During all operations, express permission is required before collecting specimens from civilians because of religious or sociological beliefs in many cultures. To obtain such specimens without permission could result in unnecessary mission complications.

NOTES

1. The term “sample” refers to nonhuman and nonanimal origin. The term “specimen” refers to human and animal origin.

2. Always consider that chemical agents may have been employed. Check for chemical agents before collecting a biological sample/specimen. Chemical agents can damage or destroy biological agents. Also, chemical agents not identified in the sample/specimen can pose a hazard to receiving laboratory personnel. Mark all samples that are potentially contaminated with chemical agents as such.

3. Precautions should be taken to protect the sample/specimen collector from potential BW agents; at a minimum, respiratory protection and protective gloves must be worn. Additional care must be taken when collecting samples/specimens to prevent cross-contamination. Gloves must be changed or decontaminated between sample/specimen collections. In addition,

sample/specimen containers and packaging should be decontaminated with 0.5% sodium hypochlorite solution to protect those who handle the package.

4. Samples will not be delivered to the clinical laboratory of an MTF for analysis. They must be delivered to the designated supporting medical laboratory for processing. This will prevent accidentally spreading a biological agent in the MTF.

c. Coordination for follow-on testing is absolutely critical to the sample/specimen collection process.

d. Coordination with the receiving laboratory should be made to establish sample requirements, preferred collection techniques, methods of preservation, and transportation conditions, when the tactical situation and/or mission permits. **Ideally, coordination with supporting laboratories should take place upon arrival in-theater or in-house. Expectations of the supporting laboratories should be trained and well-known in advance of an event occurring.**

e. The number of medical specimens that need to be collected varies with the type of analysis performed and the impact of the values determined. The number and types of "control" samples/specimens required to validate test information is determined by the supporting medical laboratory personnel. Random sampling, matched with control populations, or other techniques will be employed as the requirements are identified.

H-2. Chain of Custody

a. A strict chain of custody must be maintained for every sample/specimen collected. Use DD Form 1911 (Material Courier Receipt), or other document (such as DA Form 4137 [Evidence/Property Custody Document]) as directed for each sample/specimen collected. The chain of custody document must accompany the sample/specimen during transport from the point of collection to the final receiving laboratory. Each time the sample/specimen is transferred to another individual, the receiving person must sign the document to show that they received the sample/specimen and state what happened to the sample/specimen while in their custody. The document will provide the answer to the following questions:

- When was the sample/specimen collected?
- Who has maintained custody of the sample/specimen?
- What has been done with the sample/specimen at each change of custody?

b. The samples/specimens must be appropriately packaged, labeled, and evacuated to the designated medical laboratory for confirmation of a biological attack. The standard chain of custody for the evacuation would be as follows:

- Sampling unit.
- Unit S2/security office or medical operations officer.
- Technical escort unit or other command-designated escort personnel.

- In-theater supporting medical laboratory.

- Designated CONUS laboratory.

H-3. Sample/Specimen Background Information

a. A complete history of the circumstances about each sample's/specimen's acquisition must be provided to the agency conducting the analysis.

b. Critical information includes, but is not limited to—

- Meteorological conditions. Describe what the meteorological conditions were at the time of the alleged attack and at the time of the sampling.

- Attack to collection time. State the length of time after alleged attack when sample/specimen was taken.

- Circumstances of acquisition. Describe how the sample/specimen was obtained and the source of the sample/specimen.

- Physical description. Describe the physical state of the sample/specimen (solid, liquid, powder, apparent viscosity), color, approximate size, identity of the sample/specimen (that is, dirt, leaves, blood, tissue), and dose rate (if radiologically contaminated).

- Circumstances of the agent deposition. Describe the type of delivery system, a description of how the weapon functioned, how the agent acted on release, sounds heard during dissemination, a description of any craters or shrapnel found associated with the burst, and colors of smoke, flames, or mists that may be associated with the attack.
- Agent effects on vegetation. Describe the general area (jungle, mountain, grassland) and changes in the vegetation after the agent deposition (that is, color change, wilting, drying, dead) in the main attack and fringe areas.

- Agent effects on humans. How the agent affected personnel in the main attack area versus fringe areas; the duration of agent effects; peculiar odors that may have been noticed in the area before, during, or after an attack; measures taken that alleviated or worsened the effects; and the approximate number of victims and survivors (include age and gender).

- Agent effects on animals. Describe how they are affected.

- Grid coordinates or other descriptive information on sample collection location.

H-4. Sample/Specimen Collection and Preservation

a. Ante mortem Specimens. Physiological specimens from living human or animal patients can include just about any conceivable body source or excreted by-product. It must be noted that specimen types are seldom interchangeable; the exact type and amount of specimen required for a specific assay must be known before a collection procedure is initiated (see Table H-1). **Coordination with supporting laboratories should take place upon arrival in-theater or in-house. Expectations of the supporting laboratories should be trained and well-known in advance of an event occurring.**

- Patients seen in an MTF may be the first and in some cases the only source for sampling for suspect biological agent release. The primary medical care provider will determine the level of treatment for these patients and the specimens required for laboratory diagnosis. Forward the specimens to the appropriate supporting laboratory.. Patient disposition will be based on evacuation policies, exposure, suspect agent, clinical symptoms, and required treatment/isolation.

- Blood specimens represent the most common analytical sample. Certain techniques and special care must be exercised to ensure an acceptable specimen is collected and to minimize an adverse affect to the patient or specimen collector. In general, phlebotomy requires the use of a 20 to 22-gauge needle to minimize mechanical hemolysis during aspiration using a syringe or Vacutainer™ tube collection system. Blood collected with a syringe and needle should be transferred to an appropriate Vacutainer™ tube immediately after collection. The type of tube, type of anticoagulant or preservative, and amount of blood collected will vary with the specific assay requested. Unless some special sample preparation step is required, the blood is best left in the original rubber-stopper tube for transport.

- Urine specimens are best collected using a clean-catch (midstream, if possible) technique in a sterile urine cup. The volume of sample required will vary depending on the specific assay requested; however, 25 to 50 ml is sufficient for most tests.

- Tissue specimens can originate from any body source accessible by scraping, swabbing, or minor excision. Tissue specimens are collected only by trained medical personnel. Specific techniques for collecting these specimens are not provided in this appendix.

- Sputum specimens are best collected using a sterile cup. The volume of specimen will normally be very small. However, a sufficient quantity must be collected to provide for in-theater testing and to provide for CONUS laboratory testing.

- Nasal swabs should be collected using sterile swabs. Non-cotton swabs are preferred, as cotton interferes with PCR. The swabs with specimen from each person should be placed in a separate sterile container to prevent cross-contamination.

NOTE

In cases where the supporting laboratory cannot be contacted, as a minimum the following specimens should be collected: Urine—25 to 50 ml in a sterile container. Blood—two 7 to 10 ml tubes without anticoagulant (red-stopper Vacutainer™); two 7 to 10 ml tubes with potassium or sodium ethylenediaminetetraacetate (EDTA) (lavender-stopper Vacutainer™).

- All specimens (regardless of physiological source) must be labeled to positively identify the individual or animal from whom it was collected; at a minimum, the individual's full name, unique personal identification number (social security number, when possible), military unit and location, and date and time of collection should be written on the label of the specimen container.

- All specimens are collected using aseptic techniques. All specimens are packaged, handled, and transported in a manner that ensures they arrive at the final destination laboratory

in a testable condition. Personal protection guidelines must be adhered to when collecting or processing specimens; at a minimum, this includes gloves and a mask. In the laboratory, a gown or other protective items may also need to be used. In the field, under suspect NBC conditions, collectors should be in MOPP Level 4 or inside NBC-protected vehicles. Common sense and the clinical and/or tactical situation will determine the extent of personal protection necessary.

- Preservation of specimens, either chemically or mechanically (cooling), will be necessary to minimize the amount of analyte degradation that occurs after removing the specimen from its physiological microenvironment. The optimal preservation technique will vary with different laboratory tests and must be confirmed for each requested assay. While freezing may preserve some serum constituents, freeze-thawing cycles may denature others. Freezing may also completely destroy certain microorganisms. This caution also applies to tissue specimens since "fixing" tissue with a standard 10 percent formalin solution will preserve tissue for special staining techniques; however, it renders the specimens completely useless for microbiological culture. Always verify specimen preservation requirements for storage and transport with the supporting medical laboratory before processing the specimen. Ideally, confirmation of the correct handling conditions should be coordinated before collection.

- The importance of coordinating sample/specimen collection, as soon as personnel are assigned, with the supporting lab-oratory facility cannot be overstated. Contact the receiving laboratory for instructions when doubt exists about the appropriate source, collection technique, storage and preservation conditions (such as, aerobic or anaerobic environment), and transportation requirements for samples/specimens. Extremely small volumes of samples/specimens, properly collected and handled, can yield a tremendous amount of information to assist in making medical, tactical, and strategic decisions. Conversely, very large quantities of poorly collected and insufficiently preserved samples/specimens are essentially worthless for most analytical techniques.

- Analysis beyond intratheater capabilities will be coordinated by the supporting laboratory, when deployed, or through medical channels in the absence of an in-theater supporting laboratory.

b. Post mortem and Forensic Specimens. The analysis of specimens from deceased humans and animals can provide valuable information about the disease, organisms, injuries, or environmental conditions at the time of death. This information can greatly enhance the treatment of others affected by the same, or physiologically similar, process. Specimen collection for post mortem or forensic examination is very important; the techniques involved reflect a significant degree of training, experience, and skill. Most specimens will be of the same type and size as for ante mortem specimens, but types and amounts of specimens will be determined by the collector.

(1) The collection of specimens from remains should be conducted exclusively by a pathologist, or other personnel specifically trained in forensic collection techniques. An exception is when Special Operations Forces (SOF) personnel are operating under radio silence conditions; the most qualified medical person with the operation collects, preserves, and transports or coordinates transport of specimens for evaluation. The same chain of custody requirements applies to specimens collected by SOF personnel, as with all other specimens.

(2) A large amount of support information can be gained by analyzing the site of injury and subsequent death. This "site scene" investigation requires a tremendous attention to detail and a trained observer. If forensic personnel cannot be contacted, or will be unduly delayed in arriving at the scene, then photographs of the victim and the immediate surroundings should be made. The scope and extent of the photographs should be composed to reflect as much detail as possible to assist forensic

personnel in reviewing the scene retrospectively. In the event that photography is not feasible, detailed sketches of the scene should be made to assist the forensic investigation.

(3) Techniques such as cardiac or bladder puncture, needle biopsy of organs, spinal tap, or exploratory laparotomy will not be performed by untrained personnel unless specifically requested and directed by forensic investigators.

Table H-1. Specimen Collection for Suspect Biological Warfare Agents

EARLY POSTEXPOSURE	CLINICAL	CONVALESCENT/TERMINAL/ POSTMORTEM
ANTHRAX		
0 TO 24 HOURS. NASAL AND THROAT SWABS, AND INDUCED RESPIRATORY SECRETIONS FOR CULTURE, FA, AND PCR.	*24 TO 72 HOURS.* SERUM (TT OR RT) FOR TOXIN ASSAYS. BLOOD (E,C,H) FOR PCR. BLOOD (BC OR C) FOR CULTURES.	*3 TO 10 DAYS.* SERUM (TT OR RT) FOR TOXIN ASSAYS. BLOOD (BC OR C) FOR CULTURE. PATHOLOGY SPECIMENS.
PLAGUE		
0 TO 24 HOURS. NASAL SWABS, SPUTUM, AND INDUCED RESPIRATORY SECRETIONS FOR CULTURE, FA, AND PCR.	*24 TO 72 HOURS.* BLOOD (BC AND C) FOR CULTURE AND BLOODY SPUTUM (C) FOR FA. SERUM (TT OR RT) FOR F-1 ANTIGEN ASSAYS. BLOOD (E, C, OR H) FOR PCR.	*>6 DAYS.* SERUM (TT OR RT) FOR IgM, LATER FOR IgG. PATHOLOGY SPECIMENS.
TULAREMIA		
0 TO 24 HOURS. NASAL SWABS, SPUTUM, AND INDUCED RESPIRATORY SECRETIONS FOR CULTURE, FA, AND PCR.	*24 TO 72 HOURS.* BLOOD (BC OR C) FOR CULTURE. BLOOD (E, C, OR H) FOR PCR. SPUTUM FOR FA AND PCR.	*>6 DAYS.* SERUM (TT OR RT) FOR IgM AND LATER IgG, AGGLUTINATION TITERS. PATHOLOGY SPECIMENS.
MELIOIDOSIS/GLANDERS		
0 TO 24 HOURS. NASAL SWABS, SPUTUM, AND INDUCED RESPIRATORY SECRETIONS FOR CULTURE AND PCR.	*24 TO 72 HOURS.* BLOOD (BC OR C) FOR CULTURE. BLOOD (E, C, OR H) FOR PCR. SPUTUM AND DRAINAGE FROM SKIN LESIONS FOR PCR AND CULTURE.	>6 DAYS. BLOOD (BC OR C) AND TISSUE FOR CULTURE. SERUM (TT OR RT) FOR IMMUNOASSAYS. PATHOLOGY SPECIMENS.
BRUCELLOSIS		
0 TO 24 HOURS. NASAL SWABS, SPUTUM, AND INDUCED RESPIRATORY SECRETIONS FOR CULTURE AND PCR.	*24 TO 72 HOURS.* BLOOD (BC OR C) FOR CULTURE. BLOOD (E, C, AND H) FOR PCR.	>6 DAYS. BLOOD (BC OR C) AND TISSUE FOR CULTURE. SERUM (TT OR RT) FOR IMMUNOASSAYS. PATHOLOGY SPECIMENS.
Q FEVER		
0 TO 24 HOURS. NASAL SWABS, SPUTUM, AND INDUCED RESPIRATORY SECRETIONS FOR CULTURE AND PCR.	*2 TO 5 DAYS.* BLOOD (BC OR C) FOR CULTURE IN EGGS OR MOUSE INOCULATION. BLOOD (E, C, AND H) FOR PCR.	*>6 DAYS.* BLOOD (BC OR C) FOR CULTURE IN EGGS OR MOUSE INOCULATION. PATHOLOGY SPECIMENS.
BOTULISM		
0 TO 24 HOURS. NASAL SWABS AND INDUCED RESPIRATORY SECRETIONS FOR PCR (CONTAMINATING BACTERIAL DNA) AND TOXIN ASSAYS. SERUM (TT OR RT) FOR TOXIN ASSAYS.	*24 TO 72 HOURS.* NASAL SWABS AND RESPIRATORY SECRETIONS FOR PCR (CONTAMINATING BACTERIAL DNA) AND TOXIN ASSAYS.	*>6 DAYS.* USUALLY NO IgM OR IgG. PATHOLOGY SPECIMENS (LIVER AND SPLEEN FOR TOXIN DETECTION).

Table H-1. Specimen Collection for Suspect Biological Warfare Agents (Continued)

EARLY POSTEXPOSURE	CLINICAL	CONVALESCENT/TERMINAL/ POSTMORTEM
RICIN INTOXICATION *0 TO 24 HOURS.* NASAL SWABS AND INDUCED RESPIRATORY SECRETIONS FOR PCR (CONTAMINATING CASTOR BEAN DNA) AND TOXIN ASSAYS. SERUM (TT OR RT) FOR TOXIN ASSAYS.	*36 TO 48 HOURS.* SERUM (TT OR RT) FOR TOXIN ASSAY. TISSUE FOR IMMUNOHISTOLOGICAL STAINING. PATHOLOGY SPECIMENS.	*>6 DAYS.* SERUM (TT OR RT) FOR IgM AND IgG IN SURVIVORS.
STAPH ENTEROTOXICOSIS *0 TO 3 HOURS.* NASAL SWABS AND INDUCED RESPIRATORY SECRETIONS FOR PCR (CONTAMINATING BACTERIAL DNA) AND TOXIN ASSAYS. SERUM (TT OR RT) FOR TOXIN ASSAYS.	*2 TO 6 HOURS.* URINE FOR IMMUNOASSAYS. NASAL SWABS AND INDUCED RESPIRATORY SECRETIONS FOR PCR (CONTAMINATING BACTERIAL DNA) AND TOXIN ASSAYS. SERUM (TT OR RT) FOR TOXIN ASSAYS.	*>6 DAYS.* SERUM FOR IgM AND IgG.
T-2 TOXICOSIS *0 TO 24 HOURS POSTEXPOSURE.* NASAL AND THROAT SWABS AND INDUCED RESPIRATORY SECRETIONS FOR IMMUNOASSAYS, HPLC/MASS SPECTROMETRY.	*1 TO 5 DAYS.* SERUM (TT OR RT) AND TISSUE FOR TOXIN DETECTION.	*>6 DAYS POSTEXPOSURE.* URINE FOR DETECTION OF TOXIN METABOLITES.
EQUINE ENCEPHALOMYELITIS (VEE, EEE, AND WEE VIRUSES) *0 TO 24 HOURS.* NASAL SWABS AND INDUCED RESPIRATORY SECRETIONS FOR RT-PCR AND VIRAL CULTURE.	*24 TO 72 HOURS.* SERUM (TT OR RT) AND THROAT FOR CULTURE. SERUM (E, C, H, TT, OR RT) FOR RT-PCR. THROAT SWABS UP TO 5 DAYS FOR CULTURE THEN CSF. SERUM (TT OR RT) FOR ANTIGEN ELISA.	*>6 DAYS.* SERUM (TT OR RT) FOR IgM. PATHOLOGY SPECIMENS PLUS BRAIN.
POX (SMALL POX AND MONKEYPOX) *0 TO 24 HOURS.* NASAL SWABS AND INDUCED RESPIRATORY SECRETIONS FOR PCR AND VIRAL CULTURE.	*2 TO 5 DAYS.* SERUM (TT OR RT) FOR VIRAL CULTURE.	*>6 DAYS.* SERUM (TT OR RT) FOR VIRAL CULTURE. DRAINAGE FROM SKIN LESIONS/ SCRAPINGS FOR MICROSCOPY, EM, VIRAL CULTURE, AND PCR. PATHOLOGY SPECIMENS.
EBOLA *0 TO 24 HOURS.* NASAL SWABS AND INDUCED RESPIRATORY SECRETIONS FOR RT-PCR AND VIRAL CULTURE.	*2 TO 5 DAYS.* SERUM (TT OR RT) FOR VIRAL CULTURE.	*>6 DAYS.* SERUM (TT OR RT) FOR VIRAL CULTURE. PATHOLOGY SPECIMENS PLUS ADRENAL GLAND.

LEGEND:

BC	Blood culture	EM	electron microscopy	PCR	polymerase chain reaction
C	Citrated blood	F-1	fraction-1	RT	Red Top, if TT is not available
CSF	cerebrospinal fluid	FA	fluorescent antibody	RT-PCR	reverse transcriptase/ polymerase chain reaction
DNA	deoxyribonucleic acid	H	Heparin		
E	EDTA	HPLC	high-pressure liquid chromatography	TT	Tiger top
EEE	eastern equine encephalitis			VEE	Venezuelan equine encephalitis
ELISA	enzyme-linked immunosorbent assay	IgG	immunoglobulin class G		
		IgM	Immunoglobulin class M	WEE	western equine encephalitis

c. Water Sample Collection.

(1) Water samples for identification or verification of biological agent contamination are collected by PVNTMED personnel. The supporting laboratory should provide guidance on sampling

procedures and collecting kits for use in collecting the samples. In the absence of guidance, a technique for use of the Sep-Pak™ is described in FM 3-19.

(2) When sampling kits are not available, samples may be collected in other available sterile containers. The best containers for use are the 100-ml glass bottles used for collecting routine water samples. All water samples must be collected and placed in a cooler or refrigerator until the sample is transported to its destination. During transportation the samples must be maintained at a temperature between 1°C and 4°C.

d. Food Samples. Veterinary personnel must collect suspect biologically contaminated food samples for submission to the supporting laboratory for in-theater verification of contamination. All food samples must be collected and placed in sterile containers. Place the samples in a cooler or refrigerator until the sample is transported to its destination. During transportation the samples must be maintained at a temperature between 1°C and 4°C.

e. Animal Specimens. Veterinary personnel collect specimens from suspect biologically contaminated/diseased animals. The same types and amounts of specimens are prepared and shipped in the same manner as are human specimens.

f. Environmental Samples. Environmental samples are collected as directed in the operators' manual or other publications for operating collection systems. Example: The Biological Integrated Detection System (BIDS) collects an environmental sample using a single liquid sample collector. The collector is a high-volume aerosol sampling and collection device. On demand it samples ambient air through a two-stage virtual impactor that concentrates aerosol particles in the 2 to 10 micrometer diameter-size range. The concentrate particle stream is directed through a wet collector containing a buffer solution and, over a 45-minute period, a 40 to 50 ml sample is collected. On order or when test results indicate a suspected agent, the sample and associated documentation are packaged and transported IAW FM 3-101-4.

