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NUCLEAR, BIOLOGICAL, CHEMICAL, AND CONVENTIONAL (NBCC) DEFENSE OPERATIONS AND STANDARDS

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This manual implements AFPD 10-26, *Counter-Nuclear, Biological, and Chemical (C-NBC) Operational Preparedness*, and AFI 10-2601, *C-NBC Operations (Draft)*. It also implements portions of AFPD 10-25, *Full Spectrum Threat Response (FSTR)*, and AFI 10-2 501, *Full Spectrum Threat Response, Planning and Operations*, for the Air Force FSTR Program. This manual supports the integration of actions into a single installation wartime NBCC Defense Program. It includes current Air Force doctrine, operational concepts, tactics, techniques, and procedures to enable both survival and the conduct and sustainment of operations in wartime NBCC environments. It also provides commanders with operational standards to use when developing individual, unit, installation, and theater plans, training, and exercises.

This is the initial publication of AFMAN 10-2602. It consolidates elements of AFI 32-4001, *Disaster Preparedness, Planning and Operations*; AFI 10-212, *Air Base Operability*; and AFMAN 32-4005, *Personal Protection and Attack Actions*; which will be revised or rescinded upon publication of this manual. It incorporates and consolidates requirements from related DoD and Air Force publications to simplify understanding and compliance with multiple program requirements. See **Attachment 1** for a glossary of references and supporting information.

SUMMARY OF REVISIONS

This interim change (IC2003-1) updates guidance on: estimating chemical warfare agent hazard duration, provides the web site location for the HQ AF/XO-approved Chemical Warfare Agent Hazard Duration Charts, and provides guidelines for use of the 10-foot rule in chemical warfare environments.

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Chapter 1

OPERATIONAL CONCEPTS AND STANDARDS

1.1. Introduction:

1.1.1. The Air Force strategy of Global Engagement, the proliferation of weapons of mass destruction (WMD), the war on terrorism, and new Department of Defense (DoD) guidance required a corresponding change in the way the Air Force conducts nuclear, biological, chemical and conventional (NBCC) defense operations. This manual includes these new requirements and concepts of operation, along with existing guidance, to provide effective tactics, techniques, and procedures (TTP) for conducting and sustaining operations in NBCC environments. It provides guidance and expanded procedures to enable forces to gain an operational advantage through exploitation of less than "worst case" attack scenarios. It also describes how the Air Force will protect non-combatants from attacks. The operational concepts and actions within this manual are tools. Use these tools to complete the individual and collective (team) tasks that enable enhanced mission accomplishment in NBCC environments.

1.1.2. Successful implementation requires commanders to refine their understanding of hazard environments and adopt a risk management approach. Staff experts from Security Forces, Intelligence, Medical, and the Base Civil Engineer Operations, Explosive Ordnance Disposal (EOD), Fire Protection, and Readiness Flights are available to assist the commander to develop and implement the appropriate courses of action.

1.1.3. Commanders, senior leaders, supervisors, specialized teams, and the Expeditionary Airman will use this manual to implement courses of action based on a current threat analysis and their mission. Users must be proficient within their wartime specialty and understand basic NBCC defense operations. Basic NBCC defense knowledge and task training is provided through attendance at the NBCC Defense Training Course taught by the Base Civil Engineer Readiness Flight.

1.1.4. The procedures within this manual are considered fully executable within the current Air Force force structure and with the NBCC defense material in the field today. In many cases, existing resources and equipment can simply be re-aligned to implement the necessary actions. However, these changes do not come without a cost. Commanders must recognize that tailored training and leadership commitment is required at all levels (senior leader, supervisor, specialized personnel, and the Expeditionary Airman) to fully benefit from these revised operational concepts and TTP.

1.2. Doctrine, Policy, and Guidance:

1.2.1. This manual implements doctrinal guidance for organizing and employing aerospace forces at the tactical level of war and across the full range of military operations. It consolidates joint service and Air Force doctrine requirements for wartime NBCC defense. Responsible agencies and individuals will use this consolidated guidance to execute their assigned missions as part of the air component of a joint service or multinational force. Commanders, supervisors, specialized teams, command and control elements, and the Expeditionary Airman will use this manual to develop deliberate plans and conduct wartime operations.

1.2.2. Air Force and joint doctrine requires commanders to prepare their forces for employment across the full spectrum of conflict. This doctrine outlines Air Force operations in support of a joint service task force or coalition operation. Joint doctrine publications include Joint Publication 3-01,

Joint Doctrine for Countering Air and Missile Threats, Joint Publication 3-11, *Joint Doctrine for Operations in Nuclear, Biological, and Chemical (NBC) Environments;* and Joint Publication 3-40, *Joint Counterproliferation Operations (Draft)*. The primary sources for Air Force C-NBC doctrine are AFDD 2-1.8, *Counter-Nuclear, Biological, and Chemical Operation*s; AFDD 2-4, *Combat Support; and* AFDD 2-4.1, *Force Protection*.

1.2.3. This manual applies to all Air Force military and civilian personnel including the Air Force Reserve Command (AFRC) and Air National Guard (ANG) units and members. Air Force units and personnel, such as Special Tactics and air liaison personnel, assigned to duty with the Department of State (DOS), United States Army, United States Navy, United States Marine Corps, or coalition force units, will also comply to the greatest extent possible with the NBCC defense policies, plans, and operations orders of their host or the supported organization.

1.2.4. Major commands (MAJCOM) and units are encouraged to develop supplemental guidance to integrate theater, MAJCOM, and host-nation procedures. Supplemental guidance must be as restrictive as, and not contradict, higher headquarters publications. Commanders of forces operating as part of a joint command will follow the directives and procedures of the relevant unified commander. Commanders of forces that operate as part of a multinational (alliance or coalition) command should follow multinational doctrine and procedures ratified by the United States. For doctrine and procedures not ratified by the United States, commanders should evaluate and follow the multinational command's doctrine and procedures, where applicable.

1.3. Mission. The Air Force will conduct prompt, sustained, and decisive worldwide operations with forces prepared to operate in NBCC environments. Commanders must protect these forces throughout all phases of the operations. NBCC defense enabling tasks at the airbase, leader, unit, and Expeditionary Airman levels are shown in **Table 1.1.**

1.4. Intelligence Preparation:

1.4.1. Use current intelligence information to assess a potential adversary's ability and intent to use NBCC weapons. Commanders, planners, and key leaders should strive to obtain specific information about the types and quantities of conventional weapons and NBC materials available for adversary use, the number and type of delivery systems, and the capabilities of Special Operations Forces (SOF). They should also attempt to determine the probable order of battle facing the airbase. Accurate information enables commanders to tailor defensive tactics to defeat specific threats or mitigate the consequences of an attack. While overall weapon system capability assessments may exist, the commander may face a significant information gap when assessing the likelihood that NBCC weapons may be employed. Unless our adversaries reveal their intent (intentionally or unintentionally), this may prevent commanders from knowing the specific degree of threat until a weapon is used.

1.4.2. Operational intelligence elements will provide initial threat assessments and information on the enemy order of battle and military doctrine. They will also analyze attack reports from other locations to identify enemy behaviors and predict future actions against the airbase. Additional sources for threat and intelligence information are provided in **Attachment 1**.

1.5. Operational Areas of Concern:

1.5.1. The Air Force conducts operations in both mature theaters of operation and austere regions. NBCC defense TTP must be flexible and adaptable to varied basing realities. Forces located in or

deployed to mature theaters primarily operate from existing main or collocated operating bases. Main operating bases normally have an established support, manpower, and facility infrastructure. Collocated operating bases may have an established support and facility infrastructure, but do not normally have assigned manpower. Forces deployed to austere regions or to recently re-occupied areas may find airbases without pre-existing support and facility infrastructure. In addition, hostile action or civil unrest may damage or destroy the airbase infrastructure before the arrival of United States forces.

Table 1.1. NBCC Defense Enabling Tasks.

Installation Level	Unit Level
Maintain airbase security and physical integrity	Maintain control of resources through the unit control center and work centers
Recognize attack initiation and protect personnel, weapon systems, and material from weapon effects	Develop threat-based plans, standard operating procedures, and checklists
Generate and sustain combat sortie generation and throughput in NBCC environments	Ensure NBCC defense equipment is available and serviceable
Complete tactical, strategic, and aeromedical airlift movement	Maintain individual and team training proficiency
Care for and evaluate medical casualties	
Leader or Supervisor Level	**Expeditionary Airman Level**
Lead people and manage resources	Understand the nature of NBCC warfare
Maintain unit cohesion and focus	Prepare for and survive NBCC attacks
Control forces through the wing operations center, survival recovery center, or unit control center	Identify, avoid, mark, and report hazards
Conduct action drills for likely attack scenarios	Mitigate the effects of an attack and perform self-aid and buddy care
Ensure people are trained in NBCC defense knowledge and tasks	Perform essential individual and collective tasks while wearing individual protective equipment

1.5.2. Units located in NBCC medium and high threat areas (see **Table 2.2.**) will develop contingency plans and conduct training and exercises for both the home station and deployment location (if applicable) threat and mission. All other units will plan, train, and conduct exercises for contingency operations at their deployment location(s). Develop plans, training, contingency response checklists, and exercises based upon a realistic threat and assessment of resources that will be available in a contingency. Deliberate plans that rely upon in-place resources, such as a public address system or collective protection facilities, may not be executable at austere locations. Train and exercise forces to develop alternate methods or work-around procedures should critical resources be destroyed or if host-nation or mutual-aid resources are unavailable.

1.5.3. All units should prepare for terrorist threats at their home station (see AFI 10-2501 and AFH 10-2502, *Weapons of Mass Destruction Threat Planning and Response Handbook*).

1.6. Standards. The Air Force standards for mission sustainment and mission capability restoration following chemical or biological attacks are summarized in **1.6.1.** and **1.6.2.** Although specific standards are

not established for mission restoration following conventional weapons attacks, commanders should use the wartime NBC defense standards as a guide to restore the mission. AFI 10-2501 outlines the peacetime response enabling standards and proficiency requirements. It includes response to terrorist attacks with weapons of mass destruction.

1.6.1. Any assigned, attached, or geographically separated Air Force unit conducting combat operations or in direct or indirect support of combat operations, must be able to:

1.6.1.1. Resume their primary mission within 2 hours after the end of a chemical or biological attack or the discovery that a covert attack has occurred.

1.6.1.2. Support operational sustainment, in accordance with FSTR Plan 10-2 (or equivalent), for up to 96 hours.

1.6.1.3. Support operational sustainment by reducing contamination-related casualties to the lowest possible level.

1.6.2. Any Air Force unit conducting force projection operations in support of expeditionary forces must be able to resume their primary mission capability within 6 hours after a chemical or biological attack or the discovery that a covert attack has occurred.

1.7. Operational Assumptions:

1.7.1. Mission priorities may require commanders to make determinations on protective postures and recovery actions based on incomplete information. A high priority mission may require acceptance of an increased casualty risk for some, or all, of the airbase population. Commanders should consult with their staff experts and consider both friendly and hostile force capabilities. Factors to consider include the commander's confidence in the intelligence assessment and the importance of the mission to the current and overall theater battle plan. Also, consider attack-warning timelines, alarm signals, force training, equipage levels, and the ability to communicate desired actions to all airbase forces. For hostile forces, consider their intent, probable order of battle, attrition (if any) due to counterforce operations, theater situation, and past behaviors.

1.7.2. NBC threats require the use of protective measures that could degrade the mission. Commanders must balance mission-degrading defensive measures against sortie generation, airlift throughput, and mission continuation. The threat of NBCC attack drives the determination of the appropriate alarm condition and Mission Oriented Protective Posture (MOPP) level (see paragraph **5.3.**).

1.7.3. The potential for attacks by terrorists with weapons of mass destruction (WMD) complicates a clear definition of specific protection requirements. In addition, personnel exposure limits for NBC agents and materials during peacetime operations are far more conservative than wartime exposure guidelines. Consult with medical personnel for peacetime exposure guidelines.

1.7.4. Additional funding, by itself, does not enhance Air Force capabilities to survive, fight, and win in NBCC environments. The Air Force must have broad operational concepts to effectively use the resources and manpower available. Commanders will tailor their response to counter the threat and meet specific unit missions or objectives.

1.7.5. The currently fielded chemical and biological agent detectors do not detect every potential agent in all forms (solid, liquid, or gaseous state) at expected concentrations. These detectors will detect field concentration of likely wartime agents under most conditions. If the agent concentration is below the detector's threshold level (lower limit of the detector sensitivity), the detector will not indi-

cate the agent is present. Consequently, detector operators can only determine that, if present, the agent concentration is below the instrument's level of detection sensitivity. Civil Engineer Readiness and medical specialists can provide specific information on NBC detector capabilities, limitations, and risk assessment.

