AIR FORCE HANDBOOK 32-4014, Volume 1

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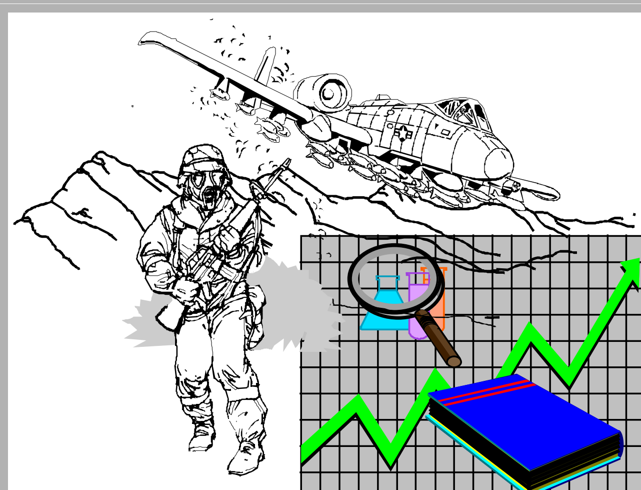
USAF OPERATIONS IN A CHEMICAL AND BIOLOGICAL (CB) WARFARE ENVIRONMENT, PLANNING AND ANALYSIS



DEPARTMENT OF THE AIR FORCE

BY ORDER OF THE SECRETARY OF THE AIR FORCE

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Civil Engineer

USAF OPERATIONS IN A CHEMICAL AND BIOLOGICAL (CB) WARFARE ENVIRONMENT, PLANNING AND ANALYSIS

This provides Civil Engineer Readiness Flight personnel with information for planning and analysis of operations in a chemical and biological warfare environment. The handbook supports AFI 32-4001, Disaster Preparedness Operations, and the USAF CB Concept of Operations. The information contained in this handbook was extracted from various Department of Defense and Air Force publications. Information on chemical and biological warfare hazards, defensive equipment, and procedures can be found in Volumes 2, 3, and 4, respectively. Send comments and suggested improvements to HQ AFCESA/CEX, 139 Barnes Drive, Suite 1, Tyndall AFB FL 32403-5319.

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SECTION 1. GENERAL INFORMATION

1.1. Introduction.

The threat of the use of chemical and biological weapons occurs across the spectrum of military operations. The number of nations capable of developing and utilizing these weapons is steadily increasing. Developing nations are receiving these weapons or means to develop them through technological transfer, overt or covert direct transfer, or support to belligerent groups or governments. The potential for their use can range from blackmail or acts of terrorism during peace to widespread use during conflict or war.

1.2. Purpose and Objective.

The ability to launch aircraft can be seriously impaired by chemical and/or biological (CB) munitions used alone or in concert with conventional weapons. A robust CB defense program can significantly reduce this impact by using techniques ingrained in personnel through planning and continuous effective training. **This guide is not a checklist of actions to be completed. It provides information on considerations that are critical to effective CB defense planning.** The primary objective of this guide is to provide Civil Engineering (CE) Readiness Flights the information necessary to effectively plan for sustained operations in a chemical and/or biological (CB) environment.

1.3. The CB Threat Today.

Possession of chemical and biological agent technologies, or more simply stated, knowing how to build a CB weapon, is only the first of four recognized steps in posing a military CB threat. The second step is the ability to produce sufficient quantities of an agent to pose a threat to the installation. It should be noted that even at the lowest level, laboratory scale, production capacity can be sufficient to generate strategic quantities for military application. The third step in becoming a CB threat is to be able to effectively weaponize the agent for delivery against an enemy. Even crude delivery vehicles have proven to be somewhat effective. Some of the more common methods of delivering chemical agents are aerial bombs, artillery rockets, artillery shells, mortar rounds, grenades, mines, and missile warheads. Certain biological agents are most effective when delivered as sprays or fogs. Finally, the fourth, and final, step is making it known that you are actually willing to employ such weapons. Recently the threat of covert application has grown, as evidenced by the Tokyo subway incident.

1.3.1. It is increasingly likely the United States Armed Forces could encounter the use of CB weapons and/or improvised devices at the operational and tactical levels in a regional conflict or in international or domestic terrorist activities. Use of these weapons at the operational level would be effective against rear area targets such as air bases and sea ports, as these resources are considered critical to U.S. efforts. Targeting these areas would degrade air operations but would be far enough removed from belligerent forces to permit the use without seriously jeopardizing the attacker's objectives. The objective of a CB attack against U.S. forces would likely be to cause casualties and degrade operations, greatly reducing sortie generation rates and attempting to deny the U.S. the critical advantage of air superiority.

SECTION 2. RISK ANALYSIS AND CB PLANNING

2.1. CB Risk Analysis.

Knowing the risks and vulnerabilities in a CB environment allows the commander to determine their unit's situation and provides options to mitigate those vulnerabilities. The Air Force uses operational risk management (ORM) as a logic-based, common sense approach to making calculated decisions on human, materiel, and environmental factors before, during, and after Air Force mission activities and operations. The ORM six-step process includes:

2.1.1. Identify the Hazards. Hazards are any real or potential condition that can cause mission degradation; injury, illness, or death to personnel; or damage to or loss of equipment or property.

2.1.2. Assess the Risk. Risk is the probability and severity of loss from exposure to the hazard.

2.1.3. Analyze Risk Control Measures. Effective control measures reduce one of the three components (probability, severity, or exposure) of risk.

2.1.4. Make Control Decisions. Decision makers at the appropriate level choose controls based on analysis of overall costs and benefits.

2.1.5. Implement Risk Controls. Implementation requires commitment of time and resources.

2.1.6. Supervise and Review. ORM is a process that continues throughout the life cycle of the system, mission, or activity.

2.2. Operational Risk Management.

Figures 2.1. and 2.2. on the following pages illustrate a chemical and biological risk assessment and efforts to mitigate the risks. Completion of these tables and follow-on assessments of the CB threat provide the foundation for future CB analysis and planning.

Figure 2.1. Chemical Warfare Risk Assessment.