Section II. SAMPLING TECHNIQUES AND PROCEDURES

H-5. General

The collection of environmental, and background (control) samples/medical specimens is an integral part of investigating allegations pertaining to the first use of chemical or biological agents. The types of samples/specimens taken and the collection methods primarily depend upon the circumstances encountered by the collector. During all chemical and biological sampling operations, the commander establishes the required protective equipment to fit the situation. This appendix includes a recommended list of equipment for use during chemical and biological sampling operations (Table H-2).

Table H-2. Example NBC Collection and Shipping Equipment List

AMOUNT	DESCRIPTION	STOCK NUMBER
20	LABELS, PAPER, PRESSURE SENSITIVE	7530-00-577-4376

2	GLOVES, 8–8 1/2, EDMONT WILSON™	8415-00-JO2-2902
2	GLOVES, 9–9 1/2, EDMONT WILSON™	8415-00-634-4639
1	TAPE, ADHESIVE, PRESSURE SENSITIVE, 2 INCH	7510-00-159-4450
1	PLIERS, #47, 5 INCHES	6520-00-543-5330
1	SCREWDRIVER, FLAT TIP, 1/4 INCH	5120-00-596-865
1	TONGS, TEFLON™ TIPS	AF 15-202-5
2	MICROSPATULA, WITH TEFLON™ ENDS	AF 21-401-50A
1	SCISSORS, UNIVERSAL TYPE	AF 08-951-30
1	SCOOP, POLYPROPYLENE, 5X2X2	ASP S1021-5
2	SPOON/SPATULA WITH TEFLON™	AF 14-356-10
1	KNIFE, POCKET	5110-00-526-8740
5	BOTTLES, SAMPLE, POLYETHYLENE, 6 OUNCE	CP J-6103-50
1	PIPET, JUMBO, TRANSFER TYPE (500/PKG)	AF 13-711-7
10	PIPET, GRADUAL, TRANSFER TYPE (500/PKG)	AF 13-711-9A
10	BAG, INSULATED, TYPE 1	AF 01-814-8
10	BAG, INSULATED, TYPE 2*	AF 01-814-10
1	BAG, WHIRL/PAK, 6 OUNCE (500/PKG)	AF 01-812-6B
1	STRIP, pH TESTING, NONBLEEDING, PLASTIC	SW S-65271
1	SEP-PAK™ C18	W51910 (50/BOX)
2	SYRINGE, HYPODERMIC, 50 OR 60 ml	6515-00-168-6913
2	STOPCOCK, THREE-WAY	ASP S8965-2
1	TUBING, LABORATORY, R3602 CLEAR	AF 14-169-3B
1	PEN, MARKING, WATERPROOF	AF13-381 (12/PKG)
2	TUBES, TENAX™	EC ST-023
1	BLADE, SURGICAL, CS2L 150S	6515-01-009-5297
2	PACK, ICE	CP TR-6345-20
6	PAD, NONADHESIVE, 3X4, 100s	6510-00-111-0708
4	PAD, COOLING, CHEMICAL, 4S	6530-00-133-4299
2	PIGLETTES	SPECIAL ORDER
1	TAPE, ANTISEIZE	8030-00-889-3535
1	AIR SAMPLER, PERSONAL	LSS G4980
1	KIT, METRIC, POCKET BUBBLE	GL4981
2	METHANOL	
1	WATER, STERILE (5 BOTTLE/PKG)	
1	MATCHES, WATERPROOF	
20	RAZOR, SURGICAL PREP	6515-00-926-2089
10	WATCH, WRIST	6645-00-066-4279
2	PARAFILM WITH DISPENSER	6640-01-185-3289
2	FLOOR SWEEP (VERMICULITE)	8720-01-026-9419
100	SEALS, TAMPER-RESISTANT	
1	A GAS METER CAPABLE OF PROVIDING ON-STATION ANALYSIS/DETECTION CAPABILITY FOR MULTIPLE GASES TO INCLUDE INDUSTRIAL GASES.	
1	A COMBUSTIBLE GAS INDICATOR THAT INDICATES PERCENTAGE OF OXYGEN AND EXPLOSIVITY.	
1	A GAS METER THAT DETECTS VAPOR IN PARTS PER MILLION (PPM) AND INDICATES PRESENCE OF VAPOR AND ITS STRENGTH.	
1	SWABS, THROAT	
2	CAN, 6 POUND, METAL	
10	BAG, MYLAR	
1	CONTAINER, LEAD SHIELDING (FOR RADIATION SAMPLES)	
1	CONTAINER, SHIPPING, IATA	
1	CHEST, ICE	
10	BAG, PLASTIC, RECLOSABLE	
	BLEACH	
	GAUZE PADS	

*WILL BE REPLACED BY MYLAR BAGS

H-6. Expended Material

The NBC recon units collect samples under various circumstances. For example, a recon unit may collect

samples in an area free of hostile forces. The Special Forces NBC Reconnaissance team may collect samples within the enemy area of operations or deep into the enemy's rear area. Samples include toxic agent munitions, chemical products, air, water, soil, and vegetation. In addition, all expended material used to collect the samples should be turned in to the laboratory with the samples. This material includes items such as expended M256A1 kits, M8 and M9 paper. These items should be recovered, packaged, and shipped with the suspected samples for analysis. Different information may be derived from each type of sample; Table H-3 compares different types of samples.

H-7. Environmental Samples

Background samples that are collected from the operational area as part of the entry operations. The background sample analysis is maintained as the baseline data. Control samples are collected from clean sources and must be identical to the samples collected from the areas near the attack areas. The contaminated samples must be compared to the baseline data (control samples). This is especially true if unknown or nonstandard chemical and/or suspected biological agents were employed. The analysis center uses the control samples to compare with a contaminated one. The recon unit collects control samples of soil, water, and vegetation from areas about 500 meters upwind of an alleged attack area. Control samples generally are the same as those collected in an alleged attack area. For example, if leaves from an apple tree in an attack area were collected as a suspected contaminated sample, the recon team should collect leaves (as a control sample) from an apple tree outside of the contaminated area. If water from a pond in the attack area is collected, the recon unit should collect control samples of water from a pond (not a moving stream) in a nearby clean area. The size of an environmental control sample should be about the same as the suspected contaminated sample collected from the attack area (see Table H-4).

Table H-3. Comparison of Sample Types

SAMPLE TYPE	INFO VALUE	SAMPLE STABILITY TO COLLECT	TIME REQUIRED	ANALYSIS RELIABILITY
AIR	GOOD	GOOD	20 MIN	HIGH
WATER	GOOD	GOOD	5 MIN	HIGH
SOIL	FAIR	FAIR	5 MIN	MODERATE
VEGETATION	FAIR	POOR	10 MIN	LOW
TISSUE	EXCELLENT	FAIR	30 MIN	HIGH
BLOOD	GOOD	FAIR	10 MIN	HIGH
URINE	GOOD	FAIR	10 MIN	HIGH
MUNITION FRAGMENTS	FAIR	FAIR	10 MIN	FAIR
PACKING MATERIALS	FAIR	FAIR	10 MIN	FAIR
Solids/powders				
Respiratory samples (i.w., sputum, NP swabs)				

H-8. Collection of Air and Vapor Samples

a. Air is a good sample matrix since it is a well-mixed medium. Air from a sample site contains a static concentration of contaminants. The concentration of contaminants depends upon the flow rate of the contaminant into the environment, the wind speed, and the physical state of the contaminant, the terrain contours, and temperature as a variable. The sample should be taken within 102 meters of a

contaminated surface and at the downwind edge of a contaminated area. The method should consist of pumping a given volume of air, by hand or electric pump, through sample tubes.

b. To avoid contamination, persons conducting air sampling should not use cologne, perfume, insect repellent, medical creams, or strong soaps before taking a sample. The fragrances from these products are volatile organic compounds that may be absorbed on the filter and skew analytical results. Smoke also severely interferes with air sampling, therefore, avoid tobacco and vehicle exhaust smoke.

c. The primary method for collecting air samples is with the PAS 1000 automatic air sampler in conjunction with a Tenax™ tube for a total of three to four minutes when possible. Upon completion of sampling, place the Tenax™ tube in a $2^{1}/_{4}$-inch piglette. Seal the piglette around the cap with either pressure-sensitive or Teflon™ tape. Once sealed, place the piglette into a Mylar or reclosable bag. Fold the bag around the piglette in a circular motion, then apply another bag and fold again. Once the bag is folded around the piglette, use any type tape to secure the bag around the piglette. Ensure that each layer of packaging is decontaminated using 0.5% sodium hypochlorite (1:10 bleach solution). Place the piglette into a refrigerator or cooler until the sample is transported to its destination.

d. When chemicals are permitted into the atmosphere from a facility, the best places to obtain samples are close to the emission source where the concentration of the chemical is not diluted. The further from the original point of release, the more diluted the sample becomes from mixing with air, water, or environmental pollutants.

e. Natural and man-made terrain features such as hills, valleys, and rows of buildings, sometimes aid the collector by channeling emissions. When these features are associated with a particular facility, their downwind side is a suitable place to collect a sample because the emission remains more concentrated further from the release point.

f. For collection in a possibly contaminated location, and if the situation permits, initially use a detection kit such as the M18A2/M256AI to determine if a possible vapor hazard exists from known chemical agents. Also, use the kit when personnel are required to examine possible toxic agent munitions. In any case, collect air samples with the white-band tubes and save for identification and analysis.

g. Small air samplers also enable the collector to obtain vapor samples from alleged toxic agent munitions at a safe distance while explosive ordnance disposal (EOD) operations are performed. If EOD personnel are not on the scene, the air sampler can be activated, and the collector can stand at a safe distance while the sampler is operating.

h. Perform sampling operations as soon as possible when directed by a higher headquarters or after suspected chemical or biological contamination is encountered.

H-9. Collection of Water Samples

a. Water sampling is a matter of collecting enough water to get acceptable information about the contaminants. The collector should provide the analysis center with one C18 and one silica cartridge when using the Sep-Pak™ technique or 100 ml in a sterile bottle when Sep-Pak™ is not available.

b. General guidelines: If it is believed that the threat has used standard chemical agents during an attack, use the M272 chemical agent water test kit for initial screening and sampling.

c. When collecting water samples using the Sep-Pak™ C18 cartridge, the following items are required:

- One 60 cc syringe without needle.
- One 3-way sterile, plastic, stopcock with protective covers.
- One piece of plastic tubing ($^{3}/_{16}$" inner diameter x 6" long minimum).
- Sterile water or methanol.
- One clean container, such as a Teflon™ cup or glass jar.

d. Prior to collecting each sample, prime the Sep-Pak™ system in the following manner:

- **Step 1.** Attach Sep-Pak™ directly to 60 cc syringe.
- **Step 2.** Pour small amount of sterile water or methanol into container.
- **Step 3.** Insert tip of Sep-Pak™ into container.
- **Step 4.** Withdraw at least 40 cc of solution.
- **Step 5.** Detach Sep-Pak™ from syringe and discard solution from syringe.
- **Step 6.** Repeat steps 3 through 5 using the same syringe.

e. After priming the Sep-Pak™, assemble the components in the following configuration:

- Attach the 3-way stopcock to a 60 cc syringe.
- Attach the Sep-Pak™ to the opposite end of stopcock.
- Attach the plastic tubing to the open end of the Sep-Pak™.

f. Use the following procedures to collect samples with Sep-Pak™:

- **Step 1.** Ensure that the lever on the stopcock is turned sideways with the off arrow pointed toward the large outlet port.
- **Step 2.** Place the open end of the plastic tubing into the water near the bottom, without touching the bottom or sides of the body of water.
- **Step 3.** Draw 60 cc of water into the syringe.
- **Step 4.** Turn the stopcock lever to the off position by positioning the lever to point toward the stopcock.
- **Step 5.** Push the plunger all the way in, discharging the water from the syringe through the outlet port.

- **Step 6.** Repeat steps 1 through 5.

- **Step 7**. Detach a plastic tubing from the Sep-Pak™, and discard it as contaminated waste.

- **Step 8**. Detach Sep-Pak™ from 3-way stopcock; place into sample container; seal with pressure-sensitive tape; and mark for identification. Ensure that each layer of packaging is decontaminated using 0.5% sodium hypochlorite (1:10 bleach solution).

NOTE

You should take a minimum of four samples: three samples of the suspected contamination and one control sample from a nearby unaffected (non-contaminated) area for reference.

- **Step 9.** Dispose of the syringe and stopcock as contaminated waste.

- **Step 10.** Insert the sample container in a cooler or refrigerator until the sample is transported to its destination.

g. For samples to be representative of the overall contaminated area, the collection point should be carefully selected. Collect samples from—

- Drains and slow-moving streams, since contamination and dilution from other sources are minimized.

- Stagnant pools of water if the pools of water are part of chemical waste areas, such as a landfill or chemical disposal area. Chemicals may percolate into stagnant pools or sumps close to the site.

NOTE

If an oil film, globules of organic materials, or an unnatural appearing powder-like material is visible on the water's surface, collect a surface sample of the material. If not, collect the sample from near the bottom of the water source (stream, lake, pond, water container). The upper layers of water may have lesser amounts of contaminants, due to higher temperatures that promote decomposition. Since most chemicals of interest are more dense than water, contaminants usually sink to the bottom of the water source.

h. Collect the sample without the Sep-Pak™ by immersing a capped or stoppered container to the desired depth, removing the cap or stopper, letting the container fill, and then capping the container. An alternate method for deeper water is to use a plastic, pump-operated siphon to pump water from a specific depth.

i. The best time to collect a sample of water from a location is when intelligence or local reports indicate that a process of possible interest is ongoing. In the absence of reliable reporting, this

may be indicated by increased activity, higher than normal amounts of security, or increased flow from facility chimneys or water discharge pipes. In field areas where a toxic agent has been sprayed or disseminated over a land area, the best time to collect water samples is just after the start of a rainstorm when runoff is beginning. Natural surface drainage will concentrate any remnants of toxic compounds in depressions, streams, or ditches.

H-10. Collection of Soil Samples

Soil is a suitable medium to collect a sample for toxic organic compounds. A critical point, however, is that the precise site of the agent deposition must be sampled for best results. Contamination may be recognized by discoloration or apparent deposition of material on the soil's surface. If discoloration or deposits of material are evident, only collect the discolored soil or deposited materials, if possible. Dead, malformed, and wilted foliage is an indicator of contamination. Soil samples should be collected from open areas, along the drip line of tents, stationary equipment, bottom of ditches and terrain depressions.

a. Collect the soil samples by using a knife, spoon, spatula, or similar item to scrape a square of topsoil (2x5x1 centimeters) from areas that appear to have been contaminated in to a collection container. If chunks or clods of earth are collected, select those that are no larger than 10x5x1 centimeters (see Table H-4). Also, collect a control sample of soil of the same type and texture from a nearby uncontaminated area.

b. Use a glass bottle, jar, or Teflon™ jar as the container when available. When these containers are not available, Mylar bags may be used. When using a glass bottle, jar, or Teflon™ jar, seal the cap with either pressure-sensitive or Teflon™ tape, and mark for identification. When using Mylar bags, place each sample in a separate bag, push excess air out, and seal by folding the open end over two to three times and wrapping the bag with tape. Insert the first bag into a second bag, seal, tape, and mark for identification. Ensure that each layer of packaging is decontaminated using 0.5% sodium hypochlorite (1:10 bleach solution).If possible, place the samples in a piglette.

CAUTION

Avoid direct contact with the sample to prevent exposing yourself to the suspect agent (MOPP 4 is required).

c. Collect samples as soon as possible when directed, upon detection of a suspect substance, or after the alleged incident.

H-11. Collection of Contaminated Vegetation

As with soil samples, vegetation is also a suitable medium to collect as samples for toxic organic compounds.

a. Collect samples of vegetation that appear to be different from normal. Select leaves that have wilted or appear to have been chemically burned. Collect samples of vegetation that appear to have liquid or solid substances deposited on their surfaces (this may be noticed as a shiny or moist area).

b. Collect samples of vegetation at several locations within the suspected contaminated area. Using a cutting tool or any sharp object, cut several affected leaves and/or a handsful of grass whenever possible. Do not crush the sample. Place the sample into a Mylar or reclosable bag. Squeeze excess air out of the bag and seal it. Fold the open end of the Mylar bag over two to three times, and wrap it with tape. The minimum size for a sample is three leaves or three handsful of grass. One leaf is of little value, but is better than nothing. Bark is acceptable but not preferred. Mark the bag for identification. Take a control sample of similar material from an unaffected (uncontaminated) area. Fold, seal, tape, and mark the control sample in the same manner as the actual sample. Ensure that each layer of packaging is decontaminated using 0.5% sodium hypochlorite (1:10 bleach solution).

c. When it is possible to determine a probable center of attack in an area, collect vegetation samples near the center of the area, about 100 meters upwind of the area, and in several 100-meter increments downwind of the area. If the collector can discern a contamination pattern in the area, this should be reported.

H-12. Control Medical Specimens

a. Just as blood and urine specimens are taken from humans who were allegedly exposed in an attack, also collect specimens from individuals who claim not to be affected by a toxic agent and are from the same group as exposed personnel. The purpose is the same as collecting environmental control specimens; that is, to determine if a toxic substance is present in the individuals' natural environment or if it has been artificially introduced.

b. Selection of humans for control sampling is somewhat more complicated than selection of environmental control samples. This is because ethnic diets, racial differences, physiological makeup, and actual living conditions of persons who are outwardly similar may introduce potentially large deviations. Each of these factors must be accurately considered before selecting subjects as controls.

c. Consideration of ethnic diets is important because of unique foods or methods of food preparation that may exist. As an example, individuals in settled areas may purchase beer that has been carefully filtered and sterilized, while individuals in a nearby unsettled area may ferment their own beer by burying home crafted jugs in the ground and extracting the product little by little over several months.

d. Racial differences can account for differences in mortality and morbidity rates in specific populations. One example of this could be the high rate of hemophilia in a population versus the rarity of the disease in another.

e. Physiological makeup is critical because of the differences in hormone balance and tissue composition in males, females, adults, and juveniles. For this reason, medical control specimens should be drawn from individuals of the same gender and approximate age as specimens from exposed personnel, if possible.

f. Differences in the actual living conditions of people also require a close look. The point here is that conditions in remote, semicivilized camps are seldom the same as those in a well-established camp that has access to modern amenities.

g. The bottom line in selecting subjects for medical control sampling is that they be as similar in all aspects as possible.

H-13. Collection of Medical Specimens

a. Trained medical technicians or physicians should collect medical specimens (human or animal);, Special Forces NBC Reconnaissance team personnel are also trained to do this. Remember, the collector must have express permission (authority) to collect medical specimens from the dead, because of religious beliefs in many cultures. To obtain such specimens without permission may result in unnecessary mission complications. Ensure all personnel handling or collecting medical specimens have received proper immunizations for their own protection. They must be inoculated IAW The Surgeon General's guidance.

b. Medical specimens collected during an investigation include blood, urine, sputum, nasal swabs, and tissue specimens from living victims and similar specimens from unexposed persons (background control specimens).

c. Collect blood specimens using either a standard 10 cc disposable syringe with a 1- to 1½-inch needle (20 to 22 gauge), or by using a Vacutainer™ system. When using a Vacutainer™ system, ensure that multiple specimen needles and appropriate Vacutainers™ are used, see table H-1. Ten cc of blood is sufficient for analytical testing. Do not take more than 5 cc from children. After blood is collected, it should be transferred to a polypropylene-type container and sealed with parafilm before transporting. All body fluids should be collected using aseptic techniques. Also, prior to transporting specimens, collectors need to check specimen containers for paper labels IAW guidelines for labeling medical specimens. Collect blood specimens using the following materials equipment:

- Gloves.
- 10 cc sterile, disposable syringe.
- 1- to 1.5-inch sterile needle (20 to 22 gauge).
- Vacutainer™ device (adapter with needle).
- Constricting band.
- Disinfectant pads, Betadine, or alcohol.
- Sterile 2x2-inch gauze pads.
- Labels.

Tubes?

NOTE

Gloves should be worn whenever handling medical specimens. Do not freeze liquid blood and urine specimens (ideal cooling temperature is between 35° and 40°F [2° to 4°C].)

d. Collect urine specimens using either a standard urine cup or by a urine catheter and urine cup. When collecting the specimen directly into a urine cup, the person must urinate into the cup until sufficient fluid is collected (40 to 50 cc). When the person is unable to urinate, the catheterization

technique is preferable. The catheterization technique is best performed in a clinical environment. Transfer the urine to sterile screw top container for packaging; urine cups will leak. As with other body fluids collected, urine must be kept cold. Do not freeze.