1.7.6. Civil aircraft that are under DoD contract and the Civil Reserve Air Fleet (CRAF) may conduct flights into NBCC high and medium threat areas. They will not conduct operations into an airbase that is under attack or contaminated at the time of flight arrival. Depending upon the type of agent and scope of exposure, the crew may require medical evaluations, treatment, or prophylaxis prior to departure. Air Mobility Command provides CRAF and contract airlift crews with NBCC defense training and issues a groundcrew chemical ensemble before entry into these areas. If a CRAF aircraft or contract crew is caught on the ground during a chemical or biological attack, the crew will be evacuated by first available means and their aircraft grounded. (***NOTE***: See Headquarters AMC publication, *Air Mobility Operations in a Chemical and Biological Environment,* for detailed information on strategic airlift operations in chemical and biological environments).

1.7.7. The airlift cargo owner is tasked to decontaminate cargo before and after on-loading or off-loading. This is especially important for cargo movements from forward operating bases.

1.7.8. For airlift operations, only critical retrograde cargo will be moved from a contaminated to an uncontaminated airbase. Critical requirements are pre-designated in theater war plans.

1.7.9. The approval authority for landing contaminated aircraft at locations in areas outside of the continental United States area, territory, or possession is the Department of State (DOS). Requests for approval to land such aircraft will be made through appropriate unified command which, in-turn, will seek DOS approval. The approval authority for landing locations within the continental United States area, territory, or possession, is the DoD. Requests for approval to land such aircraft will be made to the HQ USAF/XO, which will, in-turn, seek DoD approval. The DoD must coordinate with applicable civilian authorities, and will only issue guidance on contaminated aircraft movement after obtaining approval from the President of the United States and United States Secretary of Defense.

1.7.10. Physical NBC contamination, regardless of the form (liquid droplet, particulate, and/or absorbed agent), will pose the greatest threat to airlift operations. This threat is primarily from cross-contamination and vapor emissions from contaminated areas, equipment, and cargo.

1.8. Leadership Challenges and Responsibilities:

1.8.1. Challenges. Leadership at all levels remains an essential element to effectively conduct and sustain operations in a multi-threat, multi-mission environment. Probably the greatest challenge faced by leaders and supervisors is continuing mission operations, despite the short and long-term impact of wartime operations upon themselves and their subordinates. The physical and psychological effects of NBCC weapons upon personnel and unit operations will range from limited to severe.

1.8.1.1. A leader's knowledge of an airman's abilities has always been a key component of successful leadership and becomes even more important under NBCC conditions. Leaders must anticipate that some people will have difficulty performing operations, such as operating in protective equipment, during wartime. The cause may be a lack of training, fatigue, poor health, or poor adjustment to the local climate. Wartime stress and physical conditions will magnify existing problems for some individuals and create new ones for others. Operationally stressful training situations will provide an opportunity to both identify and correct individual problems and to train

leaders to recognize and resolve common problems. Leaders and co-workers must watch for problems, take action to correct the situation within their ability, or notify the Unit Control Center (UCC), commander, or medical staff.

1.8.1.2. If personnel within a unit become NBCC casualties, other unit members may experience significant stress-related problems. Some, even though they were not exposed, may believe they have NBC agent symptoms too. Leaders must be aware of this potential problem and request assistance from the Survival Recovery Center (SRC), or medical personnel, if this situation occurs.

1.8.1.3. Several techniques are available to extend Airman, team, and unit performance under NBCC conditions. Develop standard operating procedures and train leaders and workers to perform tasks and missions under different alarm conditions (paragraph **4.7.**) and MOPP levels. Train all personnel on the procedures for day and night operations. Train supervisors to use crew rotations, work and rest cycles, sleep discipline, and to enforce hydration standards. Align Wing Operations Center (WOC), SRC, and UCC activities to support contamination footprint identification and isolation. In addition, focus WOC, SRC, and UCC activities on management of forces under different protective postures throughout the airbase, climatic conditions, and threat scenarios.

1.8.2. Responsibilities. See AFI 10-2501 and AFI 10-2601 (Draft) for specific Air Staff, MAJCOM, installation, and functional area responsibilities for NBCC defense.

1.8.2.1. NBCC Task Qualification Training (TQT). TQT prepares individuals and teams to perform mission essential tasks in NBCC threat environments. Unit supervisors and trainers will identify and conduct training for the target audiences listed in **Table 1.2.** Use this training to increase task and leader proficiency, develop work-around procedures, and identify limiting factors. At the lowest level, individuals learn to apply common core NBCC defense skills and tasks while wearing individual protective equipment. Common core tasks are contained in AFMAN 10-100, *Airman's Manual*, and AFH 32-4014V4, *USAF Ability to Survive and Operate in a NBC Environment*. Functional managers build upon core tasks and add Air Force Specialty (AFS) TQT requirements to their Career Field Education and Training Plan (CFETP). Supervisors and trainers use the CFETP to develop local training programs. Unit training managers assist supervisors in tracking TQT requirements. See AFI 10-2501 for additional information on NBCC TQT.

Table 1.2. NBCC Task Qualification Training Implementation.

Target Audience	Source Publications	Responsible Authority
Expeditionary Airman	AFMAN 10-100 and AFH 32-4014V4	HQ Air Force
Air Force Specialty or Augmentation Duty	Career Field Education and Training Plan, functional area publications	Air Force and MAJCOM Functional Manager
Expeditionary Airman, Team, or Crew	Job Qualification Standard, functional area publications, standard operating procedures, technical orders, job guides, checklists, and unit type code concepts of operation	Unit Functional Manager, Supervisor, and Team Chief

1.8.2.1.1. Air Force Functional Area Managers (FAM). The Air Force and MAJCOM FAM provides expert guidance for their Air Force Specialty. They are the critical link responsible for integrating NBCC defense operational concepts into Air Force and MAJCOM functional

area programs. The FAM will use the concepts and TTP within this manual to further develop their functional area-specific NBCC guidance and TTP. **Attachment 4** provides interim TTP for several functional areas. The FAM will also include NBCC guidance and TTP into the next revision of their functional publications, career field education and training plans, job guides, and formal schools. This guidance must be in sufficient detail to enable supervisors to identify the minimum individual and unit training tasks required to conduct operations in NBCC environments.

1.8.2.1.2. Airbase or Unit Functional Area Managers. The FAM (or their equivalent) at the airbase or unit level will incorporate Air Force and MAJCOM guidance into unit-level publications, training or job guides, checklists, and standard operating procedures. The FAM will provide first-line supervisors with guidance on NBCC defense TQT requirements for their Air Force specialty and assist commanders to develop standard unit response and recovery procedures for likely NBCC attack scenarios.

1.8.2.2. Airbase Area of Responsibility:

1.8.2.2.1. The Joint Rear Area Coordinator (JRAC) is responsible for coordinating wartime security for all rear area forces including air bases. The JRAC may assign the in-place or deployed Air Force commander an area of responsibility that extends beyond the boundaries of the airbase perimeter boundary. The senior Air Force commander normally will delegate responsibility for security within the base area of responsibility to the Defense Forces Commander. Responsibility for NBC detection and marking in the area outside of the base perimeter may or may not be the responsibility of the airbase. Specific requirements are determined by host-nation support agreements, local sensitivities, the capability of other services, and coordination with the JRAC.

1.8.2.2.2. Security Forces patrols that operate outside the installation perimeter and within the airbase area of responsibility must have the ability to detect and report NBC contamination. This may require additional training on specialized NBC detection instruments. Another method is for specialists from Civil Engineer Readiness to accompany Security Forces patrols to detect and mark NBC contamination and unexploded ordnance (UXO) in the area of responsibility. Conversely, Security Forces patrols may need to escort Civil Engineer teams tasked to evaluate the extent of contamination within unsecured areas of the installation perimeter or outside the installation boundaries. Security Forces patrols outside the airbase perimeter should assist in maintaining the security of automatic and manual chemical and biological agent detectors. Security Forces may not be able to immediately dedicate patrols specifically to these secondary tasks, especially if actively engaged in their primary tasks for airbase defense. Civil Engineer readiness specialists tasked to provide NBC defense support for Security Forces operations will be postured for immediate response, armed, equipped with personal body armor, and trained to perform their assigned tasks. The Base Defense Operations Center (BDOC), the Communications Squadron, and SRC must closely coordinate operational planning and communications requirements. Identify requirements and TTP for off-base NBCC reconnaissance operations within airbase FSTR Plan 10-2 and the base or joint support plan.

1.9. Organization:

1.9.1. The NBCC defense operational concept is to use the existing MAJCOM, theater, and installation command and control relationships and structures to execute NBCC defense operations. This

structure provides a natural mix of forces that includes senior leaders, functional area specialists, and wartime augmentation. It maintains control of a wide range of airbase activities and enables the commander to respond effectively to all threats and maintain mission focus. Adjustments may be necessary to support joint, theater, and host nation missions, but should not require the creation of a new or separate organization or structure.

1.9.2. Commanders will organize their forces and develop a command and control structure to meet operational requirements under the most likely threat conditions. **Chapter 4** details tasks and responsibilities for this organization and provides a framework for planning, controlling, and executing response actions.

1.10. Joint and Combined Operations. Most future conflicts will include Air Force participation in a Joint or coalition campaign. Units operating from overseas bases are also subject to host-nation agreements and requirements. Joint doctrine requires Air Force units to integrate operational and support activities within the framework of the Joint organizations and host-nation agreements. Refer to JP 3-10, *Doctrine for Joint Rear Area Operations,* JP 3-11, and JP 3-40 (Draft) for additional information and guidance.

1.11. Host Nation (HN) Support:

1.11.1. The availability of host nation support may enable Air Force units to reduce support and transportation requirements by securing agreements with host nations. These agreements may include forces, civilian manpower, supplies, equipment, and facilities designated for airbase use during wartime. MAJCOM and theater planners should develop support agreements to complement Air Force NBCC capabilities and reduce the need for pre-positioned or mobility material. Any new agreements must fulfill existing regulatory requirements. Contact the Wing Judge Advocate for further guidance on new agreements and for interpretation of any existing agreement, including but not limited to, any Status of Forces Agreement or Defense Contract Agency agreement.

1.11.2. Host-nation agreements should include all of the NBCC support Air Force units receive from or provide to host nation forces. Examples include exclusive or shared use of NBCC attack warning and reporting systems, medical treatment, NBCC detection, decontamination, and access to facility hardening equipment and supplies. Also, see Joint Publication 4-0, *Doctrine for Logistics Support Operations*, for additional information.

1.11.3. The Joint Forces Commander (JFC) normally establishes a single office to serve as the executive agent to manage and coordinate host nation support (HNS) during wartime. Airbase or Air Component Command representatives use this office, according to JFC directions and guidelines, to resolve conflicts when seeking HNS.

1.12. Noncombatant Protection:

1.12.1. Host-Nation Support. Provide NBCC training and equip host-nation forces with NBCC protective equipment as required by host-nation agreements, Joint Forces, theater, or MAJCOM directives.

1.12.2. United States Family Members and Contract Personnel. Provide NBCC training and equipment to family members as required by DOS, DoD, Joint Forces, theater, or MAJCOM directives. Provide NBCC training and equipment to contractors as required by contract agreement, DoD (see

DoDI 3020.37, *Continuation of Essential DoD Contractor Services During Crises*), Joint Forces, theater, or MAJCOM directives.

1.12.3. Non-Combatant Evacuation Order Operations. Treat all United States citizens equally during noncombatant evacuation. Other nations may request evacuation support from the DOS. Upon DOS approval, Third Country Nationals from countries who have been authorized assistance will be included.

1.12.4. Enemy Prisoners of War (EPW). Security Forces, in coordination with Supply and Civil Engineer Readiness, develop personnel protection plans and issue available NBC defense clothing and equipment items to the extent possible to EPWs, retained personnel, civilian internees, and other detainees in Air Force custody. Make all reasonable attempts to transport these personnel to non-threat areas to minimize risk and limit demands for individual protective equipment. MAJCOMs may authorize units to procure and maintain additional personal protective equipment components for this requirement. Security Forces and Civil Engineer Readiness must coordinate use of protective equipment, decontamination items, and containment facility protection. EPWs and retained personnel are allowed to retain personal effects such as the helmet, canteen, protective mask, and chemical protective garment. Train these personnel to recognize the airbase attack warning signals and take protective actions. Provide each civilian internee camp with adequate shelter to ensure protection against the hazards of war.