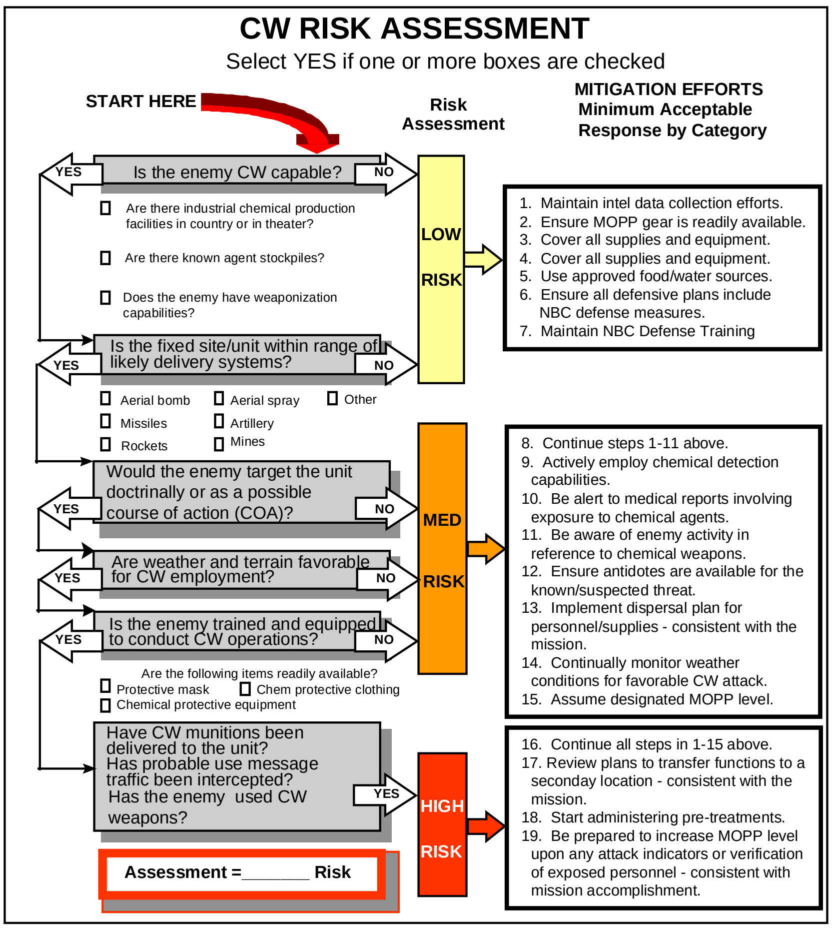
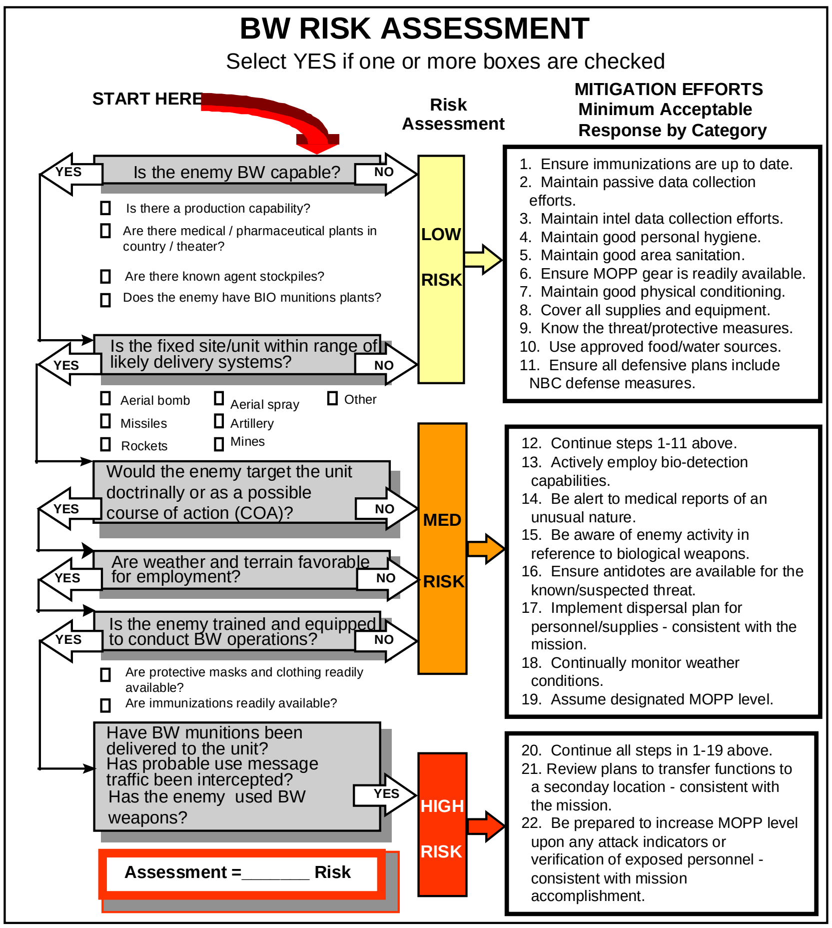


Figure 2.2. Biological Warfare Risk Assessment.



2.3. Planning and the Vulnerability Assessment Tool (VAT).

The chemical/biological warfare threat could significantly impact our ability to maintain a high ops tempo for an extended period of time. The number of casualties will be extremely high among unwarned and unprotected personnel, thereby disrupting or perhaps even suspending the sortie generation process. Although chemical defense equipment is effective in significantly reducing the number of casualties, the sortie generation process can be equally as disrupted when maximum protection is unnecessarily taken for prolonged periods of time.

The first challenge in developing an effective CB defense program is to properly balance the risk of operating in a CB threat environment with the available methods of protection for both personnel and equipment to achieve maximum operational effectiveness.

2.3.1. Because each airbase is different, it is the CE Readiness Flight's responsibility to develop site specific plans and procedures to meet the challenge of finding this balance. Ideally, this should be accomplished during the planning stage, and is based on the availability, capabilities and limitations of available CB defense equipment as well as the CE Readiness Flight's knowledge of site specific requirements.

2.3.2. To assist commanders in determining the "best mix" of defensive capability and strategies, a CB vulnerability tool has been developed. The purpose of the CB Vulnerability Assessment Tool (VAT) is to facilitate air base preparation for the possibility of CB operations by predicting the sortie generation rates and casualty levels likely to be realized in a variety of scenarios. These scenarios include a range of expected attack types and intensities as well as the most relevant aspects of possible defensive capabilities. The VAT is in AFMAN 32-4017, *Civil Engineer Readiness Technician's Manual for Nuclear, Biological, and Chemical Defense.* After completing an initial assessment of the likely threat and available defense equipment, the VAT should be used to see where improvements can be made to the balance of protection.

SECTION 3. CB DEFENSE PLANNING FUNDAMENTALS

3.1. The Base Level CB Defense Program.

An effective CB defense program can be planned by dividing actions into three distinct phases: ***assessment (pre-deployment), deployment, and employment.*** The assessment phase begins with an assessment of the battlespace environment and transitions to the deployment phase where follow-on assessments are conducted and defensive procedures are implemented. The operations phase begins at the onset of hostile activities. Planning, training, and exercising to minimize the impact of CB attacks on USAF operational capability must be conducted prior to deployment and continued after arrival at the bed-down location.

3.2. The Assessment Phase (Pre-deployment).

The assessment phase can be described as planning for the place of deployment, determining what is needed after arrival, and assessing available CB defense equipment with which to conduct operations. Planning is a dynamic process that relies on the fundamental task of establishing an initial CB defense posture, followed by implementing and evaluating CB defense procedures.