NOTE

For correct procedures on catheterization refer to STP 8-9lW15-SM-TG.

e. Collect tissue specimens using sterile scissors and forceps or as directed by the attending physician.

(1) When casualties have unidentified skin lesions, photographs of the lesion(s) and overall photos of the extent of the lesion(s) should be taken, using color film before biopsy. A specimen of the lesion should be obtained. This is done by surgically removing a portion of the skin with a sterile pair of scissors and forceps.

(2) Place tissue specimens in a Teflon™ container filled 1/4 inch from the bottom with a preservative, (formalin 10%) for preservation of the specimen until it reaches its proper destination. Seal the container and lid with parafilm. As with any other medical specimens, tissue specimens are refrigerated prior to shipment; but do not freeze tissue specimens.

f. Collect nasal swabs by using a an appropriate, non-cotton swab. Place the swab with collected specimen in a Teflon™ container filled 1/4 inch from the bottom with the appropriate preservative for preservation of the specimen until it reaches its destination. Seal the container and lid with parafilm. Refrigerate the specimen for shipment, but do not freeze.

g. Collect sputum by having the patient discharge the sputum into a small, sterile screw-top jar or urine specimen cup. Seal the container and refrigerate the specimen for shipment, but do not freeze.

H-14. Post Mortem Specimens

Post mortem specimens should be collected by individuals trained in forensics. When forensics-trained individuals are not available, the most qualified medical person should collect human specimens. Specimens from animals should be collected by veterinary personnel. In either case, the following specimens are collected:

- **Blood.** Use a 50 to 60 cc sterile syringe with an 18-gauge, 5-inch (large bore) needle to collect blood from the heart, and urine directly from the bladder. Use a spinal needle to collect cerebral spinal fluids. Three of each type of specimens must be collected.

- **Lungs.** A biopsy needle is needed to properly collect lung tissue specimens. After collecting specimens from the lungs, place specimens in a plastic or Teflon™ container filled with 10% formalin (preservative) and seal the container for transporting to its destination.

- **Liver.** If possible collect liver core specimens, using a large-gauge needle (18-gauge, 5-inch long) via intercostal or abdominal puncture. Or, if the family consents, perform a minilaparotomy and obtain one or two 2x2x2 cm sections of liver. Store and package the specimen as directed for tissue specimens. For suspect biological agents, see Table H-1 for specific types of specimens, amount,

collection medium, and from whom to collect.

NOTE

Before attempting any of the above procedures, collector must be certified by a qualified person (medical doctor) on the correct procedures to collect specimens from cadavers.

Table H-4. Standard Sizes of CB Samples/Specimens to be Collected

TYPE	SIZE	NOTES
	CHEMICAL WARFARE SAMPLES	
SOIL	(10 CM X 5 CM X 1 CM)	CIGARETTE-PACK SIZE OR LARGER AREA IS MORE USEFUL THAN GREATER DEPTH
DILUTE AGENT WATER	10 ML 500 ML (MAXIMUM)	
C18 SEP-PAK™	200 ML	
VEGETATION CONTAMI-NATION POINT	(EQUIVALENT TO 3 LEAVES OR 3 HANDSFUL OF GRASS)	DEPENDS ON AMOUNT OF NATION. BEST SAMPLES WILL BE FOUND NEAR THE RELEASE
	BIOLOGICAL WARFARE SAMPLES	
SOIL	(10 CM X 5 CM X 1CM)	CIGARETTE-PACK SIZE OR LARGER AREA IS MORE USEFUL THAN GREATER DEPTH
LIQUID	25 TO 50 ML	DO NOT USE C18 SEP-PAK™ WITH MEDICAL SPECIMENS
VEGETATION POINT	SIZE OF SOFT DRINK CAN	BEST SAMPLES DEPEND ON THE AMOUNT OF CONTAMINATION FOUND NEAR THE RELEASE
	MEDICAL SPECIMENS	
URINE COLLECT US	20 TO 50 ML	MUST OBTAIN CONSENT TO SPECIMENS FROM OTHER THAN CASUALTIES
WHOLE BLOOD OR SERUM COLLECT US	5 ML	MUST OBTAIN CONSENT TO SPECIMENS FROM OTHER THAN CASUALTIES
CEREBRAL SPINAL FLUID COLLECT US	2 ML	MUST OBTAIN CONSENT TO SPECIMENS FROM OTHER THAN CASUALTIES
ORGAN TISSUE	30 G (MINIMUM)	
MEDIASTINAL LYMPH NODES	2	SHOULD BE REMOVED BY A SURGEON DURING AN AUTOPSY

H-15. Reporting, Packaging, and Shipment

Although a sample/specimen collected from an alleged attack area can be significant, it can become useless if proper steps are not taken to record critical information about its collection or if it is improperly packed and breaks during shipment to an analysis center, This section discusses the information needed when acquiring samples/specimens and the preferred methods for handling and packing samples/specimens for shipment.

a. A complete background information history of the circumstances about each sample's/specimen's acquisition must be provided to the agency analyzing the sample/specimen.

b. Critical background information includes—

- Circumstances of acquisition. How the sample/specimen was obtained, where it was

found, and how it was collected.

- Physical description. The physical state (solid, liquid, powder, apparent viscosity), color, approximate size, identity of the specimen (such as military nomenclature), dirt, leaves, or so forth.

- Circumstances of agent deposition. The type of delivery system, a description of how the weapon functioned, how the agent acted on release, sounds heard during dissemination, a description of any craters or shrapnel found associated with a burst, and colors of smoke, flames, or mist that may be associated with the attack.

c. Provide information on the agent effects on vegetation for soil or environmental samples. A description of the general area (jungle, mountain, grassland) and changes in the vegetation after agent deposition (such as color change, wilting, drying, dead) in the main attack and fringe areas.

d. Provide information on the agent effects on humans for medical specimens. Describe how the agent affected personnel in the main attack area versus fringe areas; the duration of agent effects; peculiar odors that may have been noticed in the area prior to, during, and/or after an attack; measures taken that alleviated or deteriorated the effects; and the approximate number of victims and survivors, to include their ages and genders.

e. Describe the agent effects on animals. Provide information on the types of animals that were or were not affected by an attack and of how they were affected.

H-16. Handling and Packaging Materials

Materials used for packaging samples/specimens primarily consist of Mylar collection bags, Teflon™ specimen jars and tubes, pigs and piglettes, ice chests, sealing materials, and wrapping and cushioning supplies.

a. Collection Bag. Use the Mylar bag as the initial container for such samples as protective masks and filter canisters, individual antidote and decon kits, munition fragments, and other items too large to place in a specimen jar. Use it also to package sample/specimen containers to ensure a vapor barrier in case the container is broken in transit. The bag acts as an initial or secondary vapor barrier to prevent air from leaking inward and toxic material outward. Follow the procedures below when using the bag.

- If packaging a specimen container or nonenvironmental sample/specimen, first, verify it has a sample/specimen number. Carefully place the sample/specimen in a bottom corner of the Mylar bag. Ensure that each layer of packaging is decontaminated using 0.5% sodium hypochlorite (1:10 bleach solution).
- Squeeze all the air out of the bag and seal it by removing the adhesive's protective strip, and pressing the two sides together.

- Place a piece of 2-inch-wide fiber or cloth tape across the end of the bag that you just sealed to reseal the Mylar bag on the outside. This serves as extra insurance in case the internal seal is broken.

- With the bag lying in front of you and the seal at the top, fold the bag across its width to as small a size as possible without damaging the sample/specimen. At this point, use tape to hold the fold. Next, fold the bag from the top down to the bottom of the bag to as small a size as possible. The

sealing of the bag is the most critical step during the packaging process.

- At this point, turn the bag over and use a marker or file label to put the sample/specimen number on the outside of the bag so that analysis center personnel can identify the sample/specimen.

- Place the folded Mylar bag in a clear plastic reclosable bag, if available. Following the same steps you used for the Mylar bag, fold and seal the plastic bag. When this has been completed, again mark the sample/specimen number on the exterior of the bag.

b. Glass Specimen Jars and Polypropylene Tubes. Use glass containers to hold small environmental samples, water samples, and medical and post mortem specimens. Use polypropylene containers to hold medical specimens such as blood or urine. Polypropylene containers may be used for post mortem specimens if required; however, glass containers are preferred. The use of glass rather than plastic containers is preferred for environmental samples because toxic agents may leach chemicals from plastics into a sample, introducing contamination and confusing the analysis efforts.

- If the container has a screw-on lid, place Teflon™ plumber's tape (NSN 8030-00-889-3535; Tape, Antiseize) on the threads of the container before putting on the lid. This helps to limit the leakage of liquids and vapor from the container and to assure the lid will not fall off while in transit. If the lid has a cardboard liner, remove the liner and replace it with one or two layers of parafilm (a laboratory sealant film).

- Once the lid is on, stretch parafilm around the outside of the container at the junction of the lid and the glass. Two wraps of the film are enough to provide a leakage barrier and more assurance that the lid cannot fall off.

- At this point, ensure the sample/specimen number is on the outside of the container. Use a diamond etching pencil or an adhesive label to put the sample/specimen number on the exterior of the container. Ensure that each layer of packaging is decontaminated using 0.5% sodium hypochlorite (1:10 bleach solution).

c. Six-Pound Metal Can. Use metal cans as the external container for packaging small items that have been sealed in Mylar bags, specimen jars, and polypropylene tubes containing medical specimens. The metal can helps absorb shock from rough handling during shipment and eliminates the spread of contamination if a specimen container is broken. The six-pound metal can is capable of holding more than one sample/specimen (depending upon size of samples/specimens).

- Before placing samples/specimens in the can for shipping, ensure a sample/specimen number is assigned and is visible on each item. Ensure that each layer of packaging is decontaminated using 0.5% sodium hypochlorite (1:10 bleach solution).

- Place about 1 to 2 inches of packing material in the bottom of the can.

- Wrap jars and tubes in plastic bubble wrap or $^1/_8$- to $^1/_4$-inch-thick foam rubber sheeting, secure the wrap with tape or a rubber band, and place the wrapped item in the can.

- If bubble wrap or foam rubber is not available, use newspaper. The guiding principle is that the sample/specimen containers should fit snugly and not be able to move in the can.

d. Ice Chest. Standard polyethylene or metal ice chests are the most easily procured items

used for transworld shipment of CB samples/specimens. The most easily used size is about 24 inches long by 18 inches high by 15 inches deep. This size permits the sender to ship two or three 6-pound metal cans in each chest with sufficient dry ice to maintain freezing temperatures for about four days. Also, each chest remains at a weight that one individual can handle.

e. Transport Container. When the samples/specimens must be transported on commercial aircraft, an IATA-approved sample transport container and labeling must be used for shipment/delivery to the CONUS laboratory.

f. Coolants. Samples/specimens submitted for laboratory analysis must be properly packaged, labeled, and shipped to ensure they arrive in an analytically acceptable condition. All samples should be maintained at a temperature of 1° to 4°C during transport. Ideally, samples/specimens should arrive at the in-theater laboratory within 6 hours of collection. The samples/specimens should be delivered to the CONUS laboratory within 24 to 48 hours. If the samples/specimens cannot be delivered to the CONUS laboratory within this time, then they should be flash frozen to -165°C, if capabilities are available. If available, dry ice should be used when flash freezing cannot be accomplished. If the samples/specimens cannot be delivered to the CONUS laboratory within 24 hours, the supporting laboratory should subculture the samples/specimens and send the subculture with the samples/specimens to the CONUS laboratory. The subculturing date should also be provided.

g. Internal Insulation. While a commercial ice chest provides good insulation of both the samples/specimens and the coolant, it is best to place extra insulation and cushioning around the metal cans inside the chest. Newspapers, plastic bubble wrap, and foam rubber may all be used with almost equally good results except newspapers and standard ice do not mix well.

H-17. Collection Reporting

a. The collector must provide a formatted message for transmission as soon as possible to report acquisition and shipment of samples/specimens. During special operations in a theater in which a Special Forces Group (SFG) is deployed, the message is transmitted by the fastest means through the fewest channels to the NBC control (NBCC) center. If a NBCC center has not been deployed to the area of operations, as in low-sample/specimen volume peacetime NBC sampling operation, the message is transmitted by the fastest means through the fewest channels to the message addressees below. In addition, a written report accompanies each sample/specimen or batch of samples/specimens. The collector ensures that the acquisition message has been properly classified.

b. The collection report includes at least the following addressees:

SECSTATE WASHDC
SECDEF WASHDCHOSD-ISA/OUS-DREH
JCS WASHDC//J-3/J-5H
CIA WASHDCHOSWR-STD-LSBNIC-NIO(STP)H
DIA WASHDC//DT-3B/DT-5A//
DIR AFMIC FT DETRICK MD//AFMIC-CR/AFMIC-SA//
DA WASHDC//DAMI-FIT/DAMO-SWC//
CMDT USACMLS FT LEONARD WOOD MO //ATSN-CM-CO//
CDR SBCCOM APG
MDHSMCCR-OPF/SMCTE-OPE-RA-ID2H
CDR FSTC CHARLOTTESVILLE VA//AIAST-RA-ID2H
CDR USAMRIID FT DETRICK MD (For suspect biological samples/specimens only.)

c. A collection message contains the following information:

- The sample/specimen identification number is part of the subject line if only a single sample/specimen is referred to in the text. Otherwise, refer to the sample/specimen number within the message body with its background information.

- The shipment date, mode of transportation, courier identification, air bill of lading number, flight number destination, and estimated time of arrival are included if the sample/specimen is to be shipped immediately. Also, the material courier receipt form (DD Form 1911) should be used to maintain chain of custody.

- Background information on the sample/specimen. Questionable circumstances surrounding acquisition of a sample/specimen. The name of another country or agency that acquired a sample/specimen from the same event or area and is not shown on the message address.

- A recommended priority and rationale for analysis to guide the analysis center on the assessment of the potential value of the sample/specimen.

- All details relating to the collection of the sample/specimen, regardless of how insignificant they may seem to the collector.

d. Ship all samples/specimens by the fastest, safest means, preferably by a technical escort unit (TEU) to the theater Chemical-Biological Sampling Control Element (CBSCE) or to a location the CBSCE designates. If there is no CBSCE in the theater, send the samples/specimens IAW preplanned instructions from the Chemical-Biological Sampling Control Center (CBSCC) at CBDA, Aberdeen, Maryland. The CBSCC uses the following criteria to determine the final destination of each sample:

- Is the sample/specimen chemical or biological in content?

- Is the sample/specimen content completely unknown?

- Is the sample/specimen a possible biological material?

(1) In any case, the NBCC center must be notified in advance of shipment of the sample so additional instructions or deviations from standard instructions can be given. Figure B-1 shows an example of a shipping notification message. The NBCC center will direct, in advance, that samples be sent to one or more of the following locations, depending on the category of the samples. Prior to shipment of samples/specimens, contact must be made with—

Commander
Technical Escort Unit
ATTN: SMCTE-OPE
Aberdeen Proving Ground, MD 21010
DSN: 584-4381 (Duty hours) DSN: 584-2773 (After duty hours)

(2) This unit controls the transport of samples/specimens to their final destination(s). Do not ship suspected toxic samples/specimens or munition systems to CONUS technical centers or intelligence agencies without coordination and prior approval by the recipient.

NOTE

Suspect CB samples/specimens are first delivered to the supporting medical laboratory in the AO for in-theater analysis before they are transported out of the AO. The supporting laboratory will withdraw an aliquot of selected samples/specimens for analysis. The supporting medical laboratory is responsible for providing the AO commander confirmatory identification within the AO. The CONUS-based reference laboratory is responsible for providing confirmatory identification for President and Secretary of Defense purposes.

FM AMEMBASSY DDTTTT Z JAN 02
TO CDR TEU APG MD//SMCTE-OPE//
SECSTATE WASHDC
SECDEF WASHDC//OSD-ISA/OUS-DRE//
INFO CIA WASHDC//OSWR-STD-LSB/NIC-NIO(STP)//
JCS WASHDC//J-3/J-5//
DIA WASHDC//DT-3B/DT-5A//
DIR NSA FT MEADE MD
DIR AFMIC FT DETRICK MD//AFMIC-CR/AFMIC-SA//
DA WASHDC//DAMI-FIT/DAMO-SWC//
CDR FSTC CHARLOTTESVILLE VA//AIAST-RA-ID2//
CDR CBDA APG MD//SMCCR-OPF//
CDR USACMLS FT MCCLELLAN//ATZN-CM-CU//

CLASSIFICATION

SECSTATE FOR...
SECDEF FOR...
CIA FOR...
JCS FOR J-3/J-5 FOR..
DA FOR DAMO-SWC FOR..
AFMIC FOR...
CBDA FOR FIO...
FSTC FOR AMXST-FM/...
USACMLS FOR THREAT MGR...

E.O. 12356: DECL: OADR (Note: This is included if the message is classified.)
TAGS: ...

Subject: Shipment of CB Samples/Specimens
REF(S): TEU MSG # , (DTG DDTTTT [time zone] JAN 02)

1. (W) SHIPPING INFORMATION:

   A. DATE SHIPPED: JANUARY 11, 2002.
   B. MODE OF TRANSPORTATION: AIR EXPRESS, AIR BILL NUMBER RPT
   C. FLIGHT SCHEDULE: TO TYO BY JAL XXX, JANUARY 11, 2002. TO JFK BY JAL YYY, JANUARY 12, 2002. TO IAD BY
   D. DESTINATION: DULLES INTERNATIONAL AIRPORT.
   E. ESTIMATED TIME OF ARRIVAL: 2010 HOURS, JANUARY 12, 2002.

2. SPECIAL HANDLING REQUIREMENTS: DRY ICE ENCLOSED AS COOLANT.

3. SHIPMENT CONSISTS OF TWO ICE CHESTS (1 FOR CRDEC AND 1 FOR AFMIC) CONTAINING SIX SAMPLES/SPECIMENS. ALL LIQUID SAMPLES/SPECIMENS ARE IN POLYPROPYLENE TUBES AND HAVE BEEN CAREFULLY PACKED TO AVOID BREAKAGE. THE FOLLOWING SAMPLES ARE INCLUDED IN THE SHIPMENT:

SAMPLE/SPECIMEN NUMBER	MESSAGE REFERENCE
TH-850102-001AG THRU TH-850102-OO5AG	BANGKOK DDTTTTZ JAN 02

4. USDAO HAS STATED THAT THIS SHIPMENT IS PARTIAL FULFILLMENT OF CIR.

Figure H-1. Sample shipping notification message.

H-18. Sample/Specimen Background Documents

The sample/specimen background document allows a collector to note the most relevant details associated with pre- and postsample/specimen collection conditions. Do not consider the report to be all-inclusive. The information collected should include at least the items listed in Figure H-2. Interviews should be conducted with individuals exposed to the CB agent as well as individuals not exposed (see Figure H-3).