1.13. NBCC Defense Force Structure:

1.13.1. NBCC defense actions require a force structure that includes both primary duty and base augmentation forces. Primary duty NBCC defense forces are located within the Civil Engineer Squadron Readiness Flight. The medical portion of the NBCC defense mission is performed by several medical specialties. They include Bioenvironmental Engineering, Public Health, Medical Laboratory, and direct patient care providers. These multifunctional forces develop plans, provide NBCC technical expertise, and manage specialized teams. See **Table A3.1.**, **Table A3.7.**, and **Table A3.8.**, for summation of NBCC defense pre-, trans-, and post-attack tasks for these forces.

1.13.2. In-place and deployed units provide augmentation manpower for unit post-attack reconnaissance teams (see **Attachment 6**), unit control centers, shelter management teams, contamination control teams, and contamination control area teams. Deliberate planning guidelines for identifying specialist and augmentation support for NBCC defense are found in AFI 10-404, *Base Support and Expeditionary Site Planning*. The installation, MAJCOM, theater, or Air Force planning agent determines actual requirements after considering the threat and missions for each in-place and deployed location.

1.14. Training and Exercises:

1.14.1. The Air Force provides NBCC defense training at the expeditionary Airman, team, supervisor, and senior leader levels. Training begins with individual skills provided by the Civil Engineer Readiness Flight. TQT, conducted by first-line supervisors, builds upon these skills. The next level expands to incorporate increasingly larger and more complex team, unit, and airbase-level training and exercises. At each level, the first priority is to perform mission essential tasks in the threat environment expected at the home station or deployment location. The next priority is to perform those tasks in the expected threat environment at all other potential deployment locations. Imposing NBCC conditions upon already heavy training schedules adds complexity and increases the degree of diffi-

culty and total training time. However, the advantages are that trained Airmen, teams, units, and leaders can integrate multiple mission scenarios and cope with complex and stressful situations.

1.14.2. Develop plans and implement training and procedures based upon a realistic estimation of the enemy's ability to attack the airbase and personnel. Attack scenarios, especially for installation-level exercises, should closely resemble actual enemy or terrorist tactics, number of attacks, and times of likely attack. For example, if local exercises contain excessive numbers of simulated attacks during times convenient for evaluation but unrealistic for the threat, then supervisors cannot perfect the integration and flow of combat turn or airlift operations in a hostile environment.

1.15. NBC Defense:

1.15.1. Background. For the past decade, the Air Force has relied upon individual protective equipment as the primary means to protect Air Force people and conduct operations in NBC environments. Operational concepts required forces, under some scenarios, to wear protective equipment for extended periods under post-attack NBC conditions. Commanders devoted significant manpower and material to post-attack decontamination actions. Recent scientific reports, tests, and field studies now show that many of these techniques were largely ineffective and provided little increase in either protection or operational capability.

1.15.2. NBC Operational Concept. The Air Force operational concept for NBC defense is to organize, train, and equip the force to make risk-based decisions and gain operational advantage. Air Force units will retain the ability to operate under all conditions, but will focus their primary efforts on conducting combat operations under the NBC conditions expected at airbases. Air Force NBC defense operations rely upon risk-based decision making, individual and collective protection equipment, and integrated individual, unit, and airbase actions.

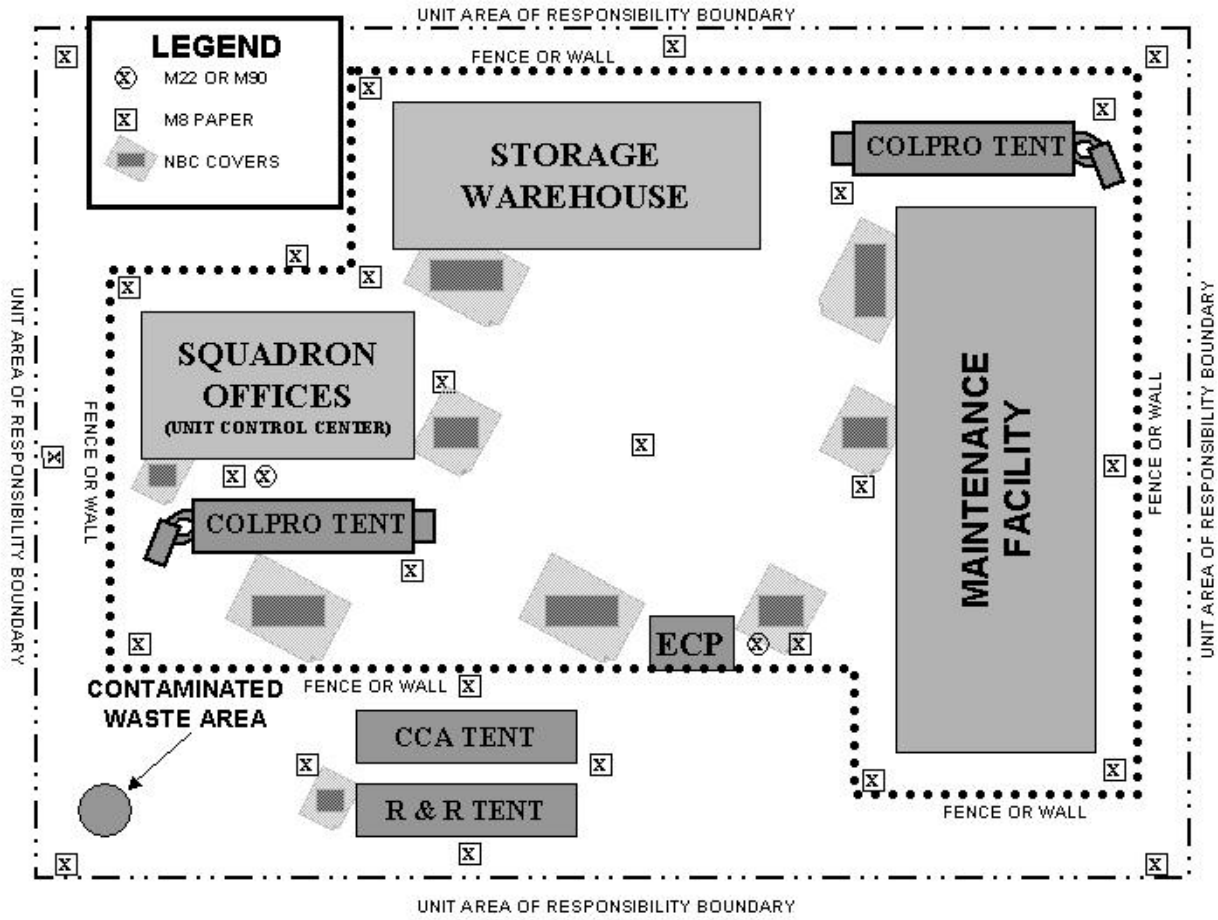
1.15.2.1. The threat of NBC agent use and presence of NBC contamination following attacks will increase logistic requirements and divert manpower and resources from other base recovery and mission support operations. Single attacks and factors such as the type of agent and environmental conditions, may require wearing protective equipment for several minutes to hours. Multiple attacks, the use of newly developed chemical or biological agents, and unfavorable weather conditions may extend wear times or require repeated donning and doffing over extended periods.

1.15.2.2. Commanders determine what actions are executable based upon pre- and post-attack threat assessment, availability of resources, and mission needs. Airmen and leaders develop plans and execute attack response actions to limit contamination. They perform immediate and operational decontamination and conduct rapid post-attack reconnaissance to detect, identify, and/or segregate contaminated resources and areas (**Figure 1.1.**). Contamination avoidance planning includes the effective use of barriers, such as tarps or plastic sheeting, and optimized use of shelters and overhead cover enhance post-attack use of uncontaminated assets. Pre-planned actions should be implemented when attack warning is received to reduce vulnerability and avoid contamination of personnel and critical equipment.

1.15.2.3. Personnel should use uncontaminated assets to the extent possible in the post-attack environment. The UCC directs unit personnel to accomplish mission essential tasks and stop non-mission essential tasks. The UCCs monitor the contamination status of people, equipment, and areas. UCCs also instruct unit personnel to minimize movement, especially between contaminated and uncontaminated zones. Individuals or teams do not enter or exit contaminated areas or

move contaminated equipment into uncontaminated areas without UCC or SRC approval. Personnel go to contamination control areas or reduce MOPP when directed by their unit or the SRC.

Figure 1.1. Contamination Avoidance and Post-Attack Reconnaissance Plan.



1.15.2.4. The senior Air Force commander assesses risk and directs protective measures for all forces within the airbase area of responsibility. Unit commanders determine need to reduce protective postures when these actions enable a more rapid focus on mission continuation or restoration. They use information from their UCC and unit post attack reconnaissance (PAR) teams for initial hazard assessment. They next contact the SRC to obtain authority from the senior Air Force commander to reduce their MOPP level. Within the SRC, Civil Engineer Readiness and medical personnel evaluate conditions (e.g., type of hazards present in sectors or zones, weather conditions) and develop the appropriate recommendation. This recommendation is presented to the senior Air Force commander and, if approved, authorization is provided to unit commanders.

1.16. Theater Basing Options:

1.16.1. Techniques such as remote basing, dispersal, and redundancy, are theater or MAJCOM options. For example, increasing the distance between the airbase and NBCC threat can reduce or eliminate the NBCC threat. Commanders can reduce NBCC defense manpower and resource require-

ments and the need for extensive protective measures by moving forces outside the optimal ranges of threat weapons systems. The DoD publication, *Proliferation: Threat and Response,* provides an excellent unclassified summary of current threats and the characteristics of threat weapons systems. Other options include relocating or dispersing high-risk, high-value assets among several bases and deploying redundant assets. Another tactic is to increase counterforce and base defense activities to reduce threats during planned airlift or sortie generation periods. Based on mission priorities, consider also delaying force deployment to allow counterforce measures time to reduce or eliminate the threat of attack. These measures apply equally well to the threat of NBC or conventional attack.

1.16.2. Remote Basing. The primary reason for remote basing is to protect critical systems from damage, destruction, contamination, or disruption of operations. The first priority should include weapons systems, command and control, and medical support functions that would experience high degradation from NBCC weapons effects or protective actions. By employing this tactic for those weapons systems that can be moved, commanders can reduce support requirements at threat bases and enhance the availability of critical assets for priority or time-sensitive missions.

1.16.3. Relocation and Dispersal. Relocation and dispersal sites offer an operational alternative if enemy attacks prevent or restrict operations at primary bases. Relocation plans should be developed prior to attack and include both personnel and aircraft options. Consider reciprocal agreements to provide temporary support at other Air Force or coalition forces within the region. Within most theaters of operation, dispersal sites will not support full-scale operations. However, dispersal remains a viable option if circumstances prevent operations at primary bases. Feasibility considerations include the time required to conduct operations, availability of cross-servicing facilities, communication connectivity, and the availability and type of munitions. Also, consider the significant logistic issues involved with moving or pre-positioning people, equipment, and consumables to support dispersal site operations and security.

1.16.4. Redundancy. An alternative to dispersal sites is to create redundancy by assigning several bases to support the same or similar missions. Consider this option, for example, when missile defense systems do not provide coverage for all operating locations. Redundancy can allow an attacked base to concentrate on recovering from damage or contamination while its assigned aircraft operate from another, pre-planned location. Planning should address the necessary equipment, supplies, munitions, security, and personnel. Supporting bases should have sufficient space to handle the additional aircraft and support requirements. Airlift may be necessary to transfer resources between bases where distance or security prevents surface movement.

1.16.5. Delayed Deployment. Under some circumstances, theater staffs may be able to evaluate the pattern of attacks and delay the airlift flow or adjust arrival times to coincide with periods of reduced threat. These adjustments may also provide additional time for counterforce elements and the base defense forces to reduce or eliminate threats. When forces must flow regardless of the threat, identify periods where enemy activity or their ability to conduct attacks is low. For example, missile attacks or special operations force activities may decrease during daylight due to the increased effectiveness of counterforce operations and base defense forces. In this situation, consider increasing the airlift flow during daylight hours and reducing flow during hours of darkness.