3.2.1. The following assessments need to be made before CB defense procedures can be implemented:

3.2.1.1. Type of base: Main Operating Base (MOB), Collocated Operating Base (COB) or Bare Base (BB),

3.2.1.2. CB threat at deployed location,

3.2.1.3. Available support at deployment location (facilities and equipment), and

3.2.1.4. Total manpower needs to provide CB defense at deployed location.

3.2.2. The type of base provides the baseline for all successive assessments. Established MOBs, such as bases in the Pacific, Europe, and Southwest Asia, should already have well-defined CB defense programs. The host wing CE Readiness Flight will be responsible for providing support to additional forces and integrating incoming resources into the existing CB defense program. Close coordination is necessary in the pre-deployment phase to ensure enough resources will be provided for all initial forces as well as additional follow-on forces. Deployments to COBs and BBs require more planning. Careful assessments must be made as to the type of facilities that are available as well as what prepositioned equipment is already in-place.

3.2.3. Augmenting CB trained readiness personnel and equipment into a battlespace is accomplished through Unit Type Code (UTC) sourcing listed in Table 3.1.

Table 3.1. CE UTCs.

4F9E5, CE Prime BEEF Lead Team	4F9E6, ARC CE Prime BEEF Lead Team
4F9E7, CE Prime BEEF Follow Team	4F9E8, ARC CE Prime BEEF Follow Team
4F9D1, CE Prime BEEF Readiness High Threat Augmentation Team	4F9E9, ARC CE Prime BEEF En-route Support Team
4F9D2, CE Prime BEEF Readiness High Threat Augmentation Equipment	

3.2.4. The 132 person 4F9E5 CE Prime BEEF Lead UTC provides one (1) Readiness Officer, one (1) Readiness Craftsman (7-Level) Non Commissioned Officer (NCO), and two (2) Readiness Journeyman (5-Level) NCOs. Additionally, each Lead UTC is joined with a 4F9D2 High Threat Equipment UTC package.

3.2.5. The 61 person 4F9E7, CE Prime BEEF Follow UTC provides one (1) Readiness Craftsman (7-Level) and two (2) Readiness Journeyman (5-Level) NCOs.

3.2.6. The 4F9D1, CE Prime BEEF Readiness High Threat Augmentation UTC provides one (1) Readiness Craftsman (7-Level) and one (1) Readiness Journeyman (5-Level) NCO. This UTC may not be sourced more than (6) times per location.

3.2.7. The 4F9D2, CE Prime BEEF Readiness High Threat Augmentation Equipment UTC provides the minimal equipment necessary to provide basic CB defense. This UTC may be sourced as many times as needed although it is obviously not an unlimited source.

3.2.8. The 4F9E9, ARC CE Prime BEEF En-route Support Team provides one Craftsman (7-Level) NCO and one Journeyman (5-Level) NCO. This UTC provides support to Tanker Airlift Control Elements (TALCE).

3.2.8. Selection and sourcing of these UTCs generally follow the rule of one (1) Lead and two (2) follow UTCs for the first squadron of aircraft deployed (total of 10 personnel and 1 Equipment set). Each subsequent aircraft squadron is then provided 4F9D1, Readiness High Threat Augmentation UTCs until a full complement of 22 trained personnel are provided.

3.3. The Deployment Phase.

Upon arrival at the deployed location, the following tasks need to be planned for and executed in preparation for CB defense operations. While this list is not comprehensive, it provides the foundation for planning considerations.

3.3.1. Inventory CB assets and integrate resources with host base, host nation, and joint forces. Continue assessment of manpower and support requirements. Identify shortages and overages to higher headquarters.

3.3.2. Develop mission tasks and work schedules for CE Readiness flight and augmented support personnel.

3.3.3. Establish a CB detection, warning, and reporting system.

3.3.4. Establish primary and secondary command and control capabilities in the Survival Recovery Center (SRC), Nuclear, Biological, and Chemical Control Center (NBCCC), and the Damage Control Center (DCC).

3.3.5. Identify and train personnel for CB reconnaissance teams. Define areas of responsibility for each team and ensure communications and verification procedures are working in each area of the base.

3.3.6. Identify and establish Contamination Control Areas (CCAs) for CB protected facilities. Identify potential CCAs and Toxic-Free Areas (TFAs) areas if collective protection is inadequate or nonexistent.

3.3.7. Ensure all personnel have been issued serviceable, individual protective equipment (IPE) and any reserve stocks are protected from loss, damage, as well as possible contamination.

3.3.8. Ensure medical personnel distribute antidotes and pretreatment for chemical agents to all personnel.

3.4. The Employment Phase.

The actions that occur during the assessment and deployment phases are considered pre-attack actions. During the operations phase of CB defense, active measures are taken to protect lives and mitigate the effects of CB attacks on sortie generation. These measures include avoidance, protection, and contamination control, which are the three USAF principles of CB defense.

3.4.1. Having a thorough understanding of how each principle relates to CB defense is essential for effective planning. The following sections examines each of these principles in detail and provides a discussion of the considerations for planning purposes.

SECTION 4. AVOIDANCE

4.1. The Principle of Avoidance.
As part of the avoidance principle, CE Readiness Flights must plan for both passive and active avoidance. Passive measures include training, camouflage, concealment, and deception (CCD) including the use of smoke and obscurants, hardened positions, and dispersion. Active avoidance includes contamination detection, marking, alarms, warning, reporting, and control measures.

4.2. Detection and Identification.

Early detection of CB agents is essential to maintaining operational capability. CB detection equipment should be utilized in a manner that will facilitate timely automated warnings. CB reconnaissance teams should be directed to begin operations immediately after an attack. Reconnaissance teams traveling over a predefined route can physically check and report status of each detector on the airbase.

4.2.1. Physically checking and reporting status of each detector must be completed rapidly and accurately to allow forces to reduce protection if no agent is present or to provide warning to base personnel that CB contamination is present. Further assessment is necessary to determine the extent of contamination, so that recovery actions can be established. Priorities for hazard assessment should be afforded to critical sortie generation areas, aircraft parking and maintenance facilities, munitions build-up and storage areas, and critical command, control and communications (C^3) facilities.