1. ID NUMBER_____

2. COLLECTION (DATE/TIME): _____

3. COLLECTOR/UNIT: _____

4. TYPE: ENVIRONMENTAL___ BIOMEDICAL___ SINGLE___ MULTIPLE___

5. PURPOSE: ATTACK___ CHEM/BIO ALARM___ CHEM DETECT___ RECON ILLNESS/DEATH___ OTHER___

6. POSTEXPOSURE: HOURS___ DAYS___ WEEKS___ UNKNOWN___

7. LOCATION: TOWN_____ COORDINATES_____

   A. TERRAIN: FLAT___ HILLS___ MOUNTAIN___ DESERT___ JUNGLE___ SPARSE TREES___ GRASS___ BODY OF WATER/TYPE___
   B. WEATHER: CLEAR___ CLOUDY___ RAIN___ FOG___ SNOW___ DUST___
   C. WIND: LIGHT___ HEAVY___ GUSTY___ NONE____
   D. ODOR: SWEET___ FRUITY___ PEPPER___ FLOWER___ IRRITATING___ CHANGING___ NONE___ OTHER _____
   E. TEMPERATURE AT TIME OF ATTACK: _____TEMPERATURE AT TIME OF SAMPLE COLLECTION: _____

8. COMMENTS:

_____
_____
_____
___

9. ATTACK: DATE/TIME _____ METHOD: ARTILLERY___ ROCKET___ AIRCRAFT___MORTAR___ RPG/GRENADE___ OTHER, DESCRIBE: _____

   A. EXPLOSION: AIR _____ (HEIGHT)_____ GROUND _____ SIZE_____ DISTANCE_____ DESCRIBE:_____
   B. CONSISTENCY: SMOKE___ MIST___ DUST___ RAIN___ GEL___ INVISIBLE, DESCRIBE:_____

10. ENVIRONMENTAL SAMPLE: SOIL___ WATER___ VEGETATION____ AIR___ OTHER___

11. BIOMED SPECIMEN: ACUTE___ CONVALESCENT___ EXPOSED___ NOT ILL___ POST MORTEM___
    CONTROL, EXPLAIN: _____ BLOOD___ LIVER___ LUNG___ SPLEEN___ BRAIN___ SKIN___ KIDNEY___ URINE___ OTHER, DESCRIBE:_____
12. COMMENTS:

_____
_____

13. CASUALTY: SSN _____ UNIT_____ SEX _____

14. SIGNS/SYMPTOMS: ONSET___ DURATION___

A. HEAD: FEVER___ CHILLS___ HEADACHE___ FLUSHED___ DIZZINESS___ UNCONSCIOUSNESS___ COMA___ HALLUCINATIONS____
B. EYES: SUNLIGHT SENSITIVE___ PAINFUL___ BURNING___ DROOPY EYELIDS___ DOUBLE VISION____ BLUFFED VISION___ LARGE PUPILS___ PINPOINT PUPILS___
C. NOSE: RUNNY___ BLEEDING___
D. THROAT: SORE___ DRY___ SALIVATING___ BLOODY SPUTUM___ HOARSENESS___ DIFFICULTY SPEAKING___
E. RESPIRATION: DIFFICULTY BREATHING___ CHEST/PAIN DISCOMFORT___ WHEEZING (IN/OUT)___ COUGHING___ LABORED BREATHING___
F. HEART: POUNDING OR RUNNING___ IRREGULAR HEARTBEAT____
G. GI: LOSS OF APPETITE___ NAUSEA___ FREQUENT VOMITING___ FREQUENT DIARRHEA___ VOMITING BLOOD___ DIARRHEA WITH BLOOD___
H. URINARY: BLOODY URINE___ UNABLE TO URINATE___
I. MUSCULOSKELETAL: NECK PAIN___ MUSCLE TENDERNESS___ MUSCLE TREMBLING/ TWITCHING___ WEAKNESS___ PARALYSIS, DESCRIBE: _____ CONVULSIONS___ TREMORS___ MUSCLE ACHES___ BACK PAIN___ JOINT PAIN___
J. SKIN: RASH___ REDDENING___ ITCHING___ BLISTERS___ PAIN___ NUMBNESS___ PROFUSE PERSPIRATION___

15. COMMENTS:
_____
_____

16. ANIMALS AFFECTED: YES___ NO____ DESCRIBE: _____

17. RELATED SPECIMENS_____
ID NUMBER_____
DESCRIPTION_____

18. COLLECTOR
SIGNATURE_____
NAME_____
PHONE NUMBER_____
E-MAIL_____

19. REVIEWER
SIGNATURE
NAME
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Figure H-2. Sample/specimen background document (continued).

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1. (X)
SHIPPING

TO CDR TEU APG MD//SMCTE-OPEI/
SECSTATE WASHDC
SECDEF WASHDC//OSD-ISA/OUS-DRE//
INFO CIA WASHDC//OSWR-STD-LSB/NIC-NIO(STP)//
JCS WASHDC//J-3/J-5//
DIA WASHDC//DT-3B/DT-5A//

DIR NSA FT MEADE MD
DIR AFMIC FT DETRICK MD//AFMIC-CR/AFMIC-SA//DA WASHDC//DAMI-FIT/DAMO-SWC//
CDR FSTC CHARLOTTESVILLE VA//AIAST-RA-ID2//
CDR CRDEC APG MD//SMCCR-OPE//
CDR USACMLS FT LEONARD WOOD MO//ATSN-CM-CO//
CDR USAMRIID FT DETRICK MD// (FOR SUSPECT BIOLOGICAL SAMPLES/SPECIMENS ONLY)

CLASSIFICATION

SECSTATE FOR...
SECDEF FOR
CIA FOR
JCS FOR J-3/J-5 FOR
DA FOR DAMO-SWC FOR
AFMIC FOR
CRDEC FOR FIO
FSTC FOR AMXST-FM)
USACMLS FOR THREAT MGR
E.O. 12356: DECL: OADR (NOTE: This is included if the message is classified.) TAGS:

SUBJECT: SHIPMENT OF CB SAMPLES
REF(S): TEU MSG, #_____, (DTG DDTTTT [time zone] Jan 02)

1. INFORMATION:
   A. DATE SHIPPED: JANUARY 11, 2002.
   B. MODE OF TRANSPORTATION: AIR EXPRESS, AIR BILL NUMBER RPT
   C. FLIGHT SCHEDULE: TO TYO BY JAL XXX JANUARY 11, 2002. TO JFK BY JAL YYY, JANUARY 13,2002. TO IAD BY DEC ZZZ, JANUARY 12,2002.
   D. DESTINATION: DULLES INTERNATIONAL AIRPORT
   E. ESTIMATED TIME OF ARRIVAL; 2010 HOURS, JANUARY 12,2002.
2. SPECIAL HANDLING REQUIREMENTS: DRY ICE ENCLOSED AS COOLANT.
3. SHIPMENT CONSISTS OF TWO ICE CHESTS (I FOR CRDEC AND I FOR AFMICO CONTAINING SIX SAMPLES/SPECIMENS. ALL LIQUID SAMPLES/SPECIMENS ARE IN POLYPROPYLENE TUBES AND HAVE BEEN CAREFULLY PACKED TO AVOID BREAKAGE. THE FOLLOWING SAMPLES/SPECIMENS ARE INCLUDED IN THE SHIPMENT:

SAMPLE/SPECIMEN NUMBER	MESSAGE REFERENCE TH-8501
1AG THRU TH-850102-005AG	BANGKOK DDTTTTZ JAN 0202-00

4. USDAO HAS STATED THAT THIS SHIPMENT IS PARTIAL FULFILLMENT OF CIR.

Figure H-3. Sample/specimen shipping report.

Appendix I

MEDICAL PLANNING GUIDE FOR THE ESTIMATION OF NUCLEAR, BIOLOGICAL, AND CHEMICAL BATTLE CASUALTIES

Section I. INTRODUCTION

I-1. General

The primary purpose of the Medical Planning Guide for the Estimation of Nuclear, Biological, and Chemical Battle Casualties—AMedP-8(A), a three-volume publication for NBC, is to assist medical planners, medical logisticians, and medical staff officers in predicting NBC warfare contingency requirements for HSS personnel, medical materiel stockpiles, patient transport or evacuation capabilities, and facilities needed for patient decontamination, triage, treatment, and supportive care. The optional use of these guides is for projecting medical NBC operational estimates at brigade, division, corps, and EAC.

NOTE

The use of "the guide" in this appendix refers to AMedP-8(A), Volume I, II, or III. The AMedP-8(A), Volume I, II, or III, is the text for each of the STANAGs. The contents of this appendix are extracts from Sections 1, 2, and 3 of the guide.

I-2. Medical Planners' Tool

Medical planners' estimates (such as casualty, logistics, evacuation, and personnel cross leveling) must be modified for the NBC environment. Estimates of NBC medical workload can be found in AMedP-8(A). A compact disk containing these documents and an automated version of AMedP-8(A), the Casualty Requirements Estimation Tool (CREST), can be obtained from Headquarters, Department of the Army, ATTN: DASG-HCZ-FD, 5109 Leesburg Pike, Falls Church, VA 22041-3258. The CREST is **primarily an Army tool** focusing on corps, brigades, and battalions, but also models aerial ports of debarkation, seaports of debarkation, and other units. Other Services may obtain and use the CREST in modeling and producing casualty estimates.

This Section Implements STANAG 2475.

Section II. MEDICAL PLANNING GUIDE FOR THE ESTIMATION OF

NUCLEAR, BIOLOGICAL, AND CHEMICAL BATTLE CASUALTIES (NUCLEAR)—AMedP-8(A), VOLUME I

I-3. General

a. Volume I of the guide provides estimates of casualties and remaining operational strength after a nuclear detonation in a brigade-sized unit during an out-of-area contingency operation. These estimates include the numbers, injury type (initial nuclear radiation, blast, and thermal injuries), and injury severity of nuclear patients based on several brigade scenarios. The scenarios include three different brigade-sized units, in warned or unwarned posture, which have single detonation of 5, 20, or 50 KT in the unit area.

b. The guide is organized into 10 sections. Section 1 introduces the guide and presents background and medical planning considerations. Section 2 provides information on the methodology used to develop the estimates of fatalities, casualties, and effectiveness of individuals remaining in the unit. Section 3 explores the use of the casualty prediction tables based on combat effectiveness decrements and estimates of the number of casualties categorized by insult level. Sections 4 through 10 contain tables of casualty estimates.

c. A sample of this information is graphically depicted in Tables 1-1 and 1-2 of the guide. The casualty estimates used to prepare these tables are presented in the guide as Tables 6-4 and 10-4 in Sections 6 and 10 respectively. The use of these tables is explained in paragraphs 3.1 through 3.6 of the guide. Paragraphs 3.7 and 3.8 of the guide discuss how to use the guide for situations not explicitly addressed.

d. The effects of residual radiation on personnel are not included in the guide. AMedP-6 and AMedP-7 provide information on planning, operations, and treatment for a residual radiation situation. Also not included is the impact of tumbling; impact of glass shards from windows of vehicles or buildings; crushing deaths from building failure; or COSC casualties; thus causing underestimations on the number of patients. Further, there will be personnel who get radiation doses or burns and do not seek medical care.

e. A nuclear detonation may introduce new levels of destruction to the battlefield. There is very little experience with nuclear effects and there is certainly no experience with these weapons on a modern, highly technological battlefield. Therefore, there is little historical data on which to base estimates of personnel injured. Computer simulations are generally used to estimate numbers of personnel injured. Although these estimates may include significant uncertainty, they provide the best estimates to date.

I-4. Medical Planning Considerations

a. For effective mass casualty management, key medical and related considerations must be well planned and practiced. These include on-site triage and emergency care, communications, health service logistics, evacuation by ground and air resources, and personnel training in self-aid/buddy aid. Plans need to be made for requirements that may differ from the usual combat situation. For example, in combat situations, severe burn injuries in large numbers are relatively uncommon. Therefore, no special planning for the care of large numbers of burn patients is required. In a nuclear environment, this may not be true, and consideration must be given to the increased need for medical support that would result from a high incidence of burn patients.

b. Prior to an attack, the data may be used by medical planners to augment the requirements for conventional combat as appropriate for the nuclear situation. The tables can be used to prepare estimates of the number of patients at all echelons.

c. After an attack, the effectiveness and adequacy of the medical support effort during the first 24 hours are critical. Commanders should be informed rapidly of the estimated medical load in order to provide rescue and treatment resources or request assistance from higher headquarters, adjacent units, or allied units. These estimates should be updated postattack based on aerial or ground reconnaissance and survey.

d. In addition to casualties, a nuclear weapon detonation can generate an EMP that may cause catastrophic failures of electronic equipment components and may adversely affect the capability of all units in the area of the detonation. Electromagnetic pulse has no direct effect on personnel and is not further addressed in this publication.

I-5. Triage

Since a nuclear detonation may produce mass casualties, plans for a triage system must be in place. Paragraphs 3.4 through 3.5 of the guide describe patient categories by injury severity and may be used to estimate the number and injury severity of patients for a particular operational scenario. The guide does not, however, provide estimates of the number of patients by triage classification.

I-6. Evacuation

a. An efficient and flexible evacuation plan is absolutely essential for the preservation of life and to retain the mobility of forward medical resources. In a potential mass casualty situation, the full range of evacuation assets should be considered.

b. The extended hospital time of nuclear casualties will influence levels of evacuation or hospitalization. In addition, estimates of the different types of casualties can be a consideration in evacuation planning. In planning for evacuation, estimates provided in the guide can be used as a starting point from which to estimate evacuation resources.

I-7. In-Unit Care

a. Some personnel within the military unit may not be classified medically as casualties, but will require some self-aid and buddy aid. A casualty is defined as anyone entering the medical system. Paragraph 2.5 of the guide further describes the basis for casualty calculation.

b. Nuclear detonations will produce a large number of blast, burn, and projectile injuries that initially must be treated by individual soldiers trained in first aid procedures. The physical damage to the surrounding area as a result of a nuclear detonation will increase delays in medical assistance and evacuation. Training in self-aid/buddy aid will improve casualty survival rates and conserve medical resources. The guide can be used to provide a conservative estimate of the numbers of injured that will require first aid. The tables in Sections 4 through 10 of the guide, showing the status of unit personnel by time period, can be used to indicate the numbers of personnel who are injured (but not casualties) who may require first aid.

I-8. Hospital Bed Requirements

The data provided in the guide can be used to determine immediate additional bed requirements resulting from a nuclear detonation. In addition to the numbers of patients who will need beds, the data provided in the guide can also indicate the increased hospitalization time of nuclear casualties. Long-term bed requirements, greater than 30 days, are not provided. Based on the theater evacuation policy specified for the operation, the hospital bed days may be in theater or in CONUS.

I-9. Medical Logistics

The data provided in the guide can assist in estimating the needed supplies. The supply system must be prepared for increased demands for certain types of medical and general supplies and equipment, kits, dressings, and antibiotics. The treatment of combined injuries will not require any special types of supplies, although demands for certain types of supplies will increase.

I-10. Medical Force Planning

The assignment of medical support is normally based upon the total military population and the expected conventional casualty rate. The data provided in the guide may be used to assess the requirement for additional medical units. The planning guidance presented in this document can (and should) be modified to reflect the needs of the anticipated operation, including operational tempo, national/coalition priorities, medical resource allotment, and so forth. When trying to augment personnel, consider that the use of a nuclear weapon in a tactical situation could be an indication of an increased tempo of warfare. Therefore, even though a unit may be targeted with

a nuclear detonation, that unit may not be the site where the highest numbers of casualties are being produced, and another unit may have priority of support.

This Section Implements STANAG 2476.

Section III. MEDICAL PLANNING GUIDE FOR THE ESTIMATION OF NUCLEAR, BIOLOGICAL, AND CHEMICAL BATTLE CASUALTIES (BIOLOGICAL)—AMedP-8(A), VOLUME II

I-11. General

The guide, AMedP-8(A), Volume II, provides estimates of casualties, and remaining operational strength, after single BW attacks on tactically deployed, brigade-sized land force units, offshore naval and marine forces, and selected strategic targets in rear areas. These worst-case casualty estimates are for personnel within both the targeted and the downwind hazard areas of the attacked forces. They assume that all affected personnel will be unsheltered and unwarned. To further estimate worst-case outcomes, the guide assumes that exposed individuals have not been vaccinated against any of the evaluated agents, nor have they undergone any type of medical prophylactic treatment prior to exposure. The tables included in the guide are designed to show numbers of expected casualties; expected fatalities; personnel at different performance levels; and times after exposure. In selected scenarios, the guide provides a method for estimating casualties among collocated civilians based on local population density.

a. The guide presents casualty estimates for all possible combinations of the following conditions:

- Eleven operational scenarios.
- Seven biological agents.
- Four types of delivery systems.
- Three attack intensities.

b. The guide is subject to limitations of extent and content. Since there are many more possible attack variables than those considered, the guide presents a limited number of estimates and provisional guidance for estimating cases not modeled. These estimates are based upon the best available medical data, but such data result in qualified estimates. Therefore, for more authoritative medical descriptions, medical planners and staff personnel should use FM 8-9, NATO Handbook on the Medical Aspects of NBC Defensive Operations, AMedP-6(B), Part II—Biological. Users of the guide must amplify or modify these estimates to meet emergent requirements such as injuries resulting from combined biological and conventional attacks.

c. Computer models that integrate available information have been used to predict the effects of future biological attacks. These resultant estimates may include substantial uncertainties when applied to specific situations. However, they provide the best estimates available to date.

d. The guide is also organized into 10 sections. Section 1 introduces features of the guide, and then presents background and medical planning considerations. Section 2 provides information on the methodology used to develop the estimates. Section 3 describes how to use the tables presented in the guide. Sections 4 through 10 of the guide contain tables of casualty estimates, with one section for each of the seven biological agents.

e. Biological attacks are likely to have a significant impact on the medical system. As detailed elsewhere in the guide, victims may number in the hundreds or even thousands. Demand for medical care may quickly overwhelm available resources; this problem will be exacerbated if medical personnel themselves become victims of the attack. Local civilian populations will be victimized as well, limiting host-nation support and potentially adding to the demands on the military medical system.

f. A variety of medical responses to BW attacks are available, depending on the agent used and whether medical countermeasures are employed prior to attack or after exposure has already occurred.
For many agents, immunization or pre-exposure prophylaxis with antibiotics may prevent illness in those subsequently exposed. After exposure, disease can often be prevented or ameliorated via immunization and therapeutic use of antibiotics, antiviral drugs, and hyperimmune gammaglobulins.

I-12. Medical Planning Considerations

a. Effective mass casualty management requires careful planning. The guide is designed to sup-port such planning by providing medical planners and staff personnel with a systematic means for estimating the number of biological casualties. However, casualty management also involves practice of self-aid and buddy aid, on-site triage and emergency care, decontamination, transport to medical facilities, infection control measures, communications, health services, logistics, and evacuation by ground or air transportation.

b. Medical requirements resulting from attacks with biological agents may be substantially different from those resulting from conventional, nuclear, or chemical combat. There would be no indication of the presence of biological agents in most tactical situations. Units downwind from an attack area may be unexpectedly exposed to biological agents. In some cases, there will also be a risk of secondary infection and subsequent epidemics amongst troops and/or the local population. Additionally, use of biological agents may generate reservoirs within the local animal population that may serve as a further source of infection.

c. Often the first indication of an attack with a biological agent will be the development of symptoms in exposed personnel. Diagnosis and treatment are complicated by the fact that

many of the agent-induced diseases described in the guide begin with symptoms associated with common illnesses, such as influenza. In such cases, biological agent attacks may generally be distinguished from naturally occurring epidemics by the sudden onset of disease, the large number of personnel presenting with similar symptoms, and the concentration of those personnel in geographically contaminated areas.

I-13. Triage

a. Since a biological attack may produce mass casualties, preparations for a triage system should be in place before the attack. Paragraph 3.3.8 of the guide describes patient categories by illness severity. For a particular described operational scenario, this information may be used to estimate the number of patients with specified levels of illness. The guide does not provide estimates of the number of patients by triage classification or usual medical descriptions.

b. Decontamination of patients must be considered before further evacuation.

I-14. Evacuation

a. An efficient and flexible evacuation plan is essential for adequate casualty treatment and to retain mobility of forward medical resources. For an assessment of a potential mass casualty situation, the medical planner should consider the full range of evacuation assets, limitations, and obstacles. After an attack, the medical staff may need to estimate the number of casualties that could require evacuation at given post exposure times.

b. Evacuation requirements will vary with the type of biological agent used. Casualties resulting from some agents may not be evacuated because the time course of effects is relatively short. For others, like botulinum toxin, casualties may require evacuation to a facility where they can receive care for weeks or even months. Estimates provided in the guide can be used as a starting point from which to plan for evacuation resources, including those required for decontamination of personnel and transportation assets.

I-15. In-Unit Care

The casualty estimates in the guide are presented without allowance for in-unit care. However, there may be need for rapid intervention. Delays in obtaining medical care may occur because of physical damage or contamination of the surrounding area. Soldiers trained in first aid procedures may be the first to provide aid to biological agent casualties. The guide provides a conservative estimate of the numbers of exposed personnel who will require first aid. The tables described in paragraphs 3.3.2 through 3.3.4 of the guide give the time courses of effects that may apply to estimation of in-unit care and delayed medical requirements.

I-16. Patient Bed Requirements

Bed requirements can be estimated using the tables described in paragraphs 3.3.2 through 3.3.4 of the guide. The latter type of table is useful after an attack since it shows gains and losses of casualties over time. The type of table described in paragraph 3.3.5 of the guide may be more useful for long-range planning. It shows maximum numbers of personnel by illness severity category. The tables in the guide only provide estimates for the first 35 days after attack. Based on the theater evacuation policy specified for the operation, hospital days may be in theater or in the national area.