1.17. Terrorist Attacks with Weapons of Mass Destruction (WMD):

1.17.1. General Actions. Terrorist use of WMD is a significant threat to airbases and personnel due to the potential for damage, casualties, and mission disruption. AFI 10-2501, AFI 10-245, *Air Force*

Force Protection Standards, and AFH 10-2502 outline Air Force procedures for terrorist WMD attack planning and response. Commanders ensure that their installation can respond to a terrorist attack by assessing the vulnerabilities within their area of responsibility. This includes preparing an installation-wide response plan and equipping, training, and exercising personnel. Include WMD incident response procedures in the airbase FSTR Plan 10-2, or the base or joint support plan. The in-place or deployed emergency response forces (medical, Civil Engineer, and security forces) provide the bulk of WMD planning, response, and recovery capability. During wartime, this capability can be augmented by host nation forces, mutual aid and support agreements, and through the deliberate addition of specialized response forces. If an attack occurs, additional response forces from the Federal Bureau of Investigation, Federal Emergency Management Agency, or the DoD may also be available.

1.17.2. En-route Support and Contingency Operating Locations. Installation and units supporting contingency operations include key command, control, computer, communications, and intelligence (C4I) operations. Contingency support also includes space support operations, en-route support bases, continental United States (CONUS)-based strategic aircraft and missile forces, airlift control centers, and aerial ports of embarkation. Planners should consider expanding or augmenting response capability at en-route support and contingency operating locations to mitigate the effects of an attack and quickly restore mission capability.

1.17.3. Other Locations. Air Force units that support missions such as training, space operations, command and control, and host-nation forces may also be at increased risk of attack during contingency operations. Heightened security at airbases or other locations in direct support of combat operations may result in terrorist actions against perceived "soft" targets. WMD threats may also escalate during periods when Air Force units support or host high-visibility civil, military, or political activities or events. Increased vigilance and operational actions may be required during such events as government summit meetings, air shows, general officer or cabinet-level meetings, and legal proceedings. Planning should consider the need for temporary augmentation or a permanent response capability expansion at these locations to increase protection and mitigate the effects of an attack.

1.18. Medical Operations:

1.18.1. Introduction. For the purposes of this manual, the term medical treatment facility (MTF) includes both fixed site MTFs and deployed medical facilities such as expeditionary medical support (EMEDS). Refer to AFTTP 3-42.1, *Medical Command and Control,* AFTTP 3-42.3, *Health Service Support in Nuclear, Biological and Chemical Environments (Draft),* and AFTTP 3-42.8, *Medical Logistics and Blood Support Operations*, for additional doctrinal guidance and functional area TTP for medical operations.

1.18.1.1. Passive defense measures may reduce, but are not expected to eliminate, injuries that result from NBCC attacks. NBCC weapons effects include blast, heat, shrapnel, chemical, radiological, and biological toxin-related illnesses, and biological warfare agent pathogen infections. Casualties are also likely from the secondary effects of an attack. These include injuries from fires, toxic industrial chemicals, building collapse, vehicle and aircraft accidents, unexploded ordnance, falls, electrocution, and enemy and friendly small arms fire.

1.18.1.2. Comprehensive prevention programs, countermeasures, and medical surveillance programs are required to minimize mission degradation from NBC agent use. These passive defense measures help prevent ingestion, inhalation, or absorption of chemical and biological agents.

Communication between line and medical personnel is critical in assessing environmental or other NBC exposure risks.

1.18.2. Responsibilities and Support:

1.18.2.1. Responsibilities:

1.18.2.1.1. Medical duties involve providing or supporting medical care and preventing casualties through various passive defense oriented missions (including preventive medicine). Medical surveillance programs include the tracking and epidemiological assessment of disease incidence to aid in the recognition of covertly delivered biological or chemical agents. This mission includes the assessment of endemic diseases, required immunizations, and other disease countermeasures. These other measures include personal protective and hygiene measures (including the use of bednets and other disease vector countermeasures), the protection of food and water, and chemoprophylaxis and chemical agent antidotes. Medical duties also include protecting the medical facility and patients who are under the control of the medical system. A summary of medical NBCC tasks and responsibilities is outlined in **Table A3.1.**, **Table A3.7.**, and **Table A3.8.**.

1.18.2.1.2. The medical commander, or designated representative, should be a member of the battle staff. The medical NBC officer, NCO, or others assigned by the Medical Commander, will serve at the SRC and alternate SRC to advise on patient management issues and NBC health risk assessment/surveillance.

1.18.2.2. Intelligence Support. The medical commander and staff have a need-to-know and must be provided operationally and tactically relevant NBCC intelligence and enemy threat assessments. This information allows medical personnel to properly orient the medical passive defense and casualty care missions. The medical commander, through the medical intelligence officer, also provides Medical Intelligence from medical surveillance systems to the WOC, SRC, and other staff agencies. Under some conditions, the data from medical surveillance systems may be the first indication of NBC attack.

1.18.2.3. Base Operating Support. Medical units will require base operating support as detailed in the various medical concepts of operation, the airbase FSTR Plan 10-2, and the base or joint support plan.

1.18.3. Casualty Management and Patient Treatment:

1.18.3.1. Medical Treatment:

1.18.3.1.1. Medical treatment is provided through five levels of care. **Table 1.3.** summarizes the medical team and personnel capabilities at each echelon. 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 MTF, and to the next echelon of care. Treatment, beyond self-aid and buddy care (SABC), is the responsibility of medical personnel. Casualties become medical patients when they enter a medical diagnosis and treatment sequence.

1.18.3.1.2. Medical personnel conduct casualty care operations required to save life or limb but within the scope of acceptable risk to the patient and medical personnel. Medical personnel will not unnecessarily compromise collective protection toxic free areas or place medical personnel or their patients at unnecessary risk. MTFs are high-value, low-density assets.

1.18.3.1.3. Most clinical care provided by medical personnel cannot be conducted in contaminated environments. This includes environments with transient chemical vapors, biological contamination, or radiological contamination. Commanders must recognize that MTFs will operate at much reduced efficiency in the event of transient vapor or aerosol, or radiological contamination. Plans must include the identification of alternate medical facilities. Medical commanders must identify critical clinical resources that will be protected in the event of NBCC attack. This protection minimizes mission degradation when assets are transferred to the alternate facility.

1.18.3.2. Medical Levels of Care (Also see AFTTP 3-42.1):

1.18.3.2.1. Level I. Level I care is rendered at the unit level (point of injury) by nearby personnel or emergency responders. It includes self-aid, buddy care, combat lifesaver skills, and examination. It also includes emergency lifesaving measures such as the maintenance of the airway, control of bleeding, prevention and control of shock, splinting or immobilizing fractures, and prevention of further injury. Treatment may include restoration of the airway by invasive procedures, use of intravenous fluids and antibiotics, and application of splints and bandages.

1.18.3.2.2. Level II. Level II care includes basic resuscitation and stabilization. It may also include advanced trauma management, emergency medical procedures, forward resuscitative surgery capability, basic laboratory, limited x-ray, pharmacy, and temporary holding facilities. Patients are treated and returned to duty, or are stabilized for evacuation to a MTF capable of providing a higher level of care.

1.18.3.2.3. Level III. 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. This level of care may be the first step toward the restoration of functional health, as compared to procedures that stabilize a condition to prolong life. It does not normally have the crisis aspects of initial resuscitative care and can proceed with greater preparation and deliberation.

Table 1.3. Levels of Care Provided by Air Force Medical Forces.

Medical Team or Asset	Level of Care				
	I	II	III	IV	V
Independent Duty Medical Technician (IDMT)	X	X			
Squadron Medical Element (SME)	X	X			
Air Transportable Clinic (ATC)	X	X			
Preventive Aerospace Medicine (PAM)	X	X			
Global Reach Laydown (GRL)	X	X			
Mobile Field Surgical Team (MFST)		X	X[1]		
Small Portable Expeditionary Aeromedical Rapid Response Team (SPEARR)		X	X[1]		
Expeditionary Medical Support (EMEDS Basic)		X	X[2]		
Expeditionary Medical Support (EMEDS Plus 10)		X	X		
Expeditionary Medical Support (EMEDS Plus 25)		X	X		
Collectively Protected Expeditionary Medical Support (EMEDS Basic 10/25) [3]		X	X		
Aeromedical Staging Facility (ASF)[3]		X			
Air Force Theater Hospital			X	X[4]	
Fixed Medical Center				X	X

NOTES:

1. Level III capabilities, when attached to additional medical assets.
2. Limited Level III capabilities. Dependent upon timely patient evacuation and resupply.
3. Clinical capabilities from SMEs through EMEDS Basic will provide only minimal ability to treat and care for NBC casualties. These assets will not deploy with collective protection systems. Without collective protection, they will be unable to treat casualties in chemically contaminated environments and may suffer operational degradation in radiological or biological environments. The ASF also does not have collective protection. Patients awaiting movement during an attack will require Individual Protective Equipment (IPE). The Air Force is in the process of building and fielding collectively protected EMEDS at the plus 10 and 25 bed levels. Medical commanders must ensure the operational limiting factors of medical systems without collective protection are accounted for in airbase NBC defense plans.
4. Level IV capabilities depend upon the geographic location and presence of specialty sets.

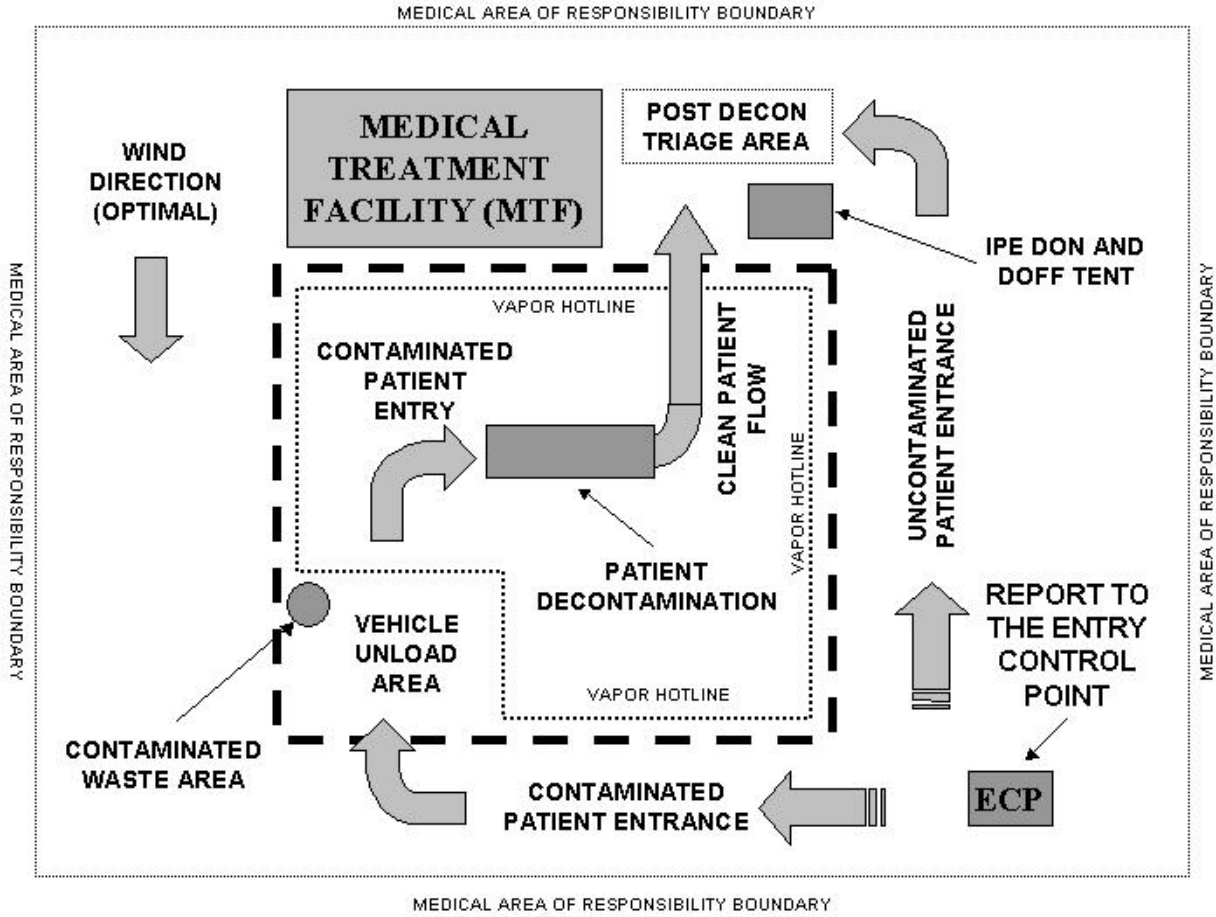
1.18.3.2.4. Level IV. Level IV care provides the surgical capabilities found in Level III care, and provides rehabilitative and recovery therapy for those who can return to duty within the theater evacuation policy. This level of care may only be available in mature theaters.

1.18.3.2.5. Level V. Level V care is definitive, convalescent, restorative, and rehabilitative. It is normally provided by military commander-approved safe havens and by Department of Veterans Affairs and civilian hospitals within the CONUS.