4.2.2. Information and reports regarding contamination should be received by the NBCCC for evaluation and plotting, and subsequently up-channeled to the SRC with recommendations for responsible actions. Additionally, suspected contaminated samples should be collected and sent to a laboratory for analysis. Biological warfare agent hazard assessment and detection is performed by Bioenvironmental Engineer and CE Readiness personnel. Some important points about the equipment currently available to support detection, identification, and warning are:

4.2.2.1. Current detectors sample for broad categories of liquids or vapors at the point where they are located.

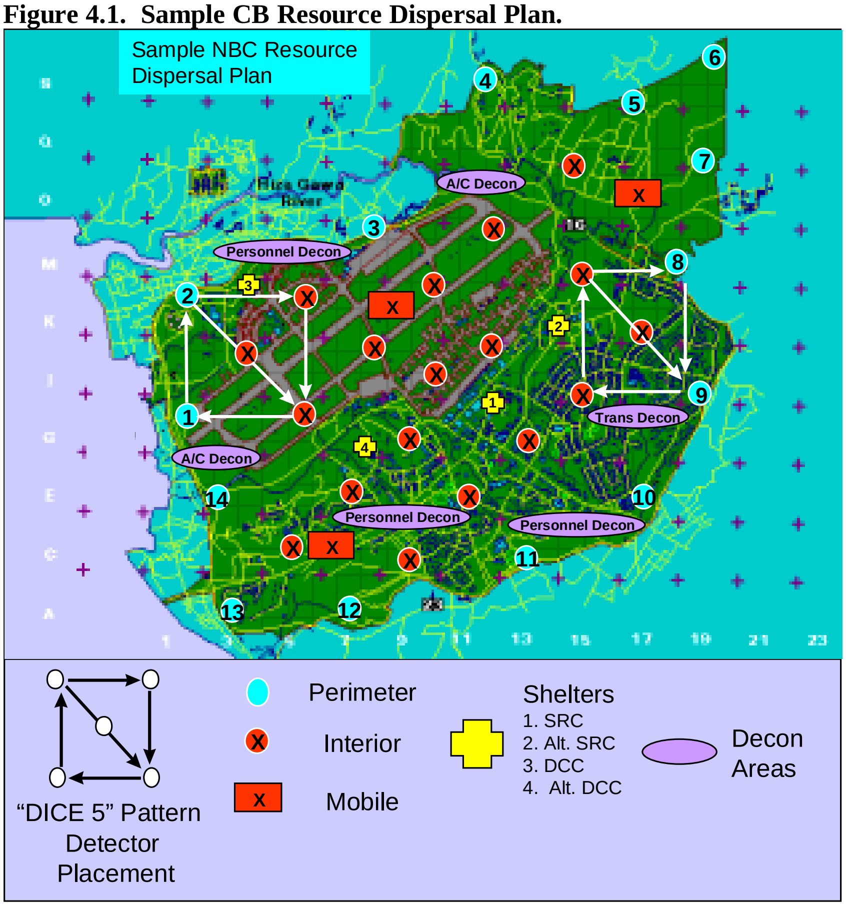
4.2.2.2. Current detectors require an educated human interpretation.

4.2.2.3. The presumptive identification of many biological warfare agents can be difficult and could take hours to complete. If laboratory analysis is needed, confirmation of biological agent attack could take several days. In fact, without field detection and identification, first knowledge of an attack may come from recognizing medical symptoms or confirmation through lab test of personnel that have been exposed. During this time, many personnel could become casualties and diseases could become epidemic if proper measures are not taken.

4.2.3. Chemical warfare agent point vapor detectors (such as the M8-A1, M22, and the M90) should be placed around the airbase to provide for rapid indication of the presence of chemical agent vapors. Because the detector is a point source detector, every effort must be made to ensure enough detectors are placed in the upwind positions on the airbase as well as the sortie generating areas, operations support areas, and personnel cantonment areas. Although the point vapor detector is capable of monitoring agent contamination at extremely low concentration, it should not be employed as a vapor monitor inside collective protection facilities unless sufficient numbers of detectors are available to provide detection of chemical attacks.

4.2.4. An baseline idealized vapor detector deployment scheme for an average airbase (approximately 3000 x 5000 meters) uses 35 detectors in an overlapping dice five pattern. This pattern calls for 14 detectors to be placed on the perimeter of the base, 18 detectors placed on the interior of the base, and 3 mobile units that are deployed with the chemical reconnaissance teams. Placement of 35 detectors in this configuration allows for quick chemical agent detection with a high confidence level regardless of wind direction and speed. The mobile units are used to verify single detector alarms and possible false alarms. See Figure 4.1.

Figure 4.1. Sample CB Resource Dispersal Plan.



4.2.5. The exact locations of the detectors are not as important as ensuring a sufficient number of detectors are staggered in upwind positions from where personnel may be working or sleeping. Each base will not conform exactly to the 3 x 5 km rectangle representation. Detector placement will have to be tailored for each airbase given unique operational considerations using the following guidelines:

4.2.5.1. Detectors should be placed between 750 and 1250 meters apart to provide maximum coverage,

4.2.5.2. Detectors should be no closer than 25 feet to any major structure in order to ensure maximum exposure to prevailing winds and limit interference caused by buildings (micro meteorological phenomenon).

4.2.5.3. Detectors should be positioned at least 3 feet, but not higher than 6 feet, off the ground to ensure maximum exposure to the contaminated environment. Placing the detectors in an elevated protective cage will satisfy this requirement as well as prevent damage from inclement weather. The cage should have air slots and a locking front door. The top to the cage should be designed to prevent rain or falling particles from affecting the detector performance.

4.2.5.4. Detectors should be placed in close proximity to personnel so that alarms may be heard and detector malfunctions can be reported. On the perimeter, it is suggested the detectors be positioned next to defensive fighting positions. On the interior of the airbase, the detectors should be placed next to maintenance or other support personnel.

4.2.6. Commanders should rely on additional information when confirming an attack. Whenever possible do not rely on the results of a single detector to determine if contamination is present. Automatically implement reconnaissance procedures upon the declaration of Alarm Black. Observe post-attack data for the activation of additional detectors, M8 or M9 paper, environmental indications, casualties, and other detection means to confirm a chemical attack.

4.2.7. In addition to the M90, M8A1, and M256, everyone is issued both M8 and M9 Paper. It may also be used after a suspected attack (by blotting) to confirm chemical agent use.

4.2.8. All personnel must be trained to check suspected surfaces with M8 or M9 paper before touching the surfaces. Everyone should recognize that marked-off areas, whether for contamination or unexploded ordnance, ***must be avoided***. Preventing the spread of contamination is a primary goal of the CB defense program.

4.3. Warning and Reporting.

Joint doctrine gives combatant commanders two specific CB warning and reporting responsibilities. The first is to verify enemy first use of CB weapons for the National Command Authorities. The second is to inform US forces, allies, and friendly governments of the impending or actual use of CB weapons by an enemy, along with US defensive measures to counter such use.

4.3.1. The USAF employs standard alarm signals to indicate the likelihood or occurrence of air attacks involving conventional weapons; nuclear, biological, or chemical (NBC) weapons; or some combination thereof. These alarms are for passive defense actions; they do not apply to active ground defense actions. Unless local or theater requirements dictate otherwise, alarm yellow indicates an attack is probable, alarm red indicates an attack is imminent or in progress, and alarm black indicates the start of post attack reconnaissance.

4.3.2. If the base obtains positive indications of a CB attack and has not received any previous indications of attack, from either its own or external sources, it forwards a high precedence initial use report to higher headquarters using the Nuclear, Biological and Chemical Warning and Reporting System (NBCWRS). CE Readiness Flights should expect to be queried about this report and should have already begun collecting samples for further analysis by the DoD laboratory. Higher headquarters will be seeking verification of the first use of CB agents to notify the National Command Authority (NCA).