I-17. Medical Logistics

a. The estimates provided in the guide are intended to support projections of medical materiel and logistical requirements. Increased demands may occur for certain types of medical and general supplies, including equipment, kits, antibiotics, disinfectants, and other critical medical materiel. Demands may also increase for items unique to the prevention and treatment of biological agent casualties, such as vaccines, antibiotics, and antisera, as well as items adapted to contaminated environments. Tables showing maximum numbers of personnel by illness severity category can provide useful input for logistical planning.

b. Often the first indication of an attack with a biological agent will be the development of symptoms in exposed personnel. Diagnosis and treatment are complicated by the fact that many of the agent-induced diseases described in the guide begin with symptoms associated with common illnesses, such as influenza. In such cases, biological agent attacks may generally be distinguished from naturally occurring diseases.

I-18. Medical Force Planning

a. The assignment of medical support is normally based upon the total military population and the expected conventional casualty rate. The guide may be used to assess requirements for additional medical units.

b. Although a specific unit may be the target of a biological attack, more casualties could be suffered by other units downwind. Accordingly, a unit other than the targeted one may have priority for support. The tables presented in the guide can be used in planning for either situation. Some tables show estimated maximum numbers of personnel by illness severity category. Such estimates should be combined with a comprehensive array of other available information to increase the effectiveness of medical force planning.

This Section Implements STANAG 2477.

Section IV. MEDICAL PLANNING GUIDE FOR THE ESTIMATION OF NUCLEAR, BIOLOGICAL, AND CHEMICAL BATTLE CASUALTIES

(CHEMICAL)—AMedP-8(A), VOLUME III

I-19. General

a. The primary purpose of Volume III is to assist medical planners, logisticians, and staff officers in predicting CW contingency requirements. Requirements include medical personnel, medical materiel stockpiles, patient transport or evacuation capabilities, and facilities needed for patient decontamination, triage, treatment, and supportive care. An optional purpose is to support medical operational estimates.

b. The guide provides medical worst-case estimates of casualties and remaining operational strength after a single CW attack on a tactically deployed, brigade-sized land force units, with protection available and protection unavailable. These worst-case casualty estimates are for personnel located within both the targeted and the downwind hazard areas of the brigade. It is assumed that all targeted personnel will be unsheltered and without medical pre-exposure prophylactic treatment. Tables in the guide are designed to show total numbers of—

- Casualties with different types and severities of injury at various times after exposure.
- Personnel at different performance levels and times after exposure.
- Fatalities at specified times after exposure.

c. The guide presents estimates of personnel status at specific time points. These range from 1 to 3 hours to 7 to 30 days after an attack, depending on the type of agent considered. Such estimates are projected from all possible combinations of the following conditions:

- Seven operational scenarios involving three types of units: heavy brigade, support brigade, and light infantry brigade.
- Three chemical agents: the nerve agents GB and VX, and the blister agent HD.
- Three types of munitions delivering the agents: aerial bombs, tactical ballistic missiles, and rounds from multiple launch rocket systems/artillery batteries—
  - Three attack intensities for each type of munition: light, moderate, and heavy.
  - Two postures of individual physical protection against the attacks: unavailable and available.

d. An index to essential information and four sample problems to illustrate use of this information are at the end of the guide (see Section 11). Section 11 provides a planning guide

overview, describes applications, and presents a brief explanation of modeling methods used to prepare estimates.

e. The guide is subject to limitations of extent and content. Since there are many more possible attack variables than those considered, the guide presents a limited number of estimates. These estimates are based upon the best available toxicological values, but such values are qualified estimates. Therefore, medical planners and staff personnel should use FM 8-9, NATO Handbook on the Medical Aspects of NBC Defensive Operations, AMedP-6 (B), Part III—Chemical, for more authoritative medical descriptions and information on effects of longer duration.

f. The guide is most value to the user who needs to know what kinds of casualties to expect, relative numbers of each, and the time frames in which they are likely to appear. To assist the user, who lacks experience in actual CW, the guide describes types of injury, relevant factors, general magnitudes of effects, and effects of time courses on chemical casualty numbers. The casualty estimates are appropriate for training exercises. However, this initial attempt to provide complex estimates has limitations for battlefield use. The limitations are described as follows:

- The guide provides estimates for a few of many possible chemical attacks. Each estimate is based upon computer modeling of the consequences of specified conditions. This is like saying that the numbers of men who sneeze, after inhaling an allergic flower pollen, might be predicted if specific information (EXAMPLE: The wind speed and direction, the current weather, altitude, time of day, and sites of concentrated flower growth) is known for the specific geographic location of a particular brigade on a given mountain. If such estimates are made for a few widely different mountains, a user of the estimates may be able to guess the numbers of sneezing men in his own brigade, located on a separate mountain. However, if the conditions on both mountains are not nearly identical, the user will need to estimate a scaling factor and apply it to adjust the number predicted for a different environment.

- It is unlikely that exactly identical conditions will exist for any two mountains or chemical attacks. The user of the guide must decide which scenario best represents his conditions (or interpolate from two scenarios), then use or adjust the estimates. Therefore, each user must recognize any differences from modeled conditions that might require him to increase, or decrease, an estimate. The user may need to apply a commander's guidance on acceptable risk levels, or consider restrictions of available resources, before accepting, interpreting, or modifying the relevant planning guide numbers. The most difficult problem for the user will be to determine how much to increase, or decrease, planning guide numbers to fit the user's situation. This problem is discussed in paragraph 3.4 of the guide.

- The user should be aware that medical worst-case targeting selects for maximal numbers of survivors entering the medical system, not for maximal operational losses. The tabulated estimates are very highly sensitive to the degree of clustering of personnel and their assumed location within a standardized brigade area. Accordingly, use of this targeting method leads to large variations that are based upon the probabilities of hitting clustered personnel, not evenly or widely distributed personnel. Therefore, these estimates do not provide

a good basis for estimating the most likely outcomes for a series of "average" attacks, or for comparing a scenario with an actual attack. Although the tabular format of the guide suggests that the listed numbers are exact, the user should understand that different targeting could readily produce other numbers. Selection of a scaling factor is discussed in paragraph 3.4 of the guide.

I-20. Medical Planning Considerations

a. The guide provides medical planners and staff personnel with a systematic means for estimating chemical casualties in various-sized units, without regard to composition. This document provides more accurate and detailed estimates and is based upon detailed operational scenarios for brigade-sized units. Both chemical planning guides support estimates of combat performance from individuals remaining in the unit.

b. Effective mass casualty management requires careful planning. The guide is designed to support such planning by providing medical planners and staff personnel with a systematic means for estimating the number, type, and time-related status of chemical casualties.

NOTE

Each user is advised to consult any available national military NBC defense doctrinal publications of similar nature.

c. Medical requirements during CW may be substantially different from those for the usual combat situation. There may be no indication of the presence of chemical agents in some tactical situations. Unprotected units downwind from an attack area, or those entering contaminated areas in an unprotected posture, may be unexpectedly exposed to chemical agents. However, casualty management also involves practice of self-aid and buddy aid, on-site medical triage and emergency care, transport to medical facilities, communications, health services, logistics, and evacuation by ground or air transportation.

d. The signs and symptoms of chemical agent exposure may be sudden and intense, or delayed and subtle, depending on the agent used and the level of exposure. Individuals may not reach the first level of care for 15 to 60 minutes after the onset of effects. Decontamination may delay medical treatment. Stabilization should occur before casualties leave emergency care areas, but contamination of these areas may delay the stabilization process. However, effects of decontamination or secondary contamination on estimated doses and effects are not considered in the guide. For medical planning, users of the guide need to consider the various qualifications of its casualty estimates, as discussed in paragraphs 3.4 and 3.4.2. of the guide.

e. A chemical burn caused by HD can require more care than a same-sized burn induced by conventional munitions. Therefore, the initial prognosis may require revision after treatment is underway, and estimates of percent capable by performance band may require adjustment.

I-21. Triage

Since a chemical attack may produce mass casualties, preparations for a triage system should be in place before the attack. Paragraph 2.5.1 of the guide describes patient categories by injury severity. For a particular described operational scenario, this information may be used to estimate the number of patients with specified levels of injury. The guide does not provide estimates of the number of patients by triage classification or usual medical and toxicological descriptions.

I-22. Evacuation

a. An efficient and flexible evacuation plan is essential for adequate casualty treatment and to retain mobility of forward medical resources. For assessment of a potential mass casualty situation, the full range of evacuation assets, limitations, and obstacles should be considered by the medical planner. After an attack, the medical staff may need to estimate the number of casualties that require evacuation resources at given post exposure times.

b. Evacuation requirements will vary with the type of chemical agent used. Nerve agent casualties may not be evacuated because the time course of severe effects is relatively short. Depending upon exposure conditions, HD casualties may or may not require evacuation to a facility where they can receive care for several days, or possibly 6 to 9 months. Estimates provided in the guide can be used as a starting point from which to plan for evacuation resources.

I-23. In-Unit Care

The casualty estimates in the guide are presented with no allowance for in-unit care such as self-aid or buddy aid. Soldiers trained in first aid procedures may be the first to see chemical injuries. The guide can provide an estimate of the numbers of injured personnel who will require first aid. However, there may be need for rapid augmentation, support, or other intervention. Delays in obtaining medical care may occur because of physical damage or contamination of the surrounding area. The tables described in paragraphs 3.3.2 and 3.3.3 of the guide give the time courses of effects that may apply to estimation of in-unit and delayed medical requirements.

I-24. Patient Bed Requirements

Requirements for patient beds and hospitalization time may be greater after chemical exposures than after a conventional attack. Such increases are particularly important for agents, such as HD, that produce injuries followed by a long recovery period. Bed requirements can be estimated using the tables described in paragraphs 3.3.2 and 3.3.3 of the guide. Casualties Occurring by Time Period tables (see paragraph 3.3.3) in the guide are useful after an attack since they show gains and losses of casualties over time. Personnel by Injury Category tables (as described in paragraph 3.3.4) in the guide may be more useful in long-range planning. They show maximum numbers of personnel by injury severity category. The tables in the guide only

provide estimates for the first 30 days after attack. Depending upon the theater evacuation policy specified for the operation, hospital days may be either in theater or in the national area.

I-25. Medical Logistics

The estimates provided in the guide are intended to support projections of medical materiel and logistical requirements. Increased demands may occur for certain types of medical and general supplies. These may include specific equipment, kits, dressings, antibiotics, and other critical medical materiel. Demands may also increase for items unique to the chemical battlefield (such as nerve agent antidote autoinjectors), as well as items adapted to chemical environments (including IV systems and special self-contained intensive care units). Tables showing maximum numbers of personnel by injury severity category (see paragraph 3.3.4 in the guide) can provide useful input for logistical planning.

I-26. Medical Force Planning

a. The assignment of medical support is normally based upon the total military population and the expected conventional casualty rate. The guide may be used to assess requirements for additional medical units. The use of chemical weapons in tactical situations could be one indication of an increased tempo of warfare and need for additional personnel.

b. Although a unit may be targeted for chemical attack, that unit might not be located where the highest number of casualties could occur (as in a downwind hazard area). Accordingly, another unit might have priority for support. The tables presented in the guide can be used in planning for either situation. Some tables (see paragraph 3.3.4 in the guide) show estimated maximum numbers of personnel by injury severity category. Such estimates should be combined with a comprehensive array of other available information to increase the effectiveness of medical force planning.

c. The guide is organized into 11 sections. Section 1 introduces the guide and presents background and medical planning considerations. Section 2 provides information on the methodology used to develop the estimates of fatalities, casualties, and effectiveness of individuals remaining in the unit. Section 3 explores the use of the casualty prediction tables based on combat effectiveness decrements and estimates of the number of casualties categorized by insult level. Sections 4 through 10 contain tables of casualty estimates. Section 11 is a tutorial on use of the tool.

d. These medical worst-case casualty estimates (see paragraph 2.1.2 through 2.1.7 in the guide) are for personnel in the chemical-targeted and downwind hazard areas of the brigade sector. The actual areas presenting chemical agent hazards to personnel are relatively small and localized when compared to the entire brigade sector. These estimates are not valid for acute effects from repeated exposures, possible delayed effects of low dosage exposures, operational worst-case targeting, targets with different numbers or distributions of exposed personnel, or attacks involving different conditions (of meteorology, terrain, protective status, and so forth)

than are modeled. Although the guide is primarily designed to support medical force planning for future CW defense, it may be used to anticipate short-term requirements. For example, delayed requirements of HD victims for care or evacuation resources may be predicted from tables that give estimates of casualty numbers by injury type at given times after a CW attack (see paragraphs 3.3.2 and 3.3.3 in the guide).

Appendix J

FIELD EXPEDIENT PROTECTIVE SYSTEMS AGAINST NUCLEAR, BIOLOGICAL, AND CHEMICAL ATTACK

J-1. General

Medical units must have protection from NBC attack and contamination to survive and function effectively. The extent of protection provided is only limited by the resources available and efforts of unit personnel. Protection as simple as an individually dug foxhole or as elaborate as the subbasement of a concrete building may be used. Expedient protections from the effects of biological and chemical agents are usually much less labor intensive.

J-2. Protection Against Radiation

The level of protection from radiation is expressed in terms of shielding. Material is available on the battlefield to construct/prepare expedient fallout shelters that offer substantial shielding against gamma radiation (see Table J-1). Generally, the denser or heavier the material, the better shielding it offers. The degree of protection afforded by a fallout shelter is expressed as a "protection factor," or a "transmission factor." The protection factor is simply the fraction of the available radiation dose that penetrates the shelter and reaches those inside compared to the radiation received by an unprotected person. Thus, a protection factor of 2 indicates that an individual in the shelter receives one-half of the radiation dose he would receive if unprotected. A protection factor of 100 (associated with about six half-value thickness) indicates that only 1/100 or 1 percent of the radiation dose reaches the inside. Transmission factors are expressed in percentages, or in decimals. Either refers to that fraction of the ambient unshielded dose that is received by personnel within the shelter. Fallout gamma transmission factors for some common shelters are shown in Table J-2.

Table J-1. Shielding Potential of Common Materials—Fallout Gamma Protection

MATERIAL	1/2 VALUE LAYER THICKNESS*
STEEL	1.8 CM (.7")
CONCRETE	5.6 CM (2.2")
EARTH	8.4 CM (3.3")
WATER	12.2 CM (4.8")
WOOD	22.4 CM (8.8")

* 1/2 VALUE LAYER THICKNESS—THICKNESS OF A GIVEN MATERIAL WHICH REDUCES THE DOSE OR DOSE RATE TO APPROXIMATELY ONE-HALF OF THAT FALLING UPON IT.

*Table J-2. Transmission Factors for Nuclear Radiation**

ENVIRONMENTAL SHIELDING	NEUTRONS	INITIAL GAMMA	RESIDUAL
BUILT-UP CITY AREA (IN OPEN)	1.0	0.5	0.7
FOXHOLES	0.3	0.2	0.1

Table J-2. Transmission Factors for Nuclear Radiation (Continued)*

ENVIRONMENTAL SHIELDING	NEUTRONS	INITIAL GAMMA	RESIDUAL
FRAME HOUSE:			
FIRST FLOOR	1.0	0.9	0.5
BASEMENT	0.5	0.3	0.1
MULTISTORY BUILDINGS:			
TOP FLOOR	1.0	0.9	0.1
INTERMEDIATE FLOORS	0.9	0.9	0.02
LOWER FLOOR	0.9	0.5	0.1
BASEMENT	0.5	0.3	0.01
SHELTER, CLOSED 91 CM (3 FT)			
(EARTH COVER)	0.05	0.02	0.005
ARMORED VEHICLES:			
ARMORED PERSONNEL CARRIER	0.3	0.2	0.1
TANKS	0.3	0.2	0.1
WOODED FOREST	1.0	1.0	0.8

* INSIDE DOSE = TRANSMISSION FACTOR TIMES OUTSIDE DOSE.

J-3. Expedient Shelters for Protection Against Radiation

a. In many cases it will be unnecessary to construct field expedient or other types of fallout shelters. There are many structures and terrain features available that afford a degree of fallout protection. Existing fallout shelters are tunnels, caves, culverts, overpasses, ditches, ravines, and man-made structures. The best existing shelters are basements. Figure J-1 shows typical protection provided in buildings. Windows can be sandbagged or covered with dirt from the outside to provide additional protection.

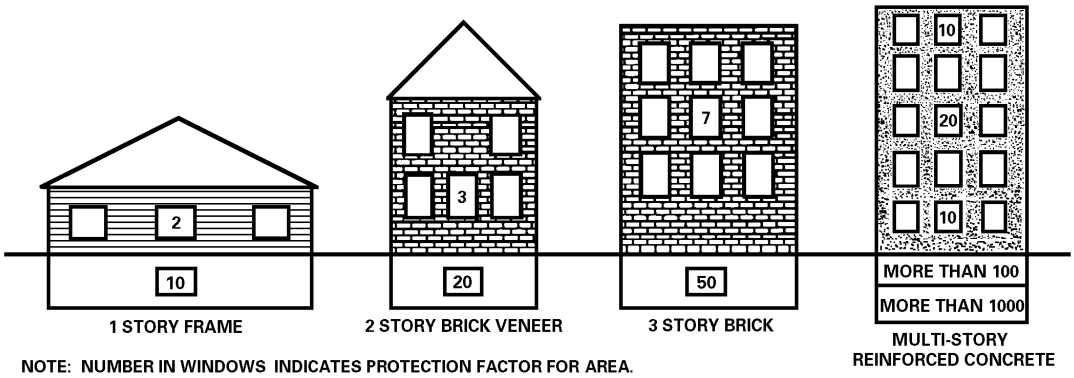

Figure J-1. Typical shelter protection provided in buildings.

b. Planners should attempt to locate HSS units near existing shelters, whenever possible. However, if an HSS unit is already established, or must be established where fallout shelters are not available, then a shelter must be constructed. Elaborate shelters are not required, since they usually only need to be occupied for a few days. There are a number of field expedients that will serve to save personnel and patients even though they may not be comfortable for those few days.

c. When engineer support is available, a bulldozer trench about 2.7 meters (9 feet) wide and 1.2 meters (4 feet) deep can be dug (Figure J-2). The length of the trench will be determined by the number of patients/personnel to be sheltered. About 0.6 meter (2 feet) length of trench is required for each person to be sheltered. These trenches reduce exposure of personnel lying on the floor to about 20 to 30 percent of the radiation that they would receive in the open. Protection and comfort can be improved, as time permits, by digging the trenches deeper; undercutting the walls (care must be taken in this option; the earth may cave in); erecting tents over the trenches; and providing improved flooring. When used with other individual and collective protection measures, bulldozer trenches provide adequate fallout shelters for most situations; they can be provided in a minimum of time and effort. Trenches should not be dug in areas subject to flooding during rainstorms; a berm should be formed on the uphill side of the trench to direct water around the trench in the event rainfall occurs in the area. Undercutting will not be possible in sandy soil; also some form of support to keep the walls from caving in is required.

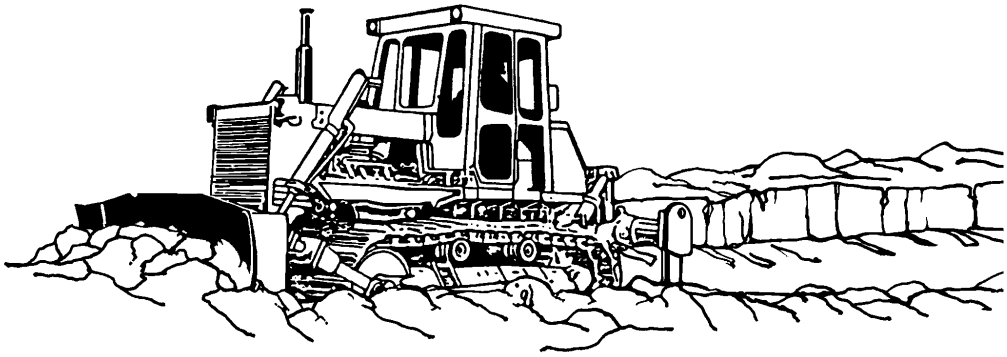

Figure J-2. Dozer trench.

d. Dug-in tents (Figure J-3) for hospitals provide more comfort and require less movement than the bulldozer trench; however, they have two drawbacks. First, they offer far less radiation protection than the bulldozer trench, and second, they require considerably more engineer effort. This option should work well with GP tents, but will probably be hard to accomplish with the TEMPER.