1.18.4. Patient Decontamination. Decontamination of casualties protects them from the detrimental effects of contamination and protects those who move and treat them. Units and individuals have the responsibility for immediate decontamination during the SABC process (i.e., use of M291 and M295 decontamination kits). This should be done as soon as contamination is found and prior to moving them to the medical facility; quick action saves lives. Upon completion of SABC efforts, units should move contaminated casualties into the medical treatment system as soon as possible, even if decontamination is not complete. The MTF will plan for and provide patient decontamination dependent on local threat conditions. The wartime patient decontamination team provides this capability and may be deployed dependent on NBC threat. Medical units without a patient decontamination team may need to establish decontamination capability using personnel and material of opportunity. Commanders at the employment location may need to provide manpower augmentation to the medical unit in the event of insufficient medical resources. Ambulatory personnel with no significant symptoms should process through unit or area Contamination Control Areas whenever practical for decontamination. Patient decontamination resources are limited and are best suited for personnel in need of medical care.

1.18.5. Transportation of Casualties. Unit commanders, supervisors, and individuals are responsible for moving casualties to the designated casualty collection point or to the MTF (see **Figure 1.2.**). Consider designating unit vehicles and drivers to support casualty movement. Use the procedures in AFH 36-2218, *Self Aid and Buddy Care*, to configure vehicles and load casualties for movement. Plans should consider situations where severe weather conditions, ground force attacks, attack damage, or NBC contamination prevents or delays transportation of casualties. Large units should designate one or more unit areas as casualty holding points. Use these areas to provide overhead cover and protect casualties from the elements until conditions improve. In some situations, patient retrieval teams may be tasked to pick up casualties; however, this must be coordinated through the SRC and medical staff.

Figure 1.2. Casualty Movement for the Medical Treatment Facility (Notional).



1.18.6. Duty Status of Casualties:

1.18.6.1. An NBC casualty is a person who enters the medical system for any NBC-related heath issue, who displays symptoms of NBC agent exposure, or has received one or more injections of the MK1 Nerve Agent Antidote Kit or other chemoprophylaxis. This broad definition enables a quick identification of NBC agent effects, allows medical personnel to begin an individual treatment program, and enables rapid evaluation of the effectiveness of current NBC protective measures. Individuals without protective equipment who are exposed to NBC agents, but do not display symptoms, should continue mission essential functions. They should report the incident to their UCC and the UCC should request instructions from medical personnel. Medical personnel should evaluate the need for treatment within 24 hours and document the exposure within the appropriate medical records.

1.18.6.2. Once a casualty enters the medical system and becomes a patient, the decision to return to duty, including flight status, or to remain under medical treatment, rests with the responsible medical official.

1.18.6.3. The medical facility will notify the unit to pick up patients who are being returned to duty. If necessary, the medical facility will equip the patient with the battle dress overgarment (BDO) or chemical protective overgarment (CPO), overboots, gloves, and protective mask. Base

supply will provide the equipment to the medical facility out of existing protective equipment stocks or from deployed forces equipment.

1.18.7. Medical NBC Countermeasures:

1.18.7.1. AFMAN 23-110, *USAF Supply Manual, Volume 5, Air Force Medical Materiel Management System - General*, provides guidance for stocking and managing medical chemical and biological warfare countermeasures war reserve material. Commanders should ensure their personnel in or subject to deployment to NBCC medium and high threat areas receive prophylaxis, based on advice from medical authorities. Consider the medical threat, attack probability, logistics stockpiles, and other available protective measures. Pre-exposure prophylactic administration of antibiotics is generally not advisable due to unknown efficacy, potential adverse reactions, costs, and possible waste of critical resources. Current DoD policy is that any off-label use of medical countermeasures is subject to the Food and Drug Administration investigational new drug policy. Medical commanders must know and understand current DoD, theater, joint task force, and Air Force policy regarding these countermeasures prior to advising any off-label use. However, they should use their medical judgment as the tactical situation dictates.

1.18.7.2. Commanders, supervisors, and medical personnel should emphasize good sanitation and hygiene measures. They should protect food and water from contamination, maintain personal cleanliness, and properly dispose of waste. Food and water sources are good targets for covert contamination with chemical or biological agents. This contamination can occur very early in the supply line and risks are greatest when foods are procured locally in foreign countries. Commanders must establish secure and reliable sources of subsistence and must monitor the safety and security of the processes of food procurement, food delivery, food preparation, and food service to ensure the safety of food and water used for troop feeding. These measures are some of the most important and least costly of protective measures against both naturally occurring diseases and biological and chemical attacks. A food and water vulnerability assessment must be conducted as part of the installation vulnerability assessment by medical, security forces, services and CE personnel.

1.18.8. Disposition of Protective Equipment, Personal Weapons, Ammunition, and Munitions. Use the following guidelines for handling casualties equipped with the groundcrew chemical ensemble (GCE), field gear, and body armor and those armed with personal weapons, ammunition, and munitions. Where possible, remove these items from casualties in a manner that enables their return to operational use. Coordinate specific actions, training, and procedures for constructing holding areas and handling these items with the security forces, CE readiness, and explosive ordnance disposal (EOD) personnel.

1.18.8.1. Patients will retain their protective mask with filter, spectacle inserts, and antidotes until they arrive at a medical treatment facility within a low threat area. Patients that are most likely to be returned to duty should retain all of their serviceable protective equipment (helmet, chemical-biological warfare defense equipment, antidotes, and canteen with water).

1.18.8.2. Armed personnel who become casualties should be relieved of their weapons, ammunition, and munitions by personnel from their own unit prior to arrival at the casualty or mortuary collection point if it is safe to do so. Unit members should return these items to the unit armory, aircrew life support section, or appropriate storage area. This action quickly returns valuable resources to the unit and reduces the potential for disruption at the collection points. If it is not safe

to remove weapons, ammunition and munitions, notify EOD personnel or the SRC to have the items removed as outlined in Joint Pub 4-06, *Joint Tactics, Techniques, and Procedures for Mortuary Affairs in Joint Operations*.

1.18.8.3. Before the start of processing and after receiving proper training from security forces and EOD personnel, medical personnel will search casualties and remove weapons, ammunition, and munitions. For United States weapons, remove the ammunition, safe the weapon, and store the weapon and ammunition in a holding area. Advise the owning unit to retrieve their weapon(s) and ammunition. Request security forces to retrieve weapon(s) and ammunition, if the unit ownership cannot be determined. Treat all munitions (such as grenades, mines, fuses, flares, and bulk explosive) and all non-United States weapons and ammunition as unexploded ordnance. Place them within the unexploded ordnance holding area and notify EOD personnel or the SRC.

1.18.9. Protective Measures within Medical Treatment Areas. The senior Air Force commander may delegate the authority to determine MOPP levels and other protective measures within medical areas or sectors to the medical commander. To implement this action, the medical facility must have the capability to provide NBC detection and identification capabilities similar to that provided by Civil Engineer NBC Reconnaissance Teams. This authority, if exercised, must be personally delegated by the senior Air Force commander. The medical staff must also verify with the NBC Defense Cell that medical areas are not within the downwind vapor plume of an agent deposition (droplet fall) area. Medical personnel will conduct detection, monitoring, and contamination assessment within these designated areas.

1.18.10. Medical Personnel Billeting. Whenever possible, provide billeting for medical personnel within the medical area or MTF. Use billeting space for the medical NBC teams, key providers, and for patient overflow.

1.18.11. Wartime Stress. During wartime, base personnel may experience significant stress-related problems. Some individuals or groups may believe they have NBC agent symptoms even when they have not been exposed. The medical system must be prepared to deal with this, and provide education and field support to base units. This may include sending medical personnel to areas where significant numbers of people believe they are experiencing NBC symptoms, even though exposure to NBC agents was unlikely. The purpose is to alleviate people's fears and quickly restore mission focus.

1.18.12. Unit First-Aid Supplies and Equipment. All units/work centers should maintain first-aid supplies, litters, and emergency supplies appropriate for the unit/work center size and mission. Add additional supplies when required to protect casualties from environmental conditions (i.e., blankets, potable water, ponchos, or snow covers). Where available, use existing unit protective shelter first aid kits and equipment to meet initial needs. Use standard Shelter First Aid Kit (NSN: 6545-01-090-0645). The basis of issue is one kit and six litters (NSN: 6530-00-783-7905) for each 100 personnel. Consult Technical Order 00-35A-39, *Instructions for Procurement, Issue, Use, and Maintenance of Medical Kits*, for more information on stocking and managing first aid kits. Also, contact the home station or deployed medical forces representative to determine specific requirements and types of supplies and equipment. Units are responsible for resourcing and maintaining the serviceability of these supplies.

Chapter 2

WARTIME AIRBASE THREATS

Section 2A—Threat Assessment

2.1. Background:

2.1.1. Commanders are expected to assess and identify the most likely threats at both home station and their deployed locations, and tailor their forces to conduct operations to counter them. AFI 10-2501 and AFI 10-245, include standards, processes, and procedures to identify threats, determine vulnerabilities, and develop effective countermeasures. This chapter provides information on likely airbase threats and discusses how potential adversaries might employ these weapons. For some threats, it provides information to assist in quantifying the enemy order of battle.

2.1.2. Airbases can be targeted by many different types of weapons systems. Fortunately, only a few categories of weapons have the range and delivery means to be viable threats. An analysis of the specific airbase threats is required to effectively apply this information under wartime conditions. Defensive planners must understand the unique capabilities, characteristics, attack profiles, and weaknesses of these weapons to develop effective countermeasures and defensive plans. This chapter discusses those commonalities and provides a framework to evaluate and mitigate threats to airbases.

2.2. Operational Environment. Air Force people and weapons systems are vulnerable to NBCC threats at both CONUS and locations outside the continental United States (OCONUS). This potential for attack requires the Air Force to adopt deliberate, pre-planned courses of action to counter general NBCC threats. It also requires the ability to adjust actions to counter specific threats identified through intelligence analysis or post-attack reconnaissance information.

2.2.1. The Asymmetric Threat. The strength of the United States military forces is well understood by our adversaries. Consequently, our adversaries are more likely to try asymmetric methods of attack as a means to counter our strengths. Some states may see asymmetric strategies as a means to avoid direct engagements with dominant United States conventional forces and a way to "level the playing field." They may resort to the use of NBC weapons as well as conventional weapons or explosives. Threat forces include terrorist groups, special operations forces, or other forces using small-unit tactics. These forces may employ this strategy to disrupt operations by employing weapons and tactics that inflict a large number of casualties or are intended to cause panic and confusion.

2.2.2. Counter-NBC Operations. Counter-NBC operations include those activities taken to detect, deter, disrupt, deny, or destroy an adversary's NBC capabilities and to minimize the effects of an enemy NBC attack on operations. The four elements of the program (**Table 2.1.**) are proliferation prevention, counterforce, active defense, and passive defense. The integration of these concepts into aerospace operations enables United States forces to operate despite confrontation with an adversary employing NBC weapons. AFDD 2-1.8 provides a framework for understanding, planning, and executing this part of aerospace warfare. Counterforce operations and active defense thin the threat, lessen the number of attacks that friendly forces have to absorb, and reduce the burden on passive defense measures.