4.4. Marking.

NBC contamination should be marked immediately upon recognition to prevent unnecessarily contaminating other personnel, equipment, and materials. Use the NBC Marking Kit to identify equipment items, vehicles, and areas that are contaminated. Establish procedures to ensure that M8 paper or M9 tape that changed color remains attached to items indicating that contamination is present until the item is decontaminated or disposed of. Use NBC reconnaissance teams, shelter management teams, building custodians, and individuals to initially mark contaminated areas with applicable marking devices. When time permits, these areas should be cordoned off. Plot contaminated areas on SRC and NBCCC grid maps, and advise base personnel of contamination locations accordingly.

SECTION 5. PROTECTION

5.1. The Principle of Protection.

Protection against the effects of CB warfare is afforded by individual IPE and collective protection (shelters). Mission oriented protective postures allows the individual to escalate their protective posture based on the threat of imminent attack and prosecute the mission with the greatest available protection.

Mission Oriented Protective Postures (MOPP) are a standardized means for communicating the prescribed wear of individual protective equipment. Consult AFMAN 32-4005 for specific use of MOPP in operational requirements.

5.2. Individual Protection.

Individual Protective Equipment (IPE) protects the wearer from direct exposure to CB agents. IPE consists of a mask, which keeps agent from entering the body through the nose, mouth, or eyes; and an overgarment, hood, gloves, and overboots which protects against skin contact and keeps agents from entering the body through cuts or abrasions of the skin and from penetrating the skin. Masks provide the immediate protection from inhalation hazards and the balance of the protective ensemble generally duplicate or enhance the protection offered by normal combat clothing. Web gear, helmets, and body armor also provide protection from conventional hazards.

5.2.1. Protection offered by the mask is critical, since inhalation, ingestion, or entry through the eyes are the easiest way for CB agents to enter the body. Assuming a proper fit, the mask itself provides a physical barrier to agent penetration, while the mask’s filter canister removes contamination from air inhaled for respiration. When worn and functioning properly, the mask’s filters, airtight body, and tight face seal adequately protect against agent penetration.

5.2.2. Normal clothing will provide a minimum level of skin protection. The overgarment, hood, gloves, and overboots provide an improved physical barrier against agent penetration, much like the mask.

5.2.3. Personnel in or deployable to CB threat areas are provides a standard basis of issue (BOI) for CB defense equipment. Units located in the threat area issue one set of gear to each individual for attack readiness and maintain the rest in one or more central location. In the past, all CONUS units maintained and deployed up to four sets of gear for each person. Now some units maintain only two sets of gear, with the mask, for each person. The remaining sets of gear are at Air Force Consolidated Mobility Bag Control Centers (CMBCCs) for direct shipment to deployment locations. This provides a better match of available equipment to priority deploying forces. Additive forces (active, Air Reserve Component, or sister services) must be considered when calculating the need for IPE and other gear and supplies.

5.2.4. MOPP levels allow commanders to change the configuration of protective gear according to the situation. It provides for increasing levels of protection as the operational situation transitions from increased alert through an attack and the subsequent presence of contamination.

Climatic conditions and workload will determine how long anyone can perform effectively while wearing protective gear. Short rest periods while still wearing the gear may be taken at or near the work site, if the situation allows. Longer periods of rest and relief requires a trip to a collective protection facility or TFA.

5.3. Collective Protection.

Shelters are structures that protect personnel CB contamination. As a minimum, they provide a physical barrier, which keeps a portion of the contamination away from the people inside. When attacks against an airbase occur, personnel take shelter to protect themselves from the possible hazards of an attack, which can include blast, heat, shrapnel, and airborne contamination, depending on the type of weapons employed. Restricting flow of air into a shelter increases its value as a CB shelter. Unless employed in combination with other types of weapons, CB weapons normally involve less destructive force than the other types of weapons, so they can disseminate the agent without destroying it in the dispersal process.

5.3.1. Collective protection (ColPro) systems protect those inside a building, room, shelter or tent against contamination through the combination of impermeable structural materials, air filtration equipment, air locks, and overpressurization. ColPro systems reduce contamination levels when personnel enter or exit the structure. They enable personnel to work or gain rest and relief without the encumbrance of IPE. If ColPro systems are not available and CB contamination is present and persists beyond a few hours, it may become necessary to locate and designate contamination-free areas for rest and relief.

5.3.2. ColPro facilities can be defined as either work centers or personnel shelters, which provide filtered air for a “shirt sleeve” environment. Although work centers do not need to have ColPro, it must be taken into consideration for sustained operations in a contaminated environment. Functional duties performed in command and control facilities such as the command post, survival recovery center, squadron operations, and medical facilities without ColPro can be sustained; however, the effectiveness will be degraded over time. With ColPro facilities, the usual 12-hour shift schedule should be modified. Normally, personnel change shift at 0600 and 1800 hours to minimize exposure and wait times. Instead, stagger shift changes along a 4 or 6 hour time frame. This will reduce exposure to mass groups of personnel and allow ColPro teams to process personnel more efficiently.

5.3.3. ColPro shelters must be designed to provide a means for rest and relief, donning and doffing personal IPE, as well as an area to work, sleep, and eat in an uncontaminated environment. They must contain a contact hazard area for removal of liquid contaminated garments, a vapor hazard area for removal and exchange of contaminated masks, and a toxic-free area for work, rest, and relief.

5.3.4. Currently, there are three primary types of ColPro systems. The first type is ColPro built into critical work areas such as squadron operations centers, wing command posts, communications centers, hospitals and avionics maintenance facilities. A number of these systems are currently in some CB threat areas. The second type of ColPro, survivable collective protection systems (SCPS), are underground rest and relief shelters positioned near operational areas. The third type, transportable ColPro, is deployable and has three variations that can protect work areas or rest and relief areas. One variation fits inside of rooms within buildings, another protects deployable shelters, and a third stands alone. These systems are in the early stages of development.

5.3.5. Sealed and closed structures offer some protection. In the absence of dedicated ColPro systems, the inherent features of some buildings offer protection not otherwise available. Walls, doors, and windows offer physical barriers to the penetration of contamination, while filters in heating, ventilation, and cooling systems can remove certain levels of particulate contamination. Wearing a mask inside such structures increases the protection for the wearer.

5.3.6. All shelters must have capable Shelter Management Teams (SMT). Without these teams, shelters will not function and the purpose for rest and relief will be severely degraded. SMT positions are key leadership positions. Assignment of dedicated personnel to these teams benefit all phases of airbase operations. Proper training and exercise of these teams is vital to shelter operations.

If ColPro is not available and CB contamination is present and persists beyond a few hours, it may become necessary to locate and designate TFAs for rest and relief.

5.4. Open Air Toxic-Free Areas.

If personnel shelters do not have ColPro, then another means must be provided for rest and relief of personnel. This can be accomplished by establishing rest and relief operations in a contamination free environment. If there is no area on base that is contamination free, then an open-air TFA will have to be established outside the confines of the base.