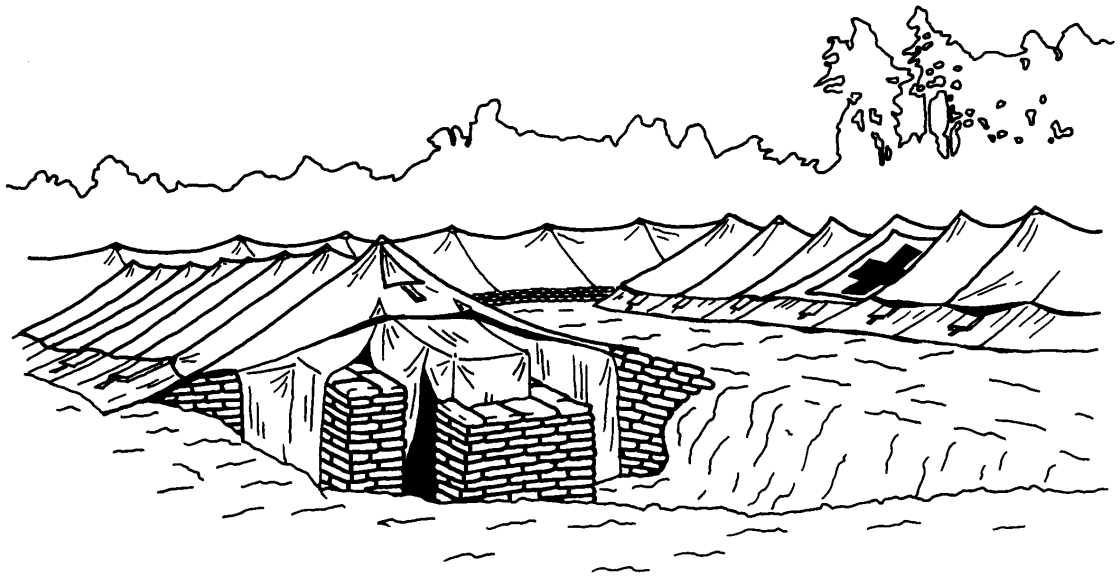

Figure J-3. Dug-in tents.

e. Sandbagged walls around the hospital tents, as shown in Figure J-4, or lightly constructed buildings provide protection from fallout. Sandbagged walls 1.2 meters high give significant protection (20 to 40 percent transmission factor); however, the effort required to achieve the protection is such that it is marginally feasible. Sandbagging is an effective means for supplementing other shelters by—

- Bolstering the shielding at weak points.
- Forming baffles at entryways.
- Blocking open ends of trenches.
- Covering windows and gaps.

f. When other shelters are not available, HSS units must prepare foxholes and trenches for patients and unit personnel. As time permits, improve these shelters by deepening, covering, undercutting, and sandbagging.

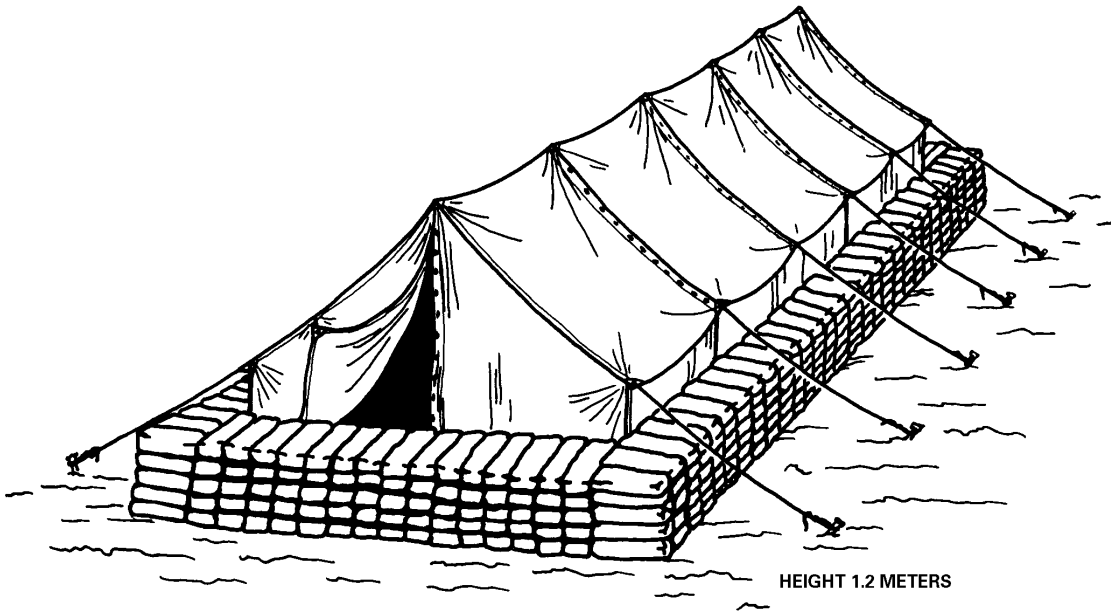

Figure J-4. Sandbag walls around tents.

J-4. Expedient Shelters Against Biological and Chemical Agents

a. When CPS systems are not available, well-sealed shelters (TEMPER, ISO, and GP) can significantly minimize or prevent the entry of CB agents. The ventilation system must be turned off, and kept off, before, during, and after the attack. The shelter must be totally sealed during this time to maximize protection. Table J-3 provides examples of protection values for well-sealed shelters. For example, a well-sealed TEMPER will only permit 1/60 of the CB agent outside to enter the shelter. If a persistent agent is used, be aware of agent off-gassing hazards. Persistent agents can penetrate TEMPER fabric and create a vapor hazard inside. In a CB agent attack, ensure that all staff and patients are protected by wearing their MOPP or are in PPWs.

Table J-3. Ratio of Nonpersistent Agent Concentrations (Inside/Outside) for Different Shelters

SHELTER	RATIO INSIDE/OUTSIDE
TEMPER TENT	1:60*
GENERAL PURPOSE TENT, MEDIUM, WITH COTTON LINER	1:50
GENERAL PURPOSE TENT, LARGE, WITH COTTON LINER	1:30
ISO SHELTER	1:60

* THE VENTILATION SYSTEM MUST BE TURNED OFF ON ALL SHELTERS TO PROVIDE THIS LEVEL OF PROTECTION.

b. Sealing shelters to prevent entry of CB agents does not require elaborate materials or procedures.

(1) Materials needed for sealing shelters include, but are not limited to the following:

- Duct tape (or similar tape) for sealing.
- Velcro kits for TEMPER.
- Sand/dirt to seal base of GP tents.
- Plastic sheeting and tape to seal large openings, such as doors and windows of GP tents.

(2) All vulnerable areas must be sealed. Seal—

- Joints in ISO shelters and GP tents with tape. Tape does not work very well on TEMPER fabrics; use Velcro kits.
- Base of GP tents with sand/dirt.
- Stovepipe openings with tape and plastic.
- Windows of GP tents with tape and plastic. Seal TEMPER tent windows by aligning and securing the Velcro border tightly; tape may be applied to the seams to provide some additional barrier.
- All ISO shelter doors that do not have CB protective seals, with tape. Seal GP tent doors with plastic sheeting and tape.
- All windows, doors, and other openings of fixed sites with plastic and tape.
- All air ventilation system vents.

NOTES

1. Do not allow any entries/exits to shelters during a CB attack.

2. In hot climates the heat load will rise in sealed shelters with the ventilation system turned off. Personnel must carefully monitor each other and the patients. All personnel must drink plenty of water to prevent heat injuries; see FM 21-10.

Appendix K

FOOD CONTAMINATION AND DECONTAMINATION

K-1. General

a. Food Susceptibility. Stored, transported, and prepared food is susceptible to NBC contamination throughout the TO. Planning for any battle or operation must include food protection from contamination; food contamination detection; and contaminated food disposition (decontaminate or destroy).

b. Agencies responsible for food Contamination / Decontamination:

(1) Air Force

- In Air Force units a vulnerability assessment is carried out by a team composed of medical personnel (Typically a public health officer), Services squadron, Civil Engineering, Office of Special Investigation, transportation, and security personnel. Food decontamination assessment and recommendations are provided to the responsible property officer by the Wartime Medical Decontamination Team. Food decontamination is carried out by a food decontamination team. Specific Air Force guidelines for food inspection and decontamination are found in *Air Force CONOPS for the Wartime Medical Decontamination Team* and AFMAN 10-2602*, NBC Defense Operations and Standards*.

(2) Army

- US Army Veterinary personnel are responsible to evaluate food supply and recommend decon or disposition procedures. Unit commanders and supply support personnel are responsible for decon and disposal

(3) Navy/Marine

- The medical department representatives responsible for public health (preventive medicine) is the Preventive Medicine Authority (PMA). This will be the senior environmental health officer/preventive medicine technician for the area of responsibility. Specific Navy guidance for food safety, water standards and preventive medicine for ground forces are contained in the NAVMEDCOM P-5010 *Manual of Naval Preventive Medicine*. In the absence of a Navy PMA Army veterinary technician, independent duty corpsmen, senior general duty corpsmen or medical officers may be designated.

c. Countermeasures. There are three primary countermeasures to overcome or reduce the NBC hazard to food:

(1) Contamination avoidance.

(2) Nuclear, biological, and chemical agent detection.

(3) Nuclear, biological, and chemical agent decontamination.

d. Priorities. The priorities for conducting NBC countermeasures are—

(1) *Contamination avoidance*. Contamination avoidance includes using natural and fabricated barriers to prevent, or significantly reduce the spread of contamination. Also, using specific procedures for entry and exit between contaminated and uncontaminated areas reduce the potential for spreading contamination. Use of these barriers and procedures may reduce the subsequent need for detection and decontamination.

(2) *Detection, measurement, and identification*. These activities are essential for determining the presence, extent, and nature of NBC contamination. This information is essential in identifying the existence of uncontaminated supplies, or decontamination requirements.

(3) *Decontamination*. Decontamination removes the contaminant and provides food that is safe for consumption.

d. Decontamination. Decontamination efforts require an extensive amount of labor, time, and supplies. The use of hasty decontamination is emphasized. That is, decontaminate just enough to sustain operations and keep fighting, rather than to make a contamination-free environment. Normally, decontamination efforts will be limited to the packaging and packing materials. Food decontamination will only occur in critical situations where other food supplies are not available. Most decontamination is performed in or very near the AO. Before beginning decontamination procedures, divide exposed food items into groups based on protection of item at time of exposure. These groups establish priorities based on ease of decontamination and the ability to monitor the food.

(1) Group I—Canned or packaged items exposed only to a chemical agent vapor.

(2) Group II—Canned or packaged items that are contaminated on the outside with a liquid chemical agent, a biological agent, or radioactive fallout.

(3) Group III—Unpacked or poorly packaged items that have been exposed to any NBC agent.

(4) Group IV—Food contaminated through the food chain.

K-2. Protection of Food from Contamination

An adequate defensive posture for a chemical attack will also protect food against biological contamination and radiation fallout.

a. Operational Rations. Operational rations include, but are not limited to, MREs; unit group ration (UGR), A; unit group ration, heat and serve; and medical diet supplement.

(1) Packaging materials and storage methods normally protect these rations. The packaging and packing of operational rations protect the contents from deterioration. As a result, the contents are protected from moisture, to include chemical liquids, chemical vapors, and biological agents. Operational rations delivered to an AO will usually have increased levels of packaging and/or packing protection. Operational rations are substantially protected while contained in the shipping cases, especially if protected with an overlay of fiberboard, shrink wrap, or film wrap.

(2) Enclosed storage is used whenever possible. Refrigerated warehouses, cold storage rooms, and even prefabricated refrigerators and trailers provide excellent protection. Underground shelters, caves, and tunnels that can be made airtight provide maximum NBC protection. Buildings provide protection depending on how well they can be closed and sealed. The basement of a building is a good storage place. However, keep in mind that chemical vapors tend to seek out low-lying areas. Storing rations indoors will protect them from liquid droplet and fallout contamination unless the building is damaged by an attack. Complete protection against chemical vapors is only offered by airtight closed spaces like cold storage facilities.

(3) Chemical protective measures are to be integrated into daily logistical operation to avoid the contamination of operational rations. Maximum use is made of alarm and detection equipment, overhead shelter, shielding materials, and protective covers. Back up stocks of operational rations should be dispersed to minimize the risk of destruction or contamination.

(4) An NBC Protective Cover or similar equipment will help greatly. The NBC Protective Cover is discarded and replaced upon becoming contaminated; it reduces overall decontamination requirements; and it improves the survivability of supplies and equipment. The NBC Protective Cover provides 24-hour protection against liquid chemical contamination. Detection paper used on the NBC Protective Cover will rapidly identify a contaminated cover.

b. Bulk and Fresh Foods.

(1) Field expedient or improvised storage may be the only choice available under high-risk conditions. Expedient storage for food supplies may be a natural or man-made depression lined to protect contents against moisture, and then covered with earth and sod. The earth gives good protection against all forms of chemical or biological contamination and nuclear fallout.

(2) Foods are only stored outdoors or in partially protected areas when absolutely necessary. Only cases of foods packed in cans, bottles, or airtight foil or film wraps, and foods packed in sealed boxes or multilayered wrappings can be subjected to exposed storage. Partial protection is provided by open sheds, temporary roofing, or tents. When subsistence must be stored in the open, give as much protection as possible. Protection material may include NBC Protective Covers, tarpaulins, tarpaulin sheds, or any other available covering such as plastic sheeting. Tarpaulins and other treated or waterproof coverings do not prevent contamination by chemical vapors, but they do reduce contamination from liquid agents. Canvas will keep out more than 95 percent of liquid contamination for a short period of time after the attack. The canvas must be removed soon after the attack to prevent the agent from seeping through onto the subsistence; placement of spacers between the covering and the food will greatly reduce this problem. Even the thinnest material will offer some protection and is better than nothing at all. Therefore, food supplies must be covered by whatever material is available.

K-3. Nuclear

a. Contamination.

(1) Following a nuclear detonation, food can become contaminated in three ways:

- *Direct contamination*. Direct contamination results by fallout collecting on plants, animals, and stored food (surface contamination). Fallout has two effects. First, it produces a gamma radiation field over the fallout area. Second, it contaminates the surface of anything on which

it is deposited. The whole-body gamma irradiation hazard to an individual far outweighs any potential hazard from food contamination. The basic rule is: If you can safely be in the area to salvage the food, then the food salvaged is safe to use (although slightly contaminated).

- *Indirect contamination*. This form of contamination can be spread throughout the food chain. Humans can ingest contamination by eating plants that have absorbed radioactive isotopes; products (milk or meat) from animals allowed to graze on contaminated pastures; or fish from contaminated water.

- *Induced radiation*. It is possible that food will be exposed to sufficient neutron flux (an increase in the number of free neutrons) as the result of a nuclear explosion to produce considerable induced radioactivity in food without it being destroyed by blast and heat. This is possible with enhanced radiation weapons in the energy range of 1 KT where the radiation kill radius exceeds the blast destruction zone. The elements that are most prominently involved are sodium, potassium, sulfur, copper, bromine, zinc, and especially phosphorous. Thus, in an area of induced radiation, foods requiring the most caution are dairy products, high salt content foods, dry beans, raisins, and ready-mixed cake and biscuit flours. The radioactivity has a short half-life; therefore, the radiation will decay very rapidly. It should be possible to consume foods containing induced radiation within a week or two. Cans, particularly those with "C" enamel, may incur a high level of induced radiation (from zinc in the enamel, not from iron in the can). Glass, because of its high salt content, will show very high levels of activity; clear glass will turn brown. Container radioactivity has no bearing on the food, it is safe to use. The radioactivity is not transferred to the contents. No significant toxic by-products are formed in the exposed canned food.

(2) Consumption of food contaminated with radioactive fallout may cause a risk of radiation injuries from internal radiation; that is, radiation from radioactive sources within the body. Most isotopes will pass through the digestive tract or be excreted very quickly. However, the intestinal tract may receive a considerable dose. Some isotopes are more hazardous because they are absorbed from the digestive tract and enter the metabolism of man and animals.

- Strontium-89 (Sr-89) and Strontium-90 (Sr-90) are beta emitters and have half-lives of 51 days and 28 years, respectively. Therefore, Sr-90 is the greatest radiation hazard in the long term. These two isotopes are absorbed in the body and used in the same way as calcium. They accumulate in bone, where bone marrow with its blood forming cells is vulnerable. Milk and other dairy products are the primary sources of Sr-89 and Sr-90 in the human diet.

- Iodine-131 (I-131) is a beta and gamma emitter and has a short physical half-life of approximately 8 days. It is efficiently absorbed and used by the body. Iodine-131 will contaminate plants that will be eaten by grazing animals. Smaller amounts can also be absorbed by breathing contaminated air. Cattle will excrete a large amount of I-131 in milk. Milk and other dairy products are the primary sources of I-131 intake. One can also get smaller amounts by eating contaminated fruits and vegetables. Iodine-131 will be concentrated in the thyroid gland. The intake of I-131 will have its greatest impact the first few days to weeks following a nuclear explosion.

- Cesium-137 (Cs-137) is a beta emitter and has a half-live of 30 years, but is eliminated relatively quickly from the body. The biological half-live is 70 to 140 days. Cesium-137 is found in most tissues of the body, but it will concentrate in muscle tissue. Cesium-137 is absorbed and used the same way as potassium. Meat and milk are the primary sources of Cs-137. Much precipitation, lack of minerals in the soil, and extensive cultivation increase the plants' absorption of Cs-137; thus, the contamination of plant products.

(3) Operational rations are safe when surface decontamination is performed before breaking the package. Operational rations stored close to ground zero may become radioactive from induced radiation. It is more likely, however, that the food will be damaged or destroyed by the blast and thermal effects of the nuclear explosion.

(4) Bulk and fresh food stored in the open without protection will be contaminated. Decontamination is very difficult and time-consuming. Efforts should be made to ensure proper packing to prevent food contamination from radioactive fallout. Packing made from hard and nonporous materials, such as plastic or multilayer cardboard with a smooth surface, should be used. In addition, storage facilities should be enclosed to avoid the entry of fallout. Any material used as a protective cover will give some protection against nuclear fallout. Protection against induced radiation, blast, and thermal effects requires a hardened shelter or underground storage.

(5) Food supplies require protection throughout the chain of production or procurement. Protection of the civilian-based food supply includes countermeasures along the production chain. Meats and milk are the most vulnerable products because of the possibility for concentration of radioactive isotopes (Strontium, Cesium, and Iodine). The primary, and possibly the only, protection of animal products is to keep the animals indoors and to avoid contaminated fodder. Immediate slaughter of food animals is recommended if there is a shortage of uncontaminated fodder. Also, food animals exposed to fallout should be considered fit for consumption and slaughtered using routine procedures. Unharvested crops cannot be protected.

b. Inspection and Monitoring.

(1) Fallout close to ground zero, especially after a surface burst, may be visible as dust. The presence of dust is an immediate indicator of contamination. Fallout on unprotected food produces a grittiness that is unpleasant and warns against eating the food. The degree and means of food protection (packaging and storage facilities) must be considered. Food in a building that remains intact should not receive enough contamination to be dangerous when eaten.

(2) Veterinary units have the AN/VDR2 Radiac Set and UDR13 dosimeter to conduct ground or aerial surveys for gamma radioactive contamination levels in an area. The measurement of the external gamma radiation in the fallout area is an indication, but not a quantitative measure, for the degree of hazard from food contamination. These units also use the AN/VDR2 Radiac Set for point detection of gamma and beta radiation sources. Food monitoring is conducted in an area with low background radiation. If the storage area is contaminated, the food must be moved to a cleaner area for monitoring. With the AN/VDR2, the initial food monitoring is performed with the probe cover in place and the probe passed approximately 6 inches from the surface. If the reading is twice the background dose rate, the food is considered contaminated. If the reading is not above the background level but contamination is still suspected, place the probe closer to the food with the beta probe cover off. Monitor meat and fish with the probe cover off; pass the probe approximately one-half inch from the surface of the food.

(3) Monitoring food contaminated through the food chain is more complicated; depending on the detection instrument used, special procedures must be followed. Gamma and beta emitting radionuclides in small volumes may be detected using radiac sets such as the AN/VDR2; however, alpha emitting ones cannot. They are rough instruments and may be used only for screening surface contaminated food. To evaluate the hazards; the isotopes contributing to the radioactivity must be identified. Surface contaminated food will contain a mixture of isotopes with some more hazardous than others, depending upon whether they are used by the body. Milk will

contain mostly I-131, Cs-137, Sr-89, and Sr-90. Meat and fish will contain mostly Cs-137. To verify I-131, Cs-137, Sr-89, and Sr-90 contamination, samples must be sent to laboratories equipped to analyze the samples.

(4) All newly selected food supplies must be surveyed. Begin continuous monitoring immediately following receipt of a fallout warning, or when increased levels of radiation are detected by periodic monitoring.

(5) Periodic monitoring is needed to establish baseline levels of background radiation in the environment and various food products. This monitoring is performed during peacetime, when possible, and throughout the time US forces are deployed in a TO.