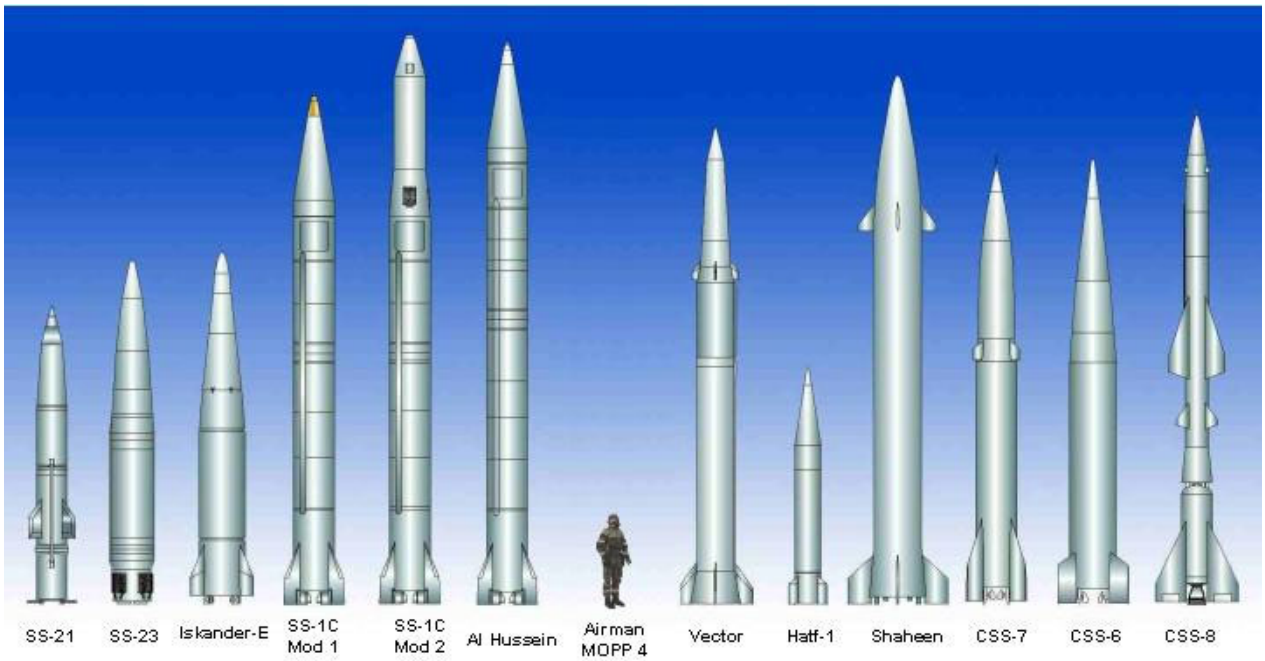
2.2.3. Airbase Threat Overview. Airbase threats may include attacks by air, ground, missile, special operations forces (SOF), or terrorists. Depending upon the theater of operations and airbase location,

enemy forces could employ NBCC weapons against multiple locations, single bases, or as part of a terrorist or SOF attack. For the near future, the theater ballistic missile (TBM) remains the dominant NBCC weapon delivery system against an airbase during wartime. The relative inaccuracy of current TBMs, such as the SCUD (see SS-1C, **Figure 2.1.**), increases the likelihood that chemical or biological warheads, if available, will be employed. Terrorists or SOF ground forces may conduct random airbase attacks with standoff weapons against targets of opportunity such as aircraft and massed troops. These forces may also use standoff weapons or saboteurs to target specific parts of the airbase, such as command and control systems; critical utility nodes; petroleum, oil, and lubricants (POL) storage and distribution systems; and large sources of toxic industrial materials on or near the base. Ground forces normally are limited to small arms and conventional explosives, but could employ small quantities of chemical or biological weapons. **Attachment 2** provides additional information on NBCC and toxic industrial material (TIM) threats.

Table 2.1. Elements of Air Force Counter-NBC Operations.

Program Area	Scope
Proliferation Prevention	Denying attempts by would-be proliferates to acquire or expand their chemical or biological capabilities
Counterforce Operations	Destroy or degrade an adversary's offensive capability before it can be used against friendly forces
Active Defense	Actions to destroy enemy weapons and delivery vehicles while en-route to their targets
Passive Defense	Contamination avoidance, protection, and contamination control

Figure 2.1. Typical Theater Ballistic Missile Systems.



2.2.3.1. Conventional Threats:

2.2.3.1.1. Theater missile attacks with high-explosive warheads are the primary conventional threat to airbases. Large-scale airbase attacks by aircraft armed with conventional weapons are unlikely, unless air dominance is lost. If attacking aircraft reach the airbase, they would most likely attack large, high visibility targets such as airfield surfaces, troop concentrations or tent cities, tactical and cargo aircraft in open areas, POL storage tanks, and visible command and control structures.

2.2.3.1.2. Mass artillery or rocket attacks on an airbase are unlikely unless the ground situation changes and the airbase comes within range of conventional artillery or multiple launch rocket forces. Airbase operations cannot be conducted within the effective range of significant amounts of enemy artillery or multiple launch rocket systems.

2.2.3.2. NBC Threats. The Air Force has made significant NBC defense capability improvements over the last ten years. However, developments throughout the world indicate an increased need for vigilance and emphasis on NBC defense. Many of the countries engaged in offensive NBC programs combine their efforts with theater missile and UAV programs. There are recent reports of newly engineered and altered forms of biological agents and new chemical agents. The possibility exists that new agents could be developed to challenge the effectiveness of current detectors, protective equipment, or medical countermeasures. UAVs are ideally suited for the delivery of chemical or biological weapons given the UAVs' ability to disseminate aerosols. Although the primary concern for adversary use UAVs with chemical or biological dissemination capability has

been nation-states, there is a potential for terrorist groups to produce or acquire small UAVs and use them as delivery vehicles.

2.2.3.2.1. Nuclear Threat. The proliferation of nuclear weapons and technology is expected to continue. Inspections and intelligence might not always predict technical advances toward nuclear weapons development. The nuclear programs on the Indian subcontinent are examples of the kind of progress that can be made in nuclear weapons development, even in the face of international safeguards and the threat of economic sanctions. China and Russia both have significant tactical and strategic nuclear arsenals undergoing modernization. Although the Russian nuclear stockpile is being reduced, there are concerns regarding the security of the remaining stockpile. On the Korean Peninsula, North Korea is known to have produced enough plutonium to make at least one nuclear device. The inspection program meant to contain the North Korean nuclear program has been challenged, and its long-term effectiveness has yet to be determined. Similarly, Iran continues to expand the technical and industrial infrastructure necessary to achieve a level of self-sufficiency and expertise in nuclear-related technologies. Iran declares this increased technical capability is peaceful in nature, but the expertise and the facilities could also support nuclear weapons development.

2.2.3.2.2. Biological Threat. The Defense Intelligence Agency estimates that more than ten countries have active biological warfare (BW) programs. Some have achieved weaponization, and others will attain that status very soon. In 1995, the revelation that Iraq had a broad BW program showed how a small core of specialists could bring a program from research to weaponization in less than five years. A number of other countries have the infrastructure, technical expertise, and the degree of secrecy needed to mimic the Iraqi program. Concerns relating to potential military use of biological warfare agents focus primarily on Russia, because of its heritage of an extensive Soviet-era BW program. Other countries are also of concern. There is strong evidence that China maintains its offensive BW program. Syria and Iran are also identified as having offensive BW programs. Finally, North Korea is suspected of having an active BW program.

2.2.3.2.3. Chemical Threat. Over 20 nations are assessed to have initiated chemical warfare (CW) programs. While a small number are believed to have abandoned their active programs, many remain committed to CW agent production and the weaponization of a variety of agents. Russia may have retained most of the chemical weapons of the Soviet Union. There are specific concerns with so-called “Fourth Generation Agents” developed more recently than V-series agents. Intelligence community leaders have testified about the possible transfer of chemical agent expertise, precursors, and technology from Russia to other countries. The revelations of the Iraqi CW program provided a real-world example of how quickly a robust CW program can be achieved through a combination of secrecy and state sponsorship. There also are indications that various Middle Eastern and Asian nations remain on the path to CW agent weaponization, even after signing and ratifying the Chemical Weapons Conventions.

2.2.3.2.4. Toxic Industrial Material Threats. There is a growing concern that the wide availability of many TIMs makes them potential tools for asymmetric attacks against airbases. Hostile forces could target storage sites, such as industrial plants or treatment facilities located on or near an airbase. Depending on the type and quantity of TIMs, a deliberate release could present a short or long term hazard at the release site and for those within the downwind chemical plume.

2.2.4. Summary. The full extent of the Iraqi NBC program profoundly affected our perceptions of proliferation. Events since 1991 made clear that, as important as treaties and international trade restrictions are, they cannot be relied upon to eliminate the proliferation of NBC technologies, materials, and expertise. The Khobar Tower bombing, attack on the United States Embassy in Kenya, attack on the USS Cole, and most recently the horrific attacks on the United States World Trade Centers and the Pentagon remind us that our military forces and civilian population are at risk from asymmetric attacks. NBC weapons and the potential for terrorism remain direct and real threats to forces at CONUS and OCONUS airbases.

2.3. Airbase Threat Assessment:

2.3.1. Worldwide NBCC Threat Assessment. **Table 2.2.** identifies threats by geographical location as provided by the major commands. This assessment, or postulated threat, enables commanders to identify minimum standards to train, organize, equip, and protect forces. The nature of NBCC weapons and their delivery systems make it difficult to positively identify the type of warhead (i.e., conventional or NBC), until after the weapon is used. Consequently, these standards address all likely NBCC weapon threats. The Air Force recognizes that the specific nature of the threat is seldom static. AFI 10-2501 outlines the requirement to develop and maintain a baseline NBCC threat assessment for the home station and each planned deployment location. This assessment includes current intelligence information and the location-specific threat information required to develop the most effective defenses. Consistent with MAJCOM and theater directives, commanders tailor their forces and employ threat-specific countermeasures. Intelligence agencies support this requirement by providing detailed assessments of the enemy order of battle, means of delivery, warhead type or agent fill, and the conditions under which hostile forces may employ these weapons.

Table 2.2. Worldwide NBCC Threat Assessment by Location.

NBCC Threat Area	Geographical Location
High Threat Area (HTA)	Bahrain, Balkans Region, Diego Garcia, Egypt, Greece, India, Israel, Jordan, Kingdom of Saudi Arabia, Kuwait, Pakistan, Qatar, Republic of China (Taiwan), Republic of Korea, Somalia, Singapore, Sudan, Thailand, Turkey, United Arab Emirates
Medium Threat Area (MTA)	Germany, Italy, Japan, and Yemen
Low Threat Area (LTA)	All locations not listed as a high or medium threat area

2.3.2. NBCC Threat Areas. **Table 2.2.** shows the NBCC threats to airbases for both deliberate and execution level planning. Airbases within these geographical locations are categorized as NBCC high, medium, or low threat areas. This assessment uses open source publications, MAJCOM and theater guidance, and unclassified intelligence information available at the time of publication.

2.3.2.1. NBCC High Threat Area (HTA). Forces in these areas are at risk from attack with NBCC weapons and subject to terrorist use of weapons of mass destruction. Potential adversaries within the region either possess or are likely to possess a substantial stockpile of NBCC weapons and weapons systems and may have special operations forces capable of conducting sustained attacks on airbases. Actual or potential terrorist threats exist during peacetime or wartime. Air Force personnel and units in or deployed to these locations will be organized, trained, and equipped to survive NBCC attacks and conduct sustained combat operations in NBC environments.

2.3.2.2. NBCC Medium Threat Area (MTA). Forces in these areas are at risk to attack with NBCC weapons and subject to terrorist use of weapons of mass destruction. Potential adversaries within the region either possess or are likely to possess NBCC weapons and have weapons systems and may also have special operations forces capable of conducting limited attacks on airbases. Actual or potential terrorist threats exist during peacetime or wartime. Air Force personnel and units in or deployed to these locations will be organized, trained, and equipped to survive NBCC attacks and conduct combat operations in NBC environments.

2.3.2.3. NBCC Low Threat Area (LTA). Forces in these areas are not considered at risk from attack with NBCC weapons, but are subject to attack by terrorists using weapons of mass destruction. Actual or potential terrorist threats exist during peacetime or wartime. Air Force personnel and weapons systems in or deployed to these locations will be organized, trained, and equipped to survive attacks by terrorists using weapons of mass destruction and restore primary mission capability. CONUS installations will comply with applicable Continuity of Operations Plans and nuclear fallout shelter requirements in AFI 10-2501 and AFMAN 32-4005, *Personal Protection and Attack Actions*.

2.3.3. Baseline NBCC Threat Assessment. Commanders are required to develop a single baseline NBCC threat assessment for their home station location and for each potential deployment location. This assessment is used for deliberate and execution planning, exercise scenario development and evaluation, and installation Vulnerability Assessment. The installation Threat Working Group is tasked to develop the assessment using guidelines in AFI 10-245, and this publication. As a minimum, commanders must use the information in the most current version of the *Worldwide Chemical-Biological Threat to USAF Air Bases: 1995 – 2005 (S/NF)*. Additional information on WMD threats is available on the Athena Web Site (http://www.dia.smil.mil/Athena). The assessment incorporates current intelligence and force protection information from theater, MAJCOM, and Joint Task Force headquarters. It also includes input from the local intelligence, the Air Force Office of Special Investigations (AFOSI), security forces, civil engineer, and medical organizations. Conduct this assessment annually, when significant threat changes occur, and prior to exercise or actual deployment of forces.

2.4. Threat Levels. Three airbase attack threat levels are used to identify likely methods of airbase attack and responsibilities for action. The enemy may use one or all of the attack methods listed. Air Force personnel and units must be capable of reacting to NBC threats at all threat levels.