5.4.1. An open-air TFA must be located well away from contact and vapor contaminated areas. Although traditionally thought to be off-base, the TFA may be established in clean areas on the installation. The open-air TFA must be stocked with provisions just as personnel shelters are. This means stocking enough food, water, and clothing for personnel who are off duty as well as providing accommodations for sleep and sanitation.

Feeding and billeting personnel in a toxic-free environment can become a major challenge. Personnel may not be able to be sent home to off-base quarters when they are off-shift, as is routinely done now. Finding a Toxic Free Area (TFA)--even off base--and developing a realistic support plan is very difficult but vital to sustaining operations.

5.4.2. It is difficult to establish how far from the contamination this TFA should be located because of unique geographical locations, but it must be located far enough away from the contaminated area to account for changes in wind speed and direction.

5.4.3. Other considerations for establishing the location of an open air toxic-free area are as follows:

5.4.3.1. A Contamination Control Area (CCA) must be used in conjunction with the exchange area to prevent and control the spread of contamination. Adequate resources to include manpower, equipment, water and decontaminants must be identified to operate this area. Processing times and procedures have been identified to allow peak base populace to process and move to a clean area. Training of the CCA teams must be addressed and exercised. Practice complete processing through the CCA during local exercises. This is necessary because of the unacceptable consequences to operations if someone should inadvertently bring contamination into a TFA. All personnel must practice **complete processing**. For peacetime, it is recommended to undress down to swimsuit or underwear levels, but it must be understood that complete processing is necessary for all personnel during wartime.

5.4.3.2. Processing of contaminated casualties into TFAs and into medical treatment areas frequently requires cutting away or otherwise discarding their clothes, including their protective gear. For wartime operations, protective ensembles and other clothing should be prepositioned at medical sites so that people can be returned to duty. For exercises, consider using old clothing so that personnel can practice cutting contaminated garments off simulated casualties.

5.4.3.3. Returning minimally injured personnel to duty requires planning and coordination between the medics and the functional areas to ensure quick return of treated personnel to duty. This means that when the medics release a person from duty, the functional area must do everything possible to get the treated back into duty, including providing clothing, clean IPE, and transportation.

5.4.3.4. Transportation routes between the contaminated base and the toxic-free area must be established and secured. In many cases these routes may be inaccessible because of local populace evacuating the area.

5.4.3.5. Sufficient quantity of transportation assets to move personnel and equipment between contaminated and "clean" locations must be identified and on hand.

5.4.3.6. Water and other decontamination assets for establishing decontamination stations in the contact and vapor hazard area must be positioned prior to movement of personnel.

5.4.3.7. Communications for command and control between the contaminated area, contact hazard area, vapor hazard area, and the clean area must be established. In addition, security cordons must be established around the contact hazard area, vapor hazard area, and toxic-free area to ensure safety of personnel as well as controlling the spread of contamination.

Ground crew ensembles must be pre-positioned to support the return of personnel to duty after processing through a decontamination point or returning to duty from a TFA.

5.5. Relocation of Personnel and Assets.

Relocation is an alternative that can be used in two different scenarios. First, it is the only alternative for continuing mission operations if rest and relief cannot be provided for base personnel within 12 to 18 hours following an attack. Regardless of whether mission operations can be continued, personnel must be moved out of the contaminated area before they become heat stress casualties. Uncontaminated assets and people are easier to move, therefore every precaution should be taken to limit the spread of contamination while relocation is taking place.

5.5.1. Traditionally, to practice the relocation process, exercise scenarios have used on-base sites such as football fields to simulate off-base long-term rest and relief sites. If you must exercise this way, take extra effort to feel the full impact of issues, such as logistics and security, associated with really using off-base sites. Program the appropriate time delays that would normally be incurred during the delivery of supplies to an off base site in your exercise scenarios.

5.5.2. This alternative may also be the best course of action if the contamination on the airbase will not be present for long periods of time (non-persistent agents) and airplanes can be recovered at another location that can provide short-term support. When the contamination is no longer present, airplanes can return to the airbase and quickly resume operations. The obvious advantage to using this alternative for non-persistent attacks is keeping as many airplanes as clean as possible.

5.6. Other Protection Planning Considerations.

The following information presumes the use of ColPro however, the reality is that the majority of personnel will not be housed in collective protection facilities. Regardless, the points brought out in this section can be applied equally to open air TFAs located upwind from the contaminated base.

5.6.1. ColPro facilities, when properly operated, require considerable man-hours to process individuals in and out of the shelters. Because of the long times involved, accommodation of shift changes and rest and relief of personnel must be considered. Address the issue of dispersing AFSCs. This means those AF specialties, especially critical ones, must not be housed in the same areas if possible. Do not risk mission degradation due to poor planning of manpower assets if a ColPro is lost.

5.6.2. Consider operations in a "button-up" mode should chemicals be present. Test that concept to see if it works at the deployed site. With this concept, a CCA processing line would not have to be set up or manned; there may be some short-term benefit to this. However, the buttoned-up function would have to work as a contaminated area once the doors are opened.

5.6.3. Plan ahead for getting resupplied with medically approved potable water once the initial supply is used. Make this resupply in an appropriate ground crew ensemble part of the exercise. In addition, store potable water wherever possible and to the maximum extent possible. Water is essential to keep personnel hydrated.

5.6.4. Ensure that shelters are stocked completely and early. For example, spare clothes are needed inside the TFA to support complete processing. Potable water, first aid kits, and food are also required inside the facilities. In addition, preposition plastic bags of assorted sizes in large numbers to help transfer items between work centers.

5.6.5. Operating in a CB environment may increase diesel fuel needs due to all the generators associated with collective protection facilities; it will also increase possible needs for generators as alternate power sources. Therefore, top off all generator fuel tanks as often as possible, ensure generators are operational, check the availability of diesel refueling trucks, and check the ability of personnel to refuel while wearing IPE . The availability of refuelers should also be checked. These should have pump and suction capability, such as R22s, to transfer fuel from passive storage (such as bladders and underground tanks) to generator fuel tanks.

5.6.6. Sanitary toilet facilities and adequate waste disposal are critical to prevent spread of disease and preserve quality of life. Priority must be given to maintaining electrical and other support needed to keep these functions operating.

5.6.7. Sewage trucks or trailers are vital to sustaining operations of ColPro facilities. Two options are available for sewage removal from the holding tanks: pump it out into trucks for hauling away or, as a last resort, pump it out onto the ground (this creates a residual problem). If sewage is pumped onto the ground, it must not be allowed to create a health hazard through direct human contact, contact with food and water supplies, and attracting disease vectors. Contact the Bioenvironmental Engineer and Public Health Officer if this option is used.