NOTE

The AN/VDR2 is being replaced by the AN/PDR77 Radiac Set.

c. Decontamination. There are two methods for nuclear decontamination: aging and removing. Aging is the process of allowing natural radiation decay to occur. The time necessary for this decay to take place depends upon the isotopes present; each has a different decay rate (half-life). Aging may not be possible when there is a short food supply. In some instances, such as with induced radioactivity, it may be the only way to decontaminate. Removing nuclear contamination from areas, personnel, food, or moving equipment to another location eliminates the immediate hazard. To determine which decontamination method is required, food supplies are divided into groups. See Table K-1 for additional information on food items and decontamination.

(1) Group II—Food in sealed and dust-proof packing such as cans, jars, fiberboard, and cellophane. These products are easily decontaminated by removing the radioactive dust covering the packing; brush, wash with soap and water, or remove the packing (depending on the type of packing material). If radiation is still detected after removing the dust, repeat the brush/wash procedure and remonitor. If radiation is still present, the food itself is then considered radioactive (induced radiation) and is unfit for consumption. Decontamination of induced radiation is possible only through aging. After aging one to two weeks, the food should be safe for consumption. After surface decontamination, the contents are safe to eat unless the food has induced radiation.

(2) Group III—Unprotected food. The method chosen to decontaminate unprotected food items will depend upon whether or not the food supply is critical. If the food supply is not critical, the contaminated items are isolated and allowed to decontaminate by aging. If the food supply is critical, food with surface contamination can, in principle, be decontaminated by removing the contaminated surface, or by washing.

(3) Some products can be decontaminated by washing, peeling, or trimming the outer skin or leaves. Decontaminate potatoes and hard-skinned fruits and vegetables by washing or scrubbing under running water, followed by peeling or scraping, then washing again. Potatoes, carrots, beets, and turnips can be washed at the supply depot. However, do not wash beans, rice, and onions until they are delivered to the field kitchen; washing reduces their storage quality and shelf life. Citrus fruits, pineapples, corn, peas, beans, melons, pumpkins, cabbage, and nuts can be peeled. Decontaminate cucumbers, tomatoes, cherries, cranberries, grapes, pears, plums, and thin-skinned squash by soaking in a water or detergent solution and rinsing with vigorous agitation or brushing. Apricots, peaches, most berries, asparagus, broccoli, and leafy vegetables cannot be satisfactorily

decontaminated because of fuzzy surfaces, irregular shapes, or small size, which makes washing difficult.

- Fresh carcass meat, sausages, and fish can be decontaminated by several washings with cold water. The exterior layer of the food item is removed if radioactivity is still present. There is, however, a risk of contaminating the inner parts of the foodstuff in the process. Cooking with several changes of water is the last step in decontamination.

Table K-1. Decontamination of Food Supplies

SURFACE OR MATERIAL	TYPE OF CONTAMINATION: CHEMICAL	BIOLOGICAL	NUCLEAR
CANNED, BOTTLED, OR PROTECTED BY IMPERMEABLE CONTAINER.	IMMERSE IN BOILING, SOAPY WATER FOR 30 MINUTES AND RINSE.	WASH WITH SOAP AND WATER, THEN IMMERSE IN DISINFECTANT SOLUTION. (IMMERSE IN BOILING WATER FOR 30 MINUTES, FOOD DISINFECTANT, OR 1/3 CANTEEN CUP OF HOUSEHOLD BLEACH IN 10 GAL OF WATER).	WASH WITH SOAP AND WATER, BRUSH, WIPE FOOD FROM SURFACE OF CONTAINER.
CHLORINE, CONTAMINATION	SPRAY WITH DS2 AND RINSE.		
	WASH IN HOT, SOAPY WATER, RINSE, AND AERATE.	BOIL IN WATER 15 MINUTES; NOT EFFECTIVE ON TOXINS AND SOME SPORES.	
		IMMERSE IN 5% SODIUM CARBONATE (4 LB WASHING SODA IN 10 GAL WATER), RINSE WITH POTABLE WATER.	
		IMMERSE IN HOUSEHOLD BLEACH SOLUTION (1/2 GAL BLEACH IN 25 GAL WATER) FOR 30 MINUTES THEN RINSE AND AERATE FOR 10 MINUTES.	
		IMMERSE IN HTH SOLUTION (1/2 LB IN 25 GAL WATER) 20 MINUTES, THEN RINSE.	
		IMMERSE IN STB SOLUTION (1 LB IN 25 GAL WATER) 30 MINUTES, THEN RINSE.	
		IMMERSE IN 2% PERACETIC ACID FOR 10 MINUTES, RINSE, AND AERATE FOR 10 MINUTES.	
NOT CANNED OR IMPERMEABLE CONTAINER. FOOD.	FOOD KNOWN OR SUSPECTED TO BE CONTAMINATED	BOIL IN WATER 15 MINUTES. COOK.	WASH OR TRIM CONTAMINATION FROM UNPACKAGED FOOD. SHOULD NOT BE CONSUMED UNTIL APPROVED BY
	IMMERSE IN OR SPRAY WITH 2% HOUSEHOLD BLEACH SOLUTION. PACKAGED, PEELED,		

VETERINARY PERSONNEL. OR PARED FOOD MAY BE IMMERSED OR SPRAYED.

- Decontaminate hard cheeses, margarine, and butter by cutting off the outer layer to a depth of 2.5 to 3 cm.

- Let cooking oils stand for 3 to 5 days, then pour off the contaminated layer; use a funnel to control spillage.

- Nonperishable items that are hard to decontaminate, such as flour, sugar, and salt, can be set aside allowing natural radioactive decay. When supplies are short, dilute the contamination by mixing with uncontaminated food. This will reduce the total amount of radioactive exposure in foods prepared using these contaminated items.

- Decontaminate air permeable, double-sacked goods by removing the outer sack. If the inner sack is free of radiation, double sack the food again to restore protection. However, when contamination is present on the inside bag, the food in contact with the bag is likely to be contaminated. Three methods can be used to handle this type of contaminated product. The easiest method involves spraying the bag of dry goods (except sugar or salt) with water. This will wet a layer of the food inside the bag. The wet layer can be removed when the bag contents are emptied. The uncontaminated contents are scooped back into clean packaging. Another method involves using melted paraffin to uniformly coat the outside of the bag. The paraffin solidifies after 30 to 40 minutes, and then the bag with the radioactive contamination can be removed from the contents. Although this method will seal the radioactive substance in the wax, it probably will not remove the layer of contaminated food product inside the bag. For the third method, form a piece of sheet metal into a cylinder the same height as the bag and 4 to 6 cm smaller in diameter. Insert the cylinder into the bag, then remove the top 3 to 4 cm of the contaminated product. Carefully scoop the remaining product out into a clean sack. With the cylinder still in place, fold the bag down catching the contaminated product on plastic sheeting, or a tarpaulin. When using this method, mixing the contaminated portion with the uncontaminated portion is a problem. Check for contamination remaining in the product.

- Boiling or cooking has no effect on radioactive contamination.

(4) Group IV—Food contaminated through the food chain. It is not practical to decontaminate this food. Meat and milk are the two most common foodstuffs contaminated in this way.

- Milk may be decontaminated to a safe level by a complicated ion exchange process. The I-131 activity will decline rapidly during storage of milk and milk-products, although the Cesium and Strontium activity will remain almost constant for years. In an area with high-level fallout, milk is withdrawn from human consumption. The duration of withdrawal will be dependent upon the type of fallout and levels.

- Meat may be decontaminated to a safe level by soaking in water or brine. Cesium is loosely bound in the meat. By repeated soaking of meat cut in small pieces, most of the Cesium activity will be removed. Traditional meat preserving, such as salting with brine, will remove up to 60 to 70 percent of the Cesium activity. See Table K-2.

- Fruits, vegetables, root crops, and grain products may also contain hazardous

amounts of radioactivity if ingested.

(5) Food animals. Food animals that have been exposed to fallout should be considered fit for consumption and slaughtered using routine inspection and slaughter procedures. In those cases where the animal has been exposed to fallout, but is not scheduled for immediate slaughter, the radiation burden can be reduced by moving the animal to an uncontaminated area (barn if available) and washing it with soap and water. Mild radiation sickness does not necessarily mean that the animals cannot be used for food. If the animals have been exposed to an internal radiation hazard, the meat can be eaten if the internal organs are discarded. Chickens that have eaten radioactive material may lay contaminated eggs, but most of the radioactivity will be concentrated in the shells. The white and yolk will be free of harmful amounts of radiation and can be eaten. Chickens will not lay eggs if the radioactive body burden is large enough that their eggs are unfit to eat.

Table K-2. Traditional Salt Preserving Brine

MEAT, WHOLE 4-5 KG

25% NaCl (SALT) BRINE. 5-LITER BRINE PER KG.
KEEP MEAT IN BRINE FOR 3 WEEKS, TEMPERATURE BELOW 10°C.
SOAK IN WATER FOR 1-2 DAYS.
65-70% OF CS ACTIVITY WILL BE REMOVED.

MEAT, CUT 1-2 KG

25% NaCl BRINE. 5-LITER BRINE PER KG.
KEEP MEAT IN BRINE FOR 4 DAYS.
SOAK IN WATER FOR 4 HOURS.
65-70% OF CS ACTIVITY WILL BE REMOVED.

MUTTON/LAMB RIB

PIECE OF RIB 1-5 KG.
25% NaCl BRINE. 5-LITER BRINE PER KG.
KEEP IN BRINE FOR 2 DAYS.
SOAK IN WATER FOR 2 HOURS.
AIR-DRYING FOR 10 DAYS.
SOAK IN WATER FOR 2 HOURS.
BOIL IN WATER FOR 3 HOURS.
85-90% CS ACTIVITY WILL BE REMOVED.

DECONTAMINATION OF COARSELY CHOPPED MEAT

0.9% NaCl SOLUTION. 2-LITER SOLUTION PER KG.
SOAK IN NaCl SOLUTION FOR 10 MIN.
60-70% CS ACTIVITY WILL BE REMOVED.
REPEATED PROCEDURES WILL REMOVE THE SAME PERCENTAGE OF CS ACTIVITY.
SIX TIMES REPEATED TREATMENT WILL REMOVE NEARLY 100% OF CS ACTIVITY.

d. Considerations When Decontamination is Not Possible. When food cannot be decontaminated, sealing the product in a wrapping material or container may be needed. Sealing the product can reduce or shield the emanation of the contamination and/or fix the contamination in place. The hazard from contaminated food is small compared with that from external gamma radiation. Hungry people or animals should not be denied food because of possible fallout contamination. It is not practicable or desirable to pre-set maximum permissible limits of gross fallout radioactivity as a basis for judging whether or not food should be used. Common sense must be applied in establishing priorities for distribution of available food. For example, use the least

contaminated and the most protected food first; hold milk products for 1 to 2 weeks before use.

K-4. Biological

a. Contamination. Biological warfare agents exist in the form of toxins and microorganisms. The normal packaging and packing of food (to protect against moisture, dust, and bacterial or other contamination) provides protection against most biological agents. The exception may be toxins and biologically derived substances. However, the protective methods used for chemical agents will also protect against toxins and derived substances. Food in freezers, refrigerators, and in refrigerated trucks or rail cars will be safe if these containers remain sealed until the outer surfaces are decontaminated.

(1) It is unlikely that a biological agent will affect the appearance, taste, or smell of the food enough for the change to be apparent.

(2) Packaging and packing materials are not life supportive to pathogenic agents and are, therefore, self-decontaminating with the exception of spore-forming organisms.

(3) Most operational rations are packaged in metal containers, or encased in heavy aluminum laminated plastics that can withstand boiling water; also, they are impervious to arthropod penetration. This food is highly resistant to biological agents.

(4) The use of unpackaged items (unwrapped meats, fresh fruits, and vegetables) should be restricted; use only operational rations. Unprotected fresh food stored in the open and close to the source of dissemination will become contaminated.

b. Detection.

(1) Rapid identification of agents used is absolutely essential to implement effective countermeasures. Agent identification must be achieved quickly; it is the first step in answering critical management questions. What adjustments must be made in food preparation and distribution? What are the essential countermeasures? What is the expected outcome of the incident?

(2) Samples of food that are suspected of being contaminated are transported to the designated supporting laboratory. Samples must be accompanied by a description of the samples, the sample collection procedures, and the circumstances, which prompted the collection. The designated medical laboratory in the TO will provide a field confirmation identification of the agent(s). Designated CONUS laboratories accomplish definitive identification. See Appendix H for sampling procedures.

NOTE

New biological detection equipment is under development that will enable units to conduct presumptive identification of biological warfare agents. However, samples must also be collected and processed as described in Appendix H.

c. Decontamination.

(1) Food contaminated with toxins is handled in the same manner as food contaminated with chemical agents. Food contaminated with microorganisms is handled in the same manner as when contaminated with the more common foodborne disease-producing microorganisms.

(2) Several methods are available to decontaminate food items contaminated with biological agents. The following decontamination methods **are considered to be the minimum**. See Table K-1.

(3) Group II food that is sealed in containers that are resistant to the passage of biological agents requires only that the exterior of the container be decontaminated. Decontamination of these items is as follows:

(*a*) For containers made of metal, glass, plastic, or porcelain:

1. Thoroughly wash the container in potable water and soap, or in a disinfectant solution. If the water used for washing is contaminated, the soap and water wash may increase, not reduce, the contamination hazard. After which, the food containers are immersed in a disinfectant solution for 30 minutes (see Table K-3); then rinsed with potable water, if available and time permits. Chlorine solutions are not as reactive or corrosive as DS2.

2. Place the containers in boiling soapy water for 15 minutes; then rinse with potable water.

NOTES

1. The chemical field decontamination kits do not meet the requirements to decontaminate food supplies exposed to biological agents.

2. The same procedures should be followed even if there is only suspicion of a biological warfare attack.

(*b*) Thoroughly wipe containers that will not withstand soaking with a cloth soaked in a chlorine detergent solution. Remove the food from the container and place it in Group III.

(*c*) Metal or glass containers determined to have trichothecenes (Yellow Rain) present can be decontaminated using DS2. Allow a contact time of 5 to 30 minutes for the DS2 to neutralize the toxin. Then rinse the container with potable water.

(4) Group III food items that are not protected by the packaging material are decontaminated or disposed of as follows:

(*a*) Decontaminate foods that can be peeled or pared by immersing them in a disinfectant solution for 30 minutes, and then rinsing them with potable water (see Table K-3). Peel or pare the items after decontamination, then wash and, if appropriate, cook before eating.

(*b*) With the exception of certain heat-stable toxins, heat is the most practical means of decontaminating food. Several heating methods may be used, but the method chosen depends upon the type of food to be decontaminated. The key is to apply as much heat as possible without rendering the food unfit.

1. Cook in a pressure-type cooker with 15 pounds of pressure at 250°F (121°C) for 15 minutes.

2. Cook in a low-pressure cooker at 228°F (109°C) for 1 hour.

3. Bake bread or related items at 400°F (204°C) for 40 minutes.

CAUTION

Bread made with toxin-contaminated flour (especially with trichothecenes) is still toxic.

4. Bake or roast meat at 325°F (163°C) for 2 hours.

5. Boil for at least 15 minutes when no other method is available.

(*c*) Although decontamination methods are provided above, vegetables such as lettuce, broccoli, and cauliflower, or unwrapped meats that have been exposed to biological agents should not be eaten.

(*d*) Foods, such as butter, ice cream, and bread that will not withstand any of the above treatments must be destroyed.

(5) Established meat inspection procedures are followed when animals exposed to biological agents must be used for food. The meat must be thoroughly cooked.

Table K-3. Chlorine Solutions for Decontamination of Biological Warfare Agents

CHLORINE SOURCE	MIXTURE TO PRODUCE 200 PPM SOLUTION OF AVAILABLE CHLORINE
HOUSEHOLD BLEACH	1/2 GAL/25 GAL WATER
HIGH-TEST HYPOCHLORITE (CALCIUM HYPOCHLORITE)	1/2 LB/25 GAL WATER
SUPERTROPICAL BLEACH	1 LB/25 GAL WATER

K-5. Chemical

a. Contamination.

(1) Contamination of foodstuffs by a chemical agent may occur at any point on the battlefield. This contact may render the food unpalatable also. In many cases, decontamination is difficult, thus, emphasis must be placed on protection. Keep food supplies covered at all times. Take special precautions to protect food that is not packed in protective packages. Unprotected food, forage, and grain supplies may be so contaminated that their consumption will produce gastrointestinal irritation, or systemic poisoning. Nerve agents, vesicants, and arsenicals are the most dangerous. Field concentrations of phosgene, hydrocyanic acid, irritants, and smokes will seldom be high enough to cause serious food contamination. The effect of CK on food is not known. As a precaution, foods exposed to CK should be considered toxic.

(2) The effects of chemical agents on food depend on the nature of the agent and the type of the food. The extent to which chemical agents penetrate food also depends on the amount, form of dispersal (liquid [droplet size], or vapor) and duration of exposure. Nerve agents and mustard will penetrate deeply into unprotected fatty foods and will readily penetrate granular products such as grain and sugar. Liquid food products can be completely contaminated. Arsenicals readily hydrolyze to poisonous arsenical oxides in some foods. Foods can be divided into three categories based on their water content, fat content, and crystalline structure:

(*a*) Foods having a high water content, a low fat content, and/or a crystalline structure (fresh vegetables, fruits, sugar, salt, and eggs) will absorb mustard and nerve agents, either as a liquid or as a vapor. Nerve agents will be hydrolyzed slowly.

(*b*) Foods having a low fat content and an irregular (amorphous) structure (flour, bread, grain, rice, cereals, dried fruits, dried vegetables, tea, coffee, peas, and beans) readily absorb mustard and nerve agents in liquid form. As a vapor, these agents are absorbed to some extent, but are easily removed by airing.

(c) Foods having a low water content and a high fat content, such as butter, fat, fatty oils, ham, cheese, milk, bacon, fatty meat, and fish, absorb mustard and nerve agents such that removal of the agents is virtually impossible.

(3) Chemical agents can be physically and chemically absorbed into food. In addition to the toxic effect, they often adversely affect taste, smell, and the appearance of the food. However, chemical agents can cause the food to become very toxic without causing any other changes in the food. Table K-4 shows the effects of a number of chemical agents on food. Since food can be contaminated without any outward change in appearance, the possibility of contamination must be assumed in a chemical agent environment. Treat the food with the same precautions as established for known contaminated items.

(4) The protective properties of packaging materials are dependent upon a number of factors. The factors include the form of the agent (liquid versus vapor); concentration and exposure time; weather (temperature, wind speed, and humidity); and packaging material (the type of material, thickness, and the presence of folds, tears, and small holes). Even the thinnest material will offer some protection and is better than nothing at all. Therefore, always cover food supplies with whatever material is available. Table K-5 summarizes the protection values of various packaging materials against vapors and liquids.

(*a*) Operational rations are substantially protected while contained in the shipping cases and especially if stored in the original palletized unit load with an overlay of fiberboard, shrink wrap, or film wrap. The worst case is pallets of subsistence contaminated by liquid

droplets during an attack. After the attack, high vapor concentrations will exist in the vicinity of the palletized loads. If the outer barrier is permeable such as fiberboard, it is possible that a liquid agent can seep through the overlay fiberboard and contact the shipping containers in liquid form. Normally, with seepage resistant materials, such as shrink wrap as the outer barriers, only the vapors of the agent are found within the pallet.

(*b*) While MREs are stored, the food is protected by up to six layers of material. Multilayer barriers result in a complex diffusion process of the agent from the outside towards the interior. Vapor penetration into nonhermetically sealed spaces is a simple gaseous diffusion process. Permeation through packaging is a much more complex process regardless of whether the challenge is a liquid or a vapor.

1. Liquid is adsorbed into permeable materials such as fiberboard or chipboard. With permeation-resistant materials (such as shrink wrap), the agent dissolves into, seeps through, and then desorbs from the barrier material. Shrink wrap provides adequate protection. Fiberboard sheathing provides adequate protection against mustard agents, but not against nerve agents.

2. The low-density polyethylene used to construct the menu bag can absorb chemical agents and possibly toxins. If the menu bag is removed from the shipping container and is exposed to liquid contamination, enough agent may pass through the bag to create a health hazard. Keep MREs in the shipping container until issued to the soldier. The menu bags should then be kept under the same degree of protection as the soldier.

3. The aluminum-laminated materials used to construct the MRE (retort and nonretort) pouches protect food from chemical contamination if hermetically sealed. The only item in the MRE meal bag that is not adequately protected is the spoon.

(5) Mylar and cellophane are resistant to chemical agents.