2.4.1. Level I includes small-scale threats conducted by agents, sympathizers, partisans, and agent-supervised or independently initiated terrorist activities. Level I threats must be defeated by the air base defense (ABD) forces.

2.4.2. Level II includes long-range reconnaissance, intelligence gathering, and sabotage operations conducted by special purpose forces, guerrilla forces, unconventional forces, or small tactical units. Level II threats must be defeated or delayed by ABD forces until assistance comes from response forces assigned to area commands.

2.4.3. Level III threats include major attacks by aircraft and theater missiles armed with NBCC weapons and major ground attacks. ABD forces must be able to delay ground-based Level III threats. They may require timely assistance from a rear area response or tactical combat force.

2.5. Terrorist Force Protection Conditions (FPCON). The FPCON system (**Table 2.3.**) is a DoD program standardizing the military services' identification of, and recommended responses to terrorist threats

against United States personnel and facilities. The FPCON system is the principle means for a commander to apply an operational decision on how to protect against terrorism. It also facilitates inter-Service coordination and support for antiterrorism. Commanders that have jurisdiction or control over threatened facilities or personnel declare the appropriate level of response. FPCONs describe progressive levels of terrorist threats and initiate pre-planned defensive or mitigation actions. FPCON declarations are normally provided through the chain-of-command, base public address system announcements, and other available base media. The minimum measures required for FPCON levels are found in AFI 10-245, as well as theater and local guidance.

Table 2.3. Terrorist Force Protection Condition (FPCON) System.

Condition	Application	Considerations
FPCON NORMAL	Applies when a general global threat of possible terrorist activity exists.	Warrants a routine security posture.
FPCON ALPHA	Applies when there is an increased general threat of possible terrorist activity against personnel or facilities, the nature and extent of which are unpredictable.	ALPHA measures must be capable of being maintained indefinitely.
FPCON BRAVO	Applies when an increased or more predict-able threat of terrorist activity exists.	Sustaining BRAVO measures for a prolonged period may affect operational capability and relations with local authorities.
FPCON CHARLIE	Applies when an incident occurs or intelligence is received indicating some form of terrorist action or targeting against personnel or facilities is likely.	Implementation of CHARLIE measures will create hardship and affect the activities of the unit and its personnel.
FPCON DELTA	Applies in the immediate area where a terrorist attack has occurred or when intelligence has been received that terrorist action against a specific location or person is imminent.	Normally, this FPCON is declared as a localized condition. FPCON DELTA measures are not intended to be sustained for substantial periods.

Section 2B—NBCC Weapons Effects and Employment Strategies

2.6. Airbase Attacks:

2.6.1. The primary NBCC weapons employment means against OCONUS airbases in the Third World are assessed to be TBMs while the danger to CONUS and OCONUS facilities in the developed world will be those means available to terrorists and enemy SOF. Other delivery methods include attacks from fixed and rotary wing aircraft, artillery, land or sea launched cruise missiles, and remotely piloted vehicles.

2.6.2. This chapter includes a brief description of threat weapons and characteristics. It provides likely airbase attack scenarios and suggests countermeasures and defensive actions. It does not address all potential threat weapons. Always consult with the local intelligence unit or agency and air

defense unit for base-specific information on ground, air, and missile threats. Request detailed information on warhead and fuse types, attack scenarios, and airbase defensive system capabilities.

2.7. Theater Ballistic Missile Systems:

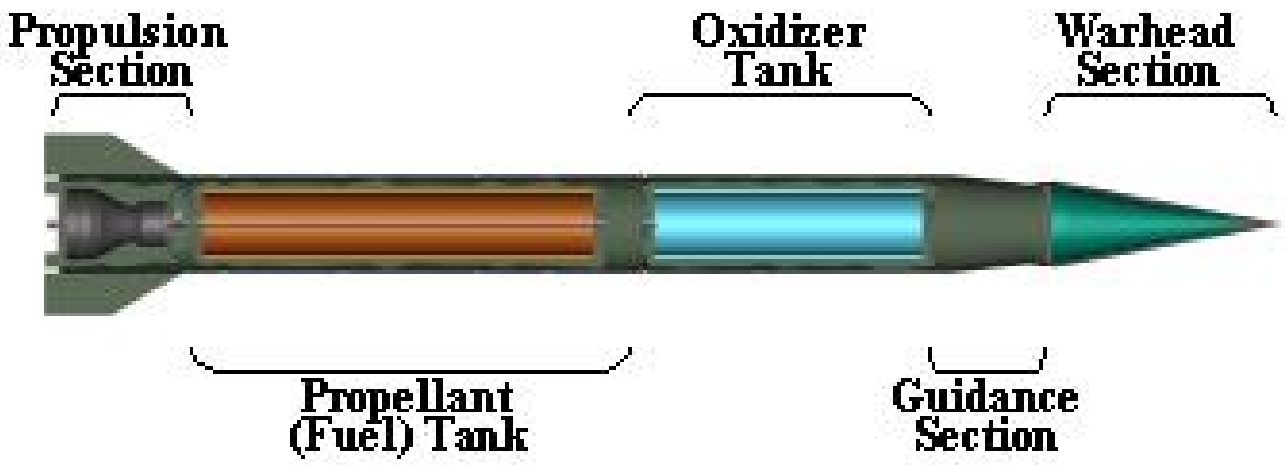
2.7.1. Description:

2.7.1.1. Many overseas airbases and planned deployment locations are within the effective range of one or more TBM systems (**Figure 2.1.**) deployed by our potential adversaries. TBMs have unique characteristics that must be considered when planning defensive actions. These unique traits, coupled with the difficulty in targeting and destroying TBMs prior to and after launch, require airbases to develop threat-specific responses to effectively counter the threat and minimize mission degradations.

2.7.1.2. Potential adversaries are not currently capable of attacking and contaminating entire airbases with TBMs equipped with liquid chemical agent filled warheads. Most medium and long-range TBMs are relatively inaccurate, and this inaccuracy increases with the range to the target. Accordingly, foreign strike planners use such techniques as firing additional systems or using bomblet or sub-munition loads to compensate for this deficiency. Agent coverage is further affected by variables such as the weather, height of burst, and method of agent dissemination. TBMs equipped with a biological agent warhead may be able to affect somewhat larger areas. The immediate hazard from most biological agents is from inhaling the agent as the cloud passes over the airbase. The amount of the biological agent that settles during the cloud's passage does not present significant operational contact hazards for extended periods. Re-suspension hazards are possible but do not pose as great an operational risk as compared to risks during the initial cloud passage and agent settling. Personnel must be aware of the potential for creating re-suspension hazards by actions such as removing contamination avoidance covers from assets during post attack operations. Personnel should use methods that do not create inhalation hazards and wear the appropriate protective equipment.

2.7.2. Weapon Characteristics. TBMs are surface-to-surface missiles that currently are used primarily as area attack weapons, though as more advanced TBMs with better guidance and control systems enter service, they may become capable of precision attack. Their primary purpose is to deliver an NBCC warhead to a target that is not within the range or ability of other weapons systems, such as manned aircraft or artillery, to successfully attack. **Figure 2.2.** shows the major components of a single-stage, non-separating warhead TBM, which constitutes most of the current TBM threat--the SCUDs in many countries' inventories. These missiles are launched on an initial steering vector, but once launched, they continue toward their pre-programmed target on an established trajectory. When the appropriate distance to a target has been covered, the fuel supply to the engine is cut off and the missile continues on a ballistic (unguided) trajectory to the target. TBM ranges extend from about 50 miles to greater than 2000 miles. Depending on the range to target, the missile can reach a terminal velocity of approximately 2100 to 3600 miles per hour (Mach 3 to Mach 5) by the time the warhead explodes and the remaining missile components impact the ground. Most older TBM warheads and missile bodies remain as a single unit until the warhead functions. New and longer-range missiles have warheads designed to separate from the missile body in flight. This separation allows the warhead to slow down to a terminal velocity of about 750 miles per hour (Mach 1). Lower terminal velocities will generally provide a more effective means to deliver a wider range of chemical or biological agents.

Figure 2.2. Typical Theater Ballistic Missile - Major Components.



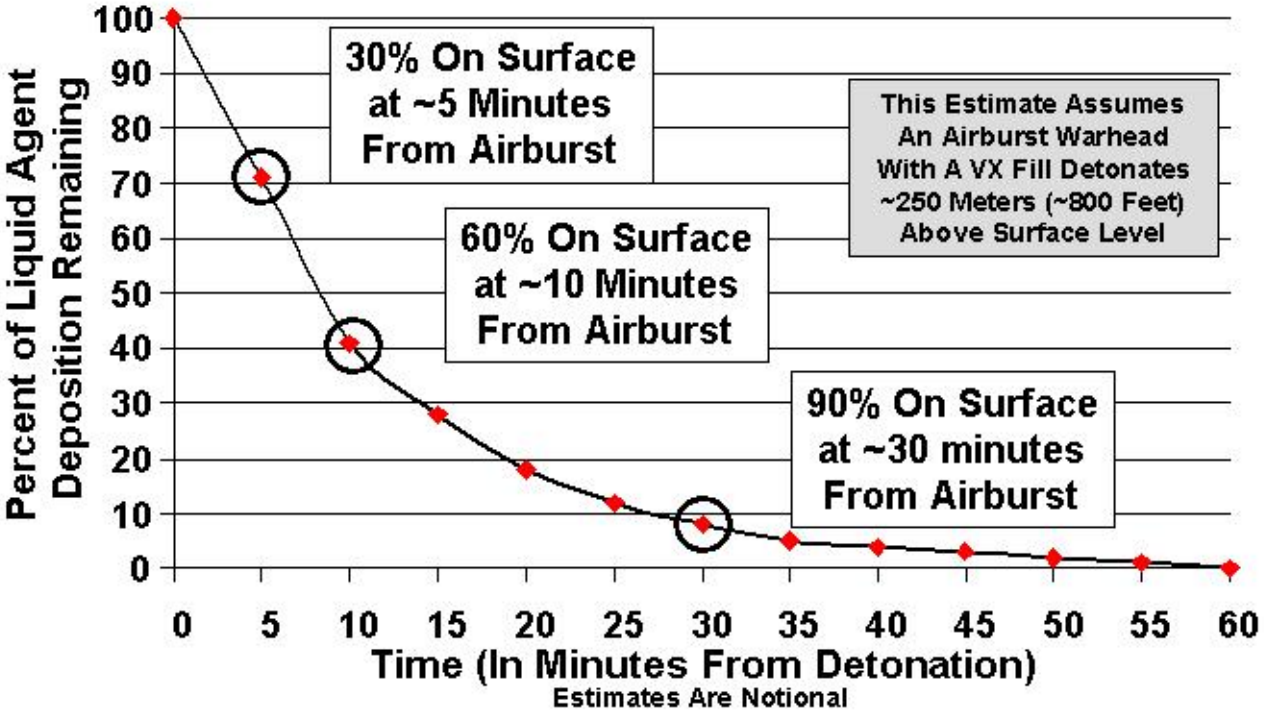
2.7.3. Weapon Effects. The primary threat from a TBM is the warhead. TBM warheads are fused (designed to explode or function) to optimize the effect of the warhead fill. Warheads may be fused for air, ground, or sub-surface bursts. The warheads may contain a conventional explosive, nuclear weapon, or a chemical or biological agent fill. Multiple-missile attacks may include more than one type of warhead. Use post-attack reconnaissance to determine what happened in an attack and direct protective actions accordingly.

2.7.3.1. Ground Burst Warheads. TBMs with conventional warheads are designed to explode upon or shortly after impact with the ground. The very high missile speed and a 600-to-1,000 pound conventional warhead combine to produce a devastating explosion at the point of impact. Significant damage will occur to buildings and utilities within the immediate area and a large impact crater is likely. Ground burst warheads with chemical and biological agents create the greatest hazard within the immediate area surrounding the impact point. Most of the agent effectiveness will be lost from the force of warhead impact.

2.7.3.2. Airburst Warheads:

2.7.3.2.1. Airburst warheads provide the most effective area coverage and dispersion pattern for chemical and biological agents. Larger agent droplets or solid particles will generally fall more quickly, while smaller droplets and particles will fall further downwind and at a slower rate. Similarly, the vapor released as liquid agents evaporate will move from the point of release toward the ground and in a downwind direction. An airburst warhead with a biological agent fill produces significantly greater downwind hazard than a chemical warhead. If an agent, such as VX, is released at an optimal burst height of about 250 meters (about 800 feet) above ground level, the agent falls to the ground over the next 60 minutes in the downwind direction of the prevailing wind. The average size of the VX liquid droplets that reach the ground from such an attack are expected to be about 200 to 250 microns, or about the thickness of four sheets of paper. **Figure 2.3.** shows the estimated deposition timeline for liquid VX droplets released in an airburst.