SECTION 6. CONTAMINATION CONTROL

6.1. The Principle of Contamination Control.

By definition, contamination control includes procedures for avoiding and marking post-attack contamination, as well as reducing, removing or rendering harmless, the hazard resulting from the contamination.

6.1.1. In practical terms, aggressive control in limiting the spread of contamination will minimize the danger to personnel and allow resources to be used immediately to expedite recovery actions. The principle of contamination control includes contamination avoidance and decontamination.

6.1.2. Contamination avoidance should be relied on to reduce or stop spreading contamination. Commanders must ensure precautions are taken to avoid contaminating personnel, equipment, supplies, and aircraft. Special care must be taken to avoid contaminating aircraft interiors. The installation Bioenvironmental Engineer (BEE) will identify biological agents and report to higher medical authority to determine appropriate medical response. The BEE and CE advise the commander in determining when the all clear alarm can be sounded for personnel to reduce or remove protection.

6.1.3. Decontamination is extremely difficult and is manpower intensive. Nevertheless, planning must provide for contamination control for mission essential facilities, medical resource areas, aircraft, and equipment.

6.2. Contamination Avoidance.

Simply defined, contamination avoidance is placing a barrier between, or a distance from, CB agents. Contamination avoidance is the most effective, cheapest and easiest method of contamination control.

6.2.1. Contamination avoidance procedures should be practiced in all training and exercises conducted on the airbase. Efforts must be taken to ensure vehicles, aircraft, equipment, and personnel are protected from possible chemical or biological attacks. Keep vehicles, equipment, supplies, etc. under cover (i.e., in warehouses, aircraft shelters, etc.) when possible. Items that must remain outdoors during periods of CB threats should be covered with tarpaulins or plastic sheeting. The following is a partial list of actions that should be addressed and planned for:

6.2.1.1. Equipment and supplies should be kept under cover to the maximum extent possible. Cover critical resources with protective covering or move resources inside enclosed facilities. Cover as much equipment as possible before the attack. Use tarps, plastic sheets, canvas, quickly constructed sheds, etc. Consider such factors as static discharge, fire hazards, ventilation, etc. for safety. Put as much equipment as possible in hangars, under carports, even under picnic pavilions. Attach M8 and M9 paper to vehicles, (front surface of side mirrors, windshield wiper arms, outside wheelwells, etc.), and also place the paper on outside windowsills (where it can be seen from inside the building), telephone poles, doors, and outside equipment that cannot be covered. Ensure M8 and M9 are placed in horizontal positions where they will likely be exposed to liquid droplets.

6.2.1.2. Close aircraft canopies, doors, or cover intakes; or move aircraft inside shelters.

6.2.1.3. All air conditioners (without CBR protection systems) should be turned off. Air dampers are often broken, stuck, or leaks and should not be relied upon to keep out contaminants.

6.2.1.4. Cover and/or seal all exterior building openings; such as ducts, exhaust and intake louvers, fan openings, broken windows, etc. Close facility doors.

6.2.1.5. Secure all doors except the one designated as the entrance/exit.

6.2.1.6. Set up boot and glove baths.

6.2.1.7. Place M8 paper or M9 tape outside the building at least 10 feet away. Horizontal posting is preferred -- DO NOT post it on vertical walls. Maintain additional M8 paper or M9 tape at the entrance/exit for use in checking personnel for liquid contamination as they enter the building.

6.2.1.8. Check the serviceability of automatic detectors and preposition them according to developed detection grids.

6.2.1.9. Maintain M291/295 decontamination kits along with the M8 paper or M9 tape for individual decontamination of equipment, etc.

6.2.1.10. Close all vehicle windows and doors and move vehicles under a protective cover.

6.2.1.11. Pre-locate water supplies inside protective shelters and fill water trailers and carriers.

6.2.1.12. Ensure replacement IPE and other protective equipment and food supplies are pre-located in protective shelters.

6.2.1.13. Direct non-essential personnel to remain indoors. Personnel required to be outdoors must have adequate IPE.

6.2.2. During an attack, personnel should make every effort to take cover with overhead protection such as inside a building, under an overhang, under a tree, or under a poncho (anything that would protect from contact contamination). Close all aircraft, vehicle, and facility windows and doors. Identify and mark contamination.

6.2.3. Post-attack actions in a CB environment call for personnel to avoid known or suspected contamination. Whenever possible, uncontaminated personnel and equipment should not enter grossly contaminated areas. Action should be taken to re-route aircraft, vehicles, and personnel or attempt to identify personnel and equipment which are already inside the area conducting wartime operations. Do not kneel on or lean against any object or surface which may be contaminated. If work must be performed in a contaminated area or on contaminated equipment, minimize exposure by:

6.2.3.1. Wearing a poncho or other rain gear over the IPE (this will also increase the heat burden)

6.2.3.2. Not kneeling or sitting in contaminated areas.

6.2.3.3. Checking equipment for contamination prior to use.

6.2.3.4. Vehicle traffic on contaminated roadways could contribute to the spread of contamination. You may be better off pushing soil or similar debris onto an area you suspect is contaminated than to invest your resources in the time-consuming process of either detailed contamination monitoring or route decontamination. Another alternative may be the selective use of protective covers or plastic ground sheets to enable travel across contaminated areas without the danger of agent transfer or pick-up.

6.2.3.5. If you find contamination, report it.

6.2.3.6. If the equipment is critical to mission, decontaminate it. If it's not critical, leave it alone. Don't needlessly contaminate yourself, allow others to contaminate themselves, or waste decontamination resources.

6.2.4. Individuals should take the following actions before entering any facility to reduce the accumulation of contact contamination within the facility.

6.2.4.1. Use the boot and glove bath at the entrance.

6.2.4.2. Quickly monitor for contact contamination at the entrance, either by themselves using the buddy system, or by assigned shelter team members. (use M8 paper or M9 tape).

6.3. Decontamination.

Once the presence of contamination has been confirmed, decisions must be made on if, what, how, and when to decontaminate areas that are determined mission critical or essential to the successful completion of the mission. Contamination control includes protecting resources from contamination and decontaminating resources that are inevitably contaminated. Removing and neutralizing contamination from these areas must be accomplished to ensure adequate protection of personnel from CB hazards. The decisions to perform decontamination operations must be based on operational and mission consideration. Operations are carried out in a priority order as designated by the installation commander or survival recovery center.

The four types of decontamination are immediate, operational, thorough, and reconstitution. Immediate decontamination would be those actions done by personnel on themselves or their personal equipment. Operational decontamination consist of actions to reduce or minimize the contact hazard associated with contamination located on specific parts of mission essential equipment, materials or work areas. This and immediate decontamination are the primary levels of decontamination that will be achieved at unit level. Thorough decontamination consists of activities taken to reduce contamination to the lowest possible level and thereby achieve a reduction in MOPP level. The reconstitution level of decontamination will primarily be required in a post-contingency environment. The objective is to eliminate contamination and restore critical resources in a manner that permits unrestricted use, handling or operation without individual protective equipment, and allows release of the asset from military control.