Table K-4. Effects of Chemical Agents on Food

AGENT	INFLUENCE ON TASTE	INFLUENCE ON SMELL	INFLUENCE ON COLOR	RESIDUAL TOXICITY
MUSTARD	BAD	BAD	DISCOLORS MEAT	+
N-MUSTARDS	BAD	BAD	DOESN'T DISCOLOR MEAT	+
ARSENICALS	ACID	BAD	DISCOLORS MEAT AND VEGETABLES	+, ARSENIC
NERVE AGENTS	BAD	NONE	NONE	+
PHOSGENE	ACID	NONE	?	- AFTER WEATHERING
CYANOGEN AGENTS	BITTER	BAD	NONE	- AFTER WEATHERING
IRRITANTS	ACID	BAD	NONE	+
SMOKE	ACID	BAD	?	-
WHITE PHOSPHOROUS	?	?	?	+

\+ INDICATES THE PRESENCE OF RESIDUAL TOXICITY.
\- DENOTES THAT RESIDUAL TOXICITY IS NOT PRESENT.
? THE INFLUENCE HAS NOT BEEN DETERMINED.

Table K-5. Protection from Chemical Contamination by Packaging Methods and Materials

	CHEMICAL VAPORS	LIQUIDS
BOTTLES AND CANS		
AIRTIGHT BOTTLES	COMPLETE	COMPLETE
SEALED METAL CANS	COMPLETE	COMPLETE
GLASS BOTTLES	GOOD	GOOD
METAL CONTAINERS	GOOD	GOOD
BOXES		
CARDBOARD	MODERATE	MODERATE
WOODEN CRATES	MODERATE	POOR OR NONE
WRAPPINGS		
METAL FOIL LAMINATES	COMPLETE	COMPLETE
PAPER	POOR	NONE
TEXTILES	NONE	NONE
WAXED PAPER	GOOD	MODERATE
MULTILAYER BAGS	GOOD	MODERATE
CELLOPHANE	GOOD	GOOD
CELLOPHANE, WET	NONE	NONE
CANVAS	POOR	POOR

b. Detection.

(1) Currently, a field method for detecting chemical agent contamination in food does not exist. Contamination is not always spread evenly throughout food; this makes it impossible to take a single sample and determine the presence or absence of chemical agents in the entire lot. Additionally, standardized laboratory tests have not been developed for determining levels of chemical agents in food. Until a specific method to detect chemical agents in food is available, reliance will have to be made upon determination of contamination, or lack thereof, on the packaging material; the integrity of the packaging material; the protective qualities of the packaging material; and the penetration characteristics of the suspected chemical agents.

(2) Food may become toxic without any change in outward appearance. Never taste or smell food to determine if contamination is present in food.

(3) Veterinary and subsistence units have the following equipment available to detect chemical agents in the field:

(*a*) The M8 Automatic Chemical Agent Alarm System consists of the M43 detector unit and the M42 alarm unit. The detector unit is a portable, automatic, point-monitoring device that is designed to be hand carried from point to point. The M8 is used to provide early warning of a toxic agent position and detects the presence of chemical vapors and aerosols. The M43 detects all nerve, blood, and choking agents, and some blister agents. The M43A1 (the replacement for the M43) only detects nerve agents.

(*b*) The M256 Chemical Agent Detector Kit detects and identifies nerve, blood, and blister agents. The M256 is the most sensitive of the chemical agent vapor detectors available.

However, it is not a continuous, real-time monitoring system. It requires 15 to 20 minutes for sampling and analysis.

(*c*) The ABC-M8 VGH (relating to V- and G- type nerve agents and H-type blister agents) Chemical Agent Detector Paper can detect and differentiate between nerve and blister agents by color change. It is intended to be used by blotting and wiping surfaces suspected of contamination. The M8 paper will respond with a visual color change in 10 seconds or less.

(*d*) The M9 Chemical Agent Detector Paper will detect liquid nerve (G & V) and blister agents (H & L), but will not identify the specific agent or differentiate between nerve and blister agents. The M9 tape is sensitive to droplets as small as 100 µ, and will respond with a visual color change in 10 seconds or less.

(4) All subsistence in a chemical attack area are considered contaminated until a survey can be conducted, preferably by veterinary and chemical personnel. Personnel must be at MOPP Level 4 while conducting the survey. Concentrate the initial portion of the survey on the adequacy of the storage facility and other protective measures in preventing chemical agent contact with subsistence items. The area surrounding the storage facility is examined for the presence of animals, rodents, birds, and arthropods acting unusual, or dead in unusual numbers. If animals are present and assistance is required in identifying the NBC agent, specimens can be collected and submitted to the area medical laboratory. Damage such as broken windows, holes, or loss of structural integrity of the storage facility is noted. This information combined with knowledge of the agent form (liquid or vapor), type of agent (which will indicate the degree of persistency), and approximate time of attack will provide a risk assessment. Liquid agents should not significantly penetrate an intact facility, but may produce vapor contamination by off-gassing.

(*a*) Upon entering the storage facility, the M8 can be used to determine the presence of chemical vapors. However, precautions must be taken. The M42 alarm is not to be used inside shelters, vehicles, vans, or other interior modes. Therefore, when checking food storage facilities, the alarm unit must be left outside, turned off, or disconnected. Do not tilt the M43 detector more than 45 degrees (because of the liquids it contains). This is not a problem with the improved M43A1, but the M43A1 requires attachment of an exit port filter when used indoors. The M256 Chemical Agent Detector Kit can be used to sample the air.

(*b*) Pre-position M9 chemical agent detector paper in food storage areas; especially on the least protected pallets and in areas where droplets may enter, such as near doors or windows. Examine the M9 paper for indications of liquid chemical agents. If the M9 paper is positive, or if the packaging materials show the presence of liquids or stains, use the M8 detector paper to determine the type of the agent. If an agent is not indicated by the detector paper, then the amount of agent present will be insufficient to cause secondary contamination when the outer package is removed.

(5) Detection procedures become more complicated if a chemical agent has penetrated or permeated through the packaging and packing materials. Unless liquid has seeped through the cardboard, any agent in the interior of the shipping case will be in a vapor form. Liquid seeping should be obvious. The sampler-detectors in the M256 Chemical Agent Detector Kit do not have an aspirator for sampling the interior of the case. However, there are several procedures that can be used. One is to open the case, place the activated sampler-detectors inside the case, and then reclose the case. Another is to punch holes in the case, place the activated sampler-detector over the holes, and cover the sampler-detector with an empty box or can (open end down) to concentrate the vapors escaping from the case. Alternatively, remove the food from the case and place it in a plastic bag

with the sampler-detectors to concentrate the vapors. These procedures require two sampler-detectors; one for blood agents and one for nerve and blister agents. Neither method is very sensitive in low concentrations of vapor as is expected to be present inside shipping containers. A better method is to modify to M43 detector with a field expedient probe of Teflon tubing attached to the detector's air inlet. Insert the open end of the tubing into a hole in the case or package to sample the interior air. When available, the improved chemical agent monitor (ICAM) can be used; its design will allow aspiration of air from inside shipping cases. The ICAM can also be used to detect and identify liquid agents on a surface provided the agent is vaporizing in sufficient quantity. The ICAM gives a visual representation of a hazard evaluation.

c. Decontamination.

(1) Decontamination is only required for contamination remaining 10 minutes or longer. Decontamination efforts on subsistence items will normally be limited to removal of the containers and carton overwrap material.

(2) The need for decontamination is primarily dictated by the type of chemical agent used. The method of decontamination selected will depend upon the type of packaging material used and the urgency with which the food is required.

(3) Food supplies in storage are not likely to be seriously contaminated if reasonable protection precautions are taken. For this reason, large supplies of food are not to be condemned as a whole simply because they have been exposed to possible chemical contamination. A prompt and careful survey of the supplies may reveal that only a few items have been contaminated to a level that decontamination is required. Prompt segregation of the heavily contaminated portions will prevent, or minimize, contamination of the remainder. Foods without protective packages constitute the major difficulty.

(4) Individual decontamination is performed by each soldier on those subsistence items in his possession at the time of the attack. Individual decontamination is limited to operational rations that are in original, intact containers. Unit-level decontamination is performed by unit personnel under the supervision of unit NBC personnel. Support decontamination is attempted at major subsistence storage facilities. Again, decontamination is limited to packing material. Decontamination of food itself is only attempted in emergency situations when alternative supplies are not available.

(5) Start decontamination operations with the easiest method and proceed to the most difficult. This allows for the removal of a relatively large portion of the contamination in a minimum of time. The simplest procedure is to allow the materials to age and air ("weather"). Substantial self-decontamination will occur with most agents. Exceptions are thickened mustard, thickened GD, and VX. Table K-6 provides the length of time for which contaminated subsistence supplies may present a contact hazard. Weather elements that affect decontamination are—

(*a*) Warm temperatures speed liquid agent off-gassing and hasten the dispersion of chemical agents into the air.

(*b*) High winds rapidly disperse chemical agent vapors and speed off-gassing from surfaces.

(*c*) Moisture causes chemical agents to react with water to form nontoxic or less toxic chemicals. Heavy rain or rain of long duration can aid decontamination by mechanically removing chemical agents.

(*d*) Even in cold weather, direct sunrays warm surfaces above the air temperature and hasten the off-gassing and decomposition of chemical agents.

Table K-6. Persistency of Selected Liquid Chemical Agents

AGENT	WEATHER CONDITIONS		
	SUNNY, AROUND 20°C, LIGHT BREEZE	WET AND WINDY, AROUND 10°C	CALM, SUNNY, LYING SNOW, AROUND -10°C
MUSTARD (HD)	2 - 7 DAYS	1/2 - 2 DAYS	2 - 8 WEEKS
TABUN (GA)	1 - 4 DAYS	1/2 - 6 HOURS	1 DAY - 2 WEEKS
SARIN (GB)	1/4 - 4 HOURS	1/4 - 1 HOUR	1 - 2 DAYS
SOMAN (GD)	2 1/2 - 5 DAYS	3 - 36 HOURS	1 - 6 WEEKS
NERVE (VX)	3 - 21 DAYS	1 - 12 DAYS	1 - 16 WEEKS

(6) Active decontamination is attempted only when weathering will not decontaminate the packaging material in sufficient time. Decontamination procedures can be enhanced by using heat to vaporize the chemical agent; by reaction with decontaminants; or by removing with hot soapy water.

(*a*) The simplest (standard) decontamination materials are water and detergents. An effective decontaminant is hot water used with the addition of soap or detergent and scrubbing. Commercial abrasive powdered cleansers are effective decontaminants for many surfaces (metal, glass, Formica), but not wood or soft plastics.

(*b*) Water can be used to flush chemical agents from surfaces. High-pressure application produces a better cleansing action than low pressure. If the surface has absorbed the agent, flushing will remove the surface contamination, but will not affect the agent that is absorbed.

(*c*) Soaking contaminated items in boiling water is an excellent decontamination method for some agents. Water alone will not be sufficient to decontaminate all chemical agents. Soaking in warm or cold water may reduce the contamination slightly; however, the hazard may not be reduced sufficiently even after prolonged soaking. If hot water is not available, or if it might cause damage to the item, other methods of decontamination should be considered, such as decontaminating solutions or a caustic solution followed by thorough rinsing.

(*d*) Fibrous materials such as cloth and canvas are best decontaminated by washing and scrubbing.

(*e*) Glass, metal, porcelain, and plastic surfaces are best decontaminated by using hot water or hot soapy water. Some toxic materials are readily removed with no more than slight abrasion or brushing.

(*f*) Painted, varnished, and waxed surfaces are generally smooth and nonporous. Dust and liquids are readily removed by wiping, brushing, or vacuuming. Absorbed materials are removed by hot water, detergent, or complexing agents. None of these surfaces stand up well to heavy abrasive techniques. Agents can be attacked and removed by caustics, acids, and organic chemicals. Some of these surfaces readily absorb agents, so weathering following decontamination is

advisable.

(*g*) Rubber is a porous material that can absorb agents. It is not easily decontaminated by abrasive techniques. Warm, soapy water used with brushing is effective since it removes some absorbed contamination. Strong acids, alkalies, and organic solvents may deteriorate and decompose rubber articles.

(7) Operational rations are the primary rations issued; always issue uncontaminated stocks first. This allows for decontamination of contaminated stocks without interrupting supply support. Normally, contaminated stocks are not issued. The decision to issue contaminated items is based on the tactical situation, criticality of the items, type and extent of contamination, and the time and resources available for decontamination. Decontamination efforts on subsistence items are limited to the containers and carton overwrap material.

(a) The MRE retort and nonretort food pouch may be decontaminated with soap and water wash. The chemical agents will be removed by the solutions.

(*b*) Semipermeable materials (polyethylene menu bag, shrink wrap, and film wrap) may have chemicals deposited not only on the surface, but also dissolved into the matrix of the material. The chemicals can be removed from the surface by washing with hot soapy water, but contaminant dissolved in the material is not removed. The remaining agent can only be removed by weathering which can be accelerated through the use of heat and sweeping the surface with air.

(*c*) Fiberboard is both sorbent and permeable and acts like a blotter. Liquid decontaminants can force the contaminant further into the fiberboard. Any attempt to decontaminate fiberboard would be futile. The only alternatives are to remove the fiberboard, or to allow it to weather.

(*d*) Palletized unit loads of MRE and UGR outerwraps can be decontaminated through the aid of a forced clean air sweep in 4 to 5 days, compared to 3 weeks or more under natural conditions without a forced air sweep.

(8) Contaminated food supplies are only handled by personnel trained in decontamination methods and in MOPP Level 4. Contaminated food items are divided into three groups as described below (see Table K-1 for additional information).

(*a*) Group I consists of canned and unopened packaged items which have been exposed only to agent vapors. Most items in this group will be safe to issue after a brief period of outdoor airing to remove clinging vapors. Table K-7 lists the decontamination procedures for packaging materials contaminated with nerve agents, mustards, and arsenicals.

Table K-7. Chemical Decontamination of Packaged Material

PACKAGING MATERIAL	CONTAMINATION	DECONTAMINATION PROCEDURES
AIRTIGHT METAL CONTAINERS, GLASS BOTTLES, FOIL ALUMINATED LAMINATED MATERIALS.	VAPOR AND LIQUID	AIR FOR 24 HOURS. WASH WITH HOT SOAPY WATER, SODA, OR BLEACH SOLUTION. RINSE WITH WATER.
POLYESTER, PVF, WOODEN BOXES, CRATES, BOARD, MULTILAYER BAGS.	VAPOR	REMOVE CONTAMINATED PACKAGE. AIR CONTENTS FOR 24 HOURS.
CARDBOARD, POLYETHYLENE.	LIQUID	CONTAMINATED CONTENTS—TREAT AS UNPACKAGED FOOD.

(*b*) Group II consists of canned and unopened packaged items which have been contaminated with a liquid chemical agent.

1. Attempts to decontaminate porous packaging materials, such as cardboard or wood, are likely to be unsuccessful and may result in spreading the contamination. The best procedure in handling such items is to strip off the outer contaminated coverings and examine the inner layer to see if penetration of the agent has occurred. If it has, continue stripping off layers until an uncontaminated layer is reached and place it in Group I. If the agent has penetrated to the food, place it in Group III.

2. Food in cans or in other sealed, impermeable containers is not in danger of chemical contamination. Because contamination is confined to the outer surface of the sealed container, decontamination is accomplished by: immersion in boiling, soapy water for 30 minutes and rinse; immersion in boiling water for 30 minutes; spray with DS2; or to wash in hot soapy water, rinse, and aerate. Under no conditions should contaminated containers be opened before they have been decontaminated and monitored.

3. Supertropical bleach and DS2 can be used on the polyethylene menu bag for up to 24 hours without a significant change in appearance, tensile properties, and size of the plastic. The use of DS2 will cause significant degradative changes to most other plastics, while STB will cause little or no change. Also, DS2 may cause false positive readings when using M8 or M9 paper, or the M256 Detector Kit to check completeness of decontamination.

(*c*) Group III will consist of unpackaged or poorly packaged items which have been exposed to an agent in either vapor or liquid form. Foodstuffs in this group should be decontaminated only when absolutely necessary. **The decision to use foods that have been contaminated is to be made by the commander.** Decontamination procedure to be followed, in order, is: trim surface fat and grossly contaminated areas; wash with water or 2-percent sodium bicarbonate solution; then boil in water.

1. Boiling in water may be eliminated when the contamination has been only with the vapors of irritant agents. When such an exposure has been light, aeration for a short time may be used for decontamination.

2. Frying, roasting, or broiling will not remove traces of blister agents from meats. In general, salvage of foods heavily contaminated with droplets of the blister agents, especially the arsenical blister agents, is not practical. Foods of high water or fat content are unfit for consumption and reclamation is not practical when contaminated with liquid mustard or a liquid

nitrogen mustard.

3. When foods have been exposed to blister agent vapor, they can be reclaimed by washing with sodium bicarbonate solutions and rinsing with clear water, by intensive cooking, or in the case of dry provisions, by 24 to 48 hours of aeration. Lean meat contaminated with mustard vapor can be reclaimed by boiling in water for 30 minutes or more. With nitrogen mustard vapor contamination, the meat should be boiled in a 2-percent sodium bicarbonate solution. Discard the water used to boil the meat.

4. Nerve agent contamination is treated the same as blister agent contamination.

5. Foods, such as potatoes and hard-skinned fruits and vegetables, can be decontaminated by washing or scrubbing, followed by peeling or scraping, then washing again.

6. Prepared food in open containers will be contaminated; it must be temporarily isolated, or disposed of (bury or as directed by commander).

7. A food item that is contaminated with irritants can be decontaminated by airing. Consumability is determined by taste rather than toxicity.

8. Phosgene is rapidly hydrolyzed, therefore, washing the food with water or airing it will usually suffice.

9. Food contaminated with white phosphorous should be destroyed.

10. Normally, hydrocyanic acid will have little effect on food supplies. The exposures will most likely be as a vapor. However, foods with a high water content may become unfit for consumption after exposure to high concentrations.

11. The effect of CK on foods is not known. Foods exposed to CK vapors are considered toxic.

12. Table K-8 lists the decontamination procedures for unpackaged food contaminated with a chemical agent.

(9) Decontaminating cattle, poultry, and other livestock is only attempted when other sources of food are not available. Heavily contaminated animals should be destroyed. Livestock contaminated lightly by phosgene, nerve agents, mustards, and arsenicals (such as vapor or liquid) may be slaughtered in the early stages of poisoning before the full effects of exposure are shown. If these animals are slaughtered in the preliminary stages of poisoning and all tissues exposed to the agent (the head, blood, lungs, organs, and local areas) are discarded, there is no danger in consumption of the meat, provided the animal passes a pre-slaughter and slaughter inspection. This is true even of animals poisoned by arsenical agents since the edible tissue will contain amounts of arsenic too small to be toxic. Organs (liver, brain, heart, kidney, and lungs) will contain more arsenic than the musculature and are discarded. The meat must be well cooked. Personnel involved in slaughtering procedures must be careful to prevent spreading contamination to the meat and to themselves.

(10) Decontaminating forage and grain exposed to only chemical agent vapors is by aeration. Aerated supplies, especially if mixed with larger amounts of uncontaminated supplies, produces no ill effects when fed to animals. Forage or grain heavily contaminated by liquid

vesicants, especially arsenicals, should not be used.

Table K-8. Chemical Decontamination of Unpackaged Food

CHEMICAL AGENT	FATTY FOODS (BUTTER, BACON, MILK, CHEESE, HAM).	NONFATTY FOODS, HIGH WATER CONTENT CRYSTALLINE (FRUITS, VEGETABLES, SALT, SUGAR).	NONFATTY FOODS, LOW WATER CONTENT, AMORPHOUS (FLOUR, CEREALS, BREAD, PEAS).
NERVE AGENTS			
VAPOR, HEAVY	DESTROY	DESTROY, UNLESS POSSIBLE TO BOIL AFTER AIRING 48 HOURS.	AIR FOR 48 HOURS, THEN BOIL.
VAPOR, LIGHT	DESTROY	AIR FOR 48 HOURS, THEN BOIL.	AIR FOR 48 HOURS, THEN BOIL.
LIQUID	DESTROY	DESTROY	DESTROY
MUSTARDS			
VAPOR	REMOVE 1-3 cm OF OUTER LAYER AND WASH WITH 2% SODIUM BICARBONATE SOLUTION. BOIL FOR AT LEAST 30 MINUTES. DESTROY MILK.	WASH WITH WATER, AIR FOR 48 HOURS.	WASH WITH WATER. AIR FOR 48 HOURS.
LIQUID	DESTROY	DESTROY	DESTROY
ARSENICALS			
	DESTROY	DESTROY	DESTROY