6.3.1. Regardless of the size of an enemy attack, initial response to limit and contain hazards and long-term recovery actions must be conducted. Consider the following in developing decontamination plans.

6.3.1.1. Large-scale, base-wide decontamination is not generally feasible. Spot or small area decontamination may be required on equipment to be handled, on mission-essential equipment, and to keep contact contamination out of the aircrew compartment. Deciding whether to decontaminate, how much to decontaminate, and when and where to decontaminate are tactical decisions that must be weighed in light of mission requirements.

6.3.1.2. Personal decontamination can be accomplished by washing with soap and water, by cleaning with other material, or more preferably by using either an M258A1 or an M291 Skin decontamination kit. The M295 decontamination kit can be used for larger areas such as equipment.

6.3.1.3. The hazards from residual biological warfare agents can be reduced by basic personal hygiene, changing and washing clothes, exposure to direct sunlight, and use of disinfectants.

6.3.2. Some equipment available for decontaminating base equipment includes general purpose as well as specialized equipment.

6.3.2.1. General purpose equipment includes such common things as firefighting equipment, mops, brooms, deicing equipment, water hoses, etc.

6.3.2.2. Specialized equipment includes a lightweight decontamination apparatus (LDA). The LDA can heat water, and dispense in either low or high pressure mode.

6.3.3. All units should plan for and conduct immediate and operational decontamination operations to remove liquid or powder BW agents. Although specialized decontamination teams are assigned, expedient decontamination can be performed by anyone (i.e., crew chief with a bucket of soapy water an a mop) and all units should plan to decontaminate their own critical resources without specialized training or equipment.

6.3.3.1. Washing of aircraft ingress and egress areas to prevent the contamination of aircrews or aircraft interior.

6.3.3.2. Decontamination of personnel/equipment with the M258A1, M291, or M295 decontamination kits to stop the spread of contamination to known uncontaminated areas of equipment.

6.3.3.3. Until sufficient sorbent powder is available in the supply system to support your decontamination needs, consider using the natural soils around your base. If the vegetation is removed, then the soil (just common, ordinary dirt) can do much of the same job that the sorbent powder can do. Kitty litter is an excellent alternative for sorbent powder. Other alternatives include rags, sawdust, etc. You can also make good use of brooms, shovels, mops and similar equipment to spread around natural decontaminants (such as dirt); such equipment should be prepositioned for immediate use.

6.3.4. Thorough decontamination is not normally conducted until base recovery operations are implemented. Recovery is a time-consuming operation which requires detailed planning. However, if heavy contamination is present, it may be desirable to initially utilize the weathering method and relocate non-essential personnel and uncontaminated equipment to uncontaminated areas of the base.

6.4. Operational Control of Decontamination Assets.

Direction and priority of decontamination operations will be established by the Wing Commander, coordinated through the Survival Recovery Center (SRC) and passed to organization control centers tasked to conduct decontamination operations. SRC coordination of assigned assets is critical during initial and expedient decontamination operations. Control of these assets may be turned over to the owning organization during long-term recovery operations. The NBC Cell should post the current location of decontamination teams/equipment on the base grid map and advises the SRC accordingly.

6.4.1. Peacetime planning should take into consideration those areas expected to require priority decontamination immediately after attack. The pre-positioning of LDA bladders filled with water will expedite operations. However, not all assigned LDAs should be committed to pre-positioning. A predetermined number should be identified as mobile. These LDAs could be dispatched quickly and would not be restricted by non availability of fixed water sources or manning limitations.

6.5. Decontamination Support Requirements.

Critical to decontamination operations is the availability of water, fuel, and trained manpower. The lack of any of these would greatly affect the decontamination operations.

6.5.1. Procedures should be developed to identify primary and alternate water sources. Wartime fuel requirements should be identified to the base-level fuels section. In addition to readiness trained decontamination team members, each organization should train additional personnel as backup operators.

6.5.2. If a percentage of LDAs are identified for mobile use, vehicles must be identified to support them. These vehicles need not be obligated on a full-time basis, but will be needed for exercise and actual wartime use.

SECTION 7. SUMMARY

7.1 Summary.

During CB operations, the time it takes to perform tasks and execute missions will be different. The key is to think things through well ahead of time.

7.1.1. Protecting personnel from contamination requires specific planning considerations. Loss of tactility, restricted vision, and increased heat stress imposed by IPE will drive modifications to plans and procedures. Likewise, the need to have clean areas for personnel to rest, drink, and eat will cause work schedules to be reexamined. Getting clean and contaminated personnel into the same TFA requires thorough planning and painstakingly precise, step-by-step, processing through the CCA.

7.2. Training and Exercises - A Final Note.

Only a rigorous training and exercise program can achieve the following benefits.

7.2.1. Acclimation. Individuals learn how to pace themselves if representative tasks are performed while wearing IPE for extended times or in warmer climates. Also, procedures necessary to accommodate the restrictions of the ensemble become routine if they are practiced regularly.

7.2.2. Workarounds. Take a hard look at procedures that are exempted from wearing all or part of the ensemble for reasons such as safety. For example, could a hand mirror help the person see? Could a safety observer be used to allow practice at an acceptable level of risk? An aggressive exercise regime is needed in order to find issues that could be show stoppers in a real CB environment.

WILLIAM P. HALLIN, Lt General, USAF
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Attachment 1

ABBREVIATIONS, ACRONYMS, AND TERMS

Abbreviations and Acronyms

AFSC	Air Force Specialty Code
BB	Bare Base
BDO	Battle Dress Overgarment
BEE	Bioenvironmental Engineer
BOI	Basis of Issue
BW	Biological Warfare
C^3	Command, Control, and Communications
CB	Chemical, Biological
CCA	Contamination Control Areas
CCD	Camouflage, Concealment, and Deception
CMBCC	Consolidated Mobility Bag Control Center
COB	Collocated Operating Base
ColPro	Collective Protection
CONUS	Continental United States
CW	Chemical Warfare
CWC	Chemical Weapons Convention
DCC	Damage Control Center
DIA	Defense Intelligence Agency
DoD	Department of Defense

IPE	Individual Protective Equipment
JSLIST	Joint Service Lightweight Integrated Suite Technology
LDA	Lightweight Decontamination Apparatus
MOB	Main Operating Base
MOPP	Mission Oriented Protective Posture
NBC	Nuclear, Biological, Chemical
NBCWRS	Nuclear, Biological and Chemical Warning and Reporting System
NBCCC	Nuclear, Biological, and Chemical Control Center
NCA	National Command Authority
ODS	Operation Desert Storm
SRC	Survival Recovery Center
TALCE	Tanker Airlift Control Elements
TBM	Tactical Ballistic Missile
TFA	Toxic Free Area
UTC	Unit Type Code
UXO	Unexploded Ordnance
VAT	Vulnerability Assessment Tool
WMD	Weapons of mass destruction
WRM	War Reserve Material

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