Figure 2.3. Estimated VX Liquid Agent Deposition Time Following a SCUD Airburst Warhead Detonation 250 Meters (820 feet) Above Ground Level.



2.7.3.2.2. One of the simplest and most effective countermeasures to avoid contamination from airburst weapons is to remain under overhead cover (and in protective equipment) until after the liquid agent or solid particle fallout reaches the ground. Specific chemical agent deposition, or droplet fall times, vary based on the agent type, burst height, weather conditions, and the missile speed at detonation.

2.7.3.3. Submunition Warheads. TBMs may also be equipped with warheads filled with chemical or biological agent submunitions. Submunition warheads are filled with multiple small bomblets that are released at altitude to disperse over a wide area. This configuration can deliver a wider range of agents to the target but reduces the total amount of agent carried. Submunitions may also be used to deliver agents that are not robust enough to survive release from a ground burst or supersonic airburst. Although an airburst may disperse the individual submunitions over a large portion of an airbase, any liquid or solid agent contamination will be limited to the immediate impact area of each bomblet. For further information on chemical and biological agent submunitions, consult current intelligence assessments.

2.7.4. Secondary Threats:

2.7.4.1. Several significant secondary threats also exist during and after TBM attacks. TBMs, such as the SCUD and SCUD variants, have warheads that are not designed to separate from the missile body. These missiles often remain as one unit until the warhead functions or it impacts the ground, although stresses encountered during descent can cause SCUD variants modified for extended range to break up prior to impact. When an airburst warhead functions (or if the missile is hit with an anti-ballistic missile), the missile components (body, fuel tanks, guidance and pro-

pulsion sections) continue on a ballistic trajectory and impact within the targeted area. Missile components from a separating warhead TBM will follow a different trajectory and will not normally impact the targeted airbase.

2.7.4.2. In addition to potential explosive, chemical or biological hazards, the missile may impact a building or create a crater. Other hazard may be present from the remaining missile fuel and oxidizer or from the facility or structure the missile hit (e.g., fuel, power lines, munitions). Personnel in MOPP 4 (see **Chapter 5**) are protected from potential chemical and biological hazards, but are not fully protected from the unused or unburned missile oxidizers and fuel hazards. Depending on the quantity remaining, the residual propellants present a potential toxic chemical hazard to emergency response forces, rescue workers and utility and pavement repair crews. These substances may also cause M8 paper to falsely indicate the presence of chemical agents or mask the presence of the actual agent. Emergency response forces should follow procedures within the *Emergency Response Guidebook* when missile propellant hazards are suspected or found. Consult current intelligence assessments to determine the most likely hazards from threat missile systems and develop response procedures accordingly.

2.7.4.3. Security forces, maintenance personnel, post-attack reconnaissance teams, and others who work outdoors, are most likely to discover craters caused by the impact of a TBM missile body or warhead. Personnel should treat these craters as hazardous until cleared by EOD personnel, and use standard explosive ordnance reconnaissance marking and reporting procedures. Be aware that vapors from missile propellants may be present and hazardous. Unless required to rescue injured personnel, do not come closer than 100 feet from the crater edge or visible debris. If possible, approach suspicious areas, craters, and missile debris from the upwind side. Use M8 paper to check contamination on non-porous surfaces (bare metal and glass) and check pre-positioned M8 paper sites within the immediate area. These actions will assist Civil Engineer EOD and readiness personnel analyze the situation and begin hazard reduction.

2.7.4.4. Patriot batteries located within or near the airbase also present indirect hazards to airbase forces. Personnel within the immediate area of Patriot batteries, such as security forces or repair crews, may receive little or no warning of a missile launch. A sudden launch may throw debris that could injure unprotected personnel. Hazards also may exist from falling components of the Patriot missiles that either impact the enemy missile or self-destruct over the airbase.

2.7.5. Employment Strategies. TBM attacks are most effective when large numbers of missiles are launched and programmed to arrive at a single target area within a short period. Depending on the number of missiles launched, an attack of this type could saturate missile defenses and allow one or more missiles to enter the airbase area. Another tactic is to launch smaller numbers of missiles spaced several hours apart. Although missile defenses will likely destroy these missiles, this tactic forces the airbase to implement mission-degrading defensive actions and disrupts operations. In addition, some damage may occur from falling missile components. However, accuracies are improving as threat nations continually strive to develop or acquire improved guidance systems and longer range weapons with larger warheads. **Table 2.4.** provides a notional estimate of SCUD missile impacts under several potential attack scenarios and current accuracy assumptions.

Table 2.4. Potential SCUD Missile Impacts by Raid Size (Notional Estimate).

Missiles Inbound*	Possible Warhead Impacts		Possible Missile Body Impacts**
	Limited Patriot Defense	No Patriot Defense	
3	0-1	1	2
6	1	2-3	4-6
12	2	4-5	8-10
18	5	6-7	12-14

*Assumes one attack with 50-50 mix of chemical and conventional warheads, against a target with a 1000-meter (3280 foot) radius, using a time-on-target employment strategy.

**Assumes non-separating warhead missile (such as SCUD variants) with or without Patriot defenses.

2.7.6. Defensive Actions and Countermeasures:

2.7.6.1. TBMs are not smart weapons and do not seek and identify specific targets on the airbase. Camouflage, concealment, and deception (CCD) and blackout countermeasures are useless against this threat. Permanent and expedient hardening methods are effective ways to increase physical protection for people, critical facilities, and infrastructure (see **Attachment 7**). Train personnel to pre-plan actions and conduct "last second" contamination avoidance and protective actions. When attack warning is received, safely terminate current operations (such as fueling, munitions loading, and medical care) and take reasonable actions to protect people and material. Actions may include moving equipment, vehicles and aircraft under cover, and closing windows, doors, canopies, and hatches.

2.7.6.2. Missile warning systems are different within each theater of operations. The airbase may receive missile launch warning from the Theater Air Control Center or other command and control node. Warning systems are often a mix of computer systems, radio, telephone, or pager alert systems. Actual warning timelines are a combination of events that begin with the missile launch, and end with the impact on or near the airbase. Quick actions are required by each link in the warning chain to maximize pre-attack actions at the targeted airbase. Delays in warning or slow response by key staff may limit or eliminate the ability to accomplish mitigating actions. Preplanning for these scenarios and quick decisions by the staff may allow the airbase to launch sorties that would otherwise be delayed or lost.

2.7.6.3. Airbase staffs must analyze their warning system and develop likely timelines for each warning event from missile launch to impact. **Table 2.5.** shows a method to identify the warning timelines from three different launch sites capable of targeting the airbase. An actual analysis would include the actual or expected time for each event in the warning chain. These events may show that a window of opportunity exists for the commander to direct last minute actions to continue missions or protect highly vulnerable resources.

Table 2.5. Example of TBM Warning Time Assessment for Airbase Attack.

Launch Location	Time (In Minutes) to Complete Action								
	Missile Launch	Theater Detect	Theater Warns	WOC* Receives	WOC Decision	Alarm Red	Total Time	Flight Time	Difference
Site 1	0	:30	1:00	:30	1:00	:30	3:30	4:30	+1:00
Site 2	0	:30	1:00	:30	1:00	:30	3:30	4:45	+1:15
Site 3	0	:30	1:00	:30	1:00	:30	3:30	6:10	+2:40

NOTE: Use actual TBM threat information, distances, and warning transmission times to develop a warning time assessment for a specific location.

* WOC - Wing Operations Center or equivalent

2.7.6.4. Protective actions for missile attacks are not always as simple as declaring Alarm Red. The operations and support staff must use the warning timelines to develop and practice missile launch responses for likely day and night mission and support scenarios. Examples may include missile launch warning receipt during aircraft generation and recovery, cargo aircraft loading or unloading, bomb buildup, post-attack reconnaissance, or combat turn operations. Depending on the estimated time to impact, the commander may direct some operations to continue (such as tactical and cargo aircraft launch-to-survive) or safely terminate (fueling, aircraft taxi, munitions loading). Pre-planned actions may include direction through functional area channels to implement "last second" contamination avoidance and protective actions regardless of Alarm Red declaration. Examples may include moving equipment, munitions, and aircraft into shelters, closing hardened aircraft shelter or hanger doors, moving casualties under protective cover, or moving munitions in transit to shelter. Pre-planned actions and coordinated execution can limit the inherent risk to personnel and reduce attack damage and contamination.

2.8. Aircraft Threats:

2.8.1. Description. A successful enemy air attack against an airbase depends upon the enemy order of battle and their ability to penetrate air defenses and target the base. Weapons may include gravity bombs, rockets, precision-guided munitions, or aircraft cannon. Consult with the supporting intelligence office to determine enemy capabilities and weapons systems.

2.8.2. Weapons Effects. Refer to AFMAN 10-222V14, *Defensive Fighting Position Construction*, and AFPAM 32-1147(I), *Design and Analysis of Hardened Structures to Conventional Weapons Effects,* for unclassified data on conventional weapons effects and countermeasures.

2.8.3. Employment Strategies. The type of aircraft and the ordnance delivery profile will dictate the specific aircraft attack profile. By flying at higher altitudes, attacking pilots can detect targets at greater ranges, but attacking aircraft then become more vulnerable to air defense systems. To reduce that vulnerability, we can anticipate that enemy aircraft will attack using low-level maneuvers. A low-level approach significantly reduces the time available for the pilot to recognize and engage the target. Consult with the supporting intelligence office to determine employment strategies. Consult with the unit Tactical Deception Officer to determine the need for airbase camouflage, concealment, and deception measures.

2.8.4. Countermeasures and Defensive Actions:

2.8.4.1. Theater warning systems should detect and warn the airbase of enemy fighter and bomber aircraft activity and track their flight profiles. However, it may be more difficult to track helicopters, light aircraft, or remotely piloted vehicles. If no prior warning of aircraft attack is received, use the missile attack procedures to warn and protect the airbase.

2.8.4.2. The aircraft attack warning process is similar to the missile warning process, with the exception that warning times may permit the commander to implement pre-planned, Alarm Yellow actions. **Table 2.6.** shows how the staff identifies aircraft attack warning timelines for three likely airbase attack ingress routes. The actual analysis includes the actual or expected time for each event in the warning chain. These events show how long the airbase can take advantage of Alarm Yellow actions and establish an approximate time for declaration of Alarm Red. Alarm Yellow actions should be pre-planned and time-phased to achieve the highest defensive posture possible shortly before Alarm Red is declared.

Table 2.6. Example of Aircraft Warning Time Assessment for Airbase Attack.

Attack Ingress Route	Time (In Minutes) to Complete Action								
	Cross Threshold	Theater Detect	Theater Warns	WOC Receives	WOC Decision	Alarm Red	Total Time	Flight Time	Difference
1	0	:30	1:00	:30	1:00	:30	3:30	19.00	+15:30
2	0	:30	1:00	:30	1:00	:30	3:30	23:00	+19:30
3	0	:30	1:00	:30	1:00	:30	3:30	27.00	+23:30
NOTE: Use actual aircraft threat information, distances, and warning transmission times to develop a warning time assessment for a specific location.									

2.8.4.2.1. Leaders should identify a distance around the airbase that is the threshold of concern for enemy aircraft. Determine the threshold distance by analyzing real-time warning provided by the theater and installation warning systems. Consider the speed of the enemy aircraft, speed and range of standoff munitions, likely attack profile and ingress routes, status of pre-attack task completion, and the time required to achieve higher alarm conditions or protective postures. If enemy aircraft cross the threshold, declare Alarm Yellow, notify the base populace of the situation, and direct actions to reduce mission degradation. The commander makes the decision of when to warn the base populace. Actions taken in Alarm Yellow should prepare the base for attack and minimize the need for "last second" actions. Continue to provide updates and direct protective actions until Alarm Red is declared or the threat passes.

2.8.4.2.2. As soon as the enemy aircraft depart the immediate area, be prepared to declare Alarm Black and begin post-attack recovery actions. Maintain vigilance over the departing aircraft until they cross the aircraft attack threshold. If the aircraft were observed using spray tanks, assume a chemical or biological attack, and consider leaving personnel (other than specialized reconnaissance teams) under cover for approximately 15 minutes in order to allow for the liquid chemical agent deposition, or droplet fall phase. If bombs or missiles were used, unexploded ordnance or contamination may be present. Agents delivered by aircraft bombs will settle to the ground within a few minutes and recovery actions may be accelerated.

Regardless the type of attack, use PAR information and critical mission requirements to determine the tempo of operations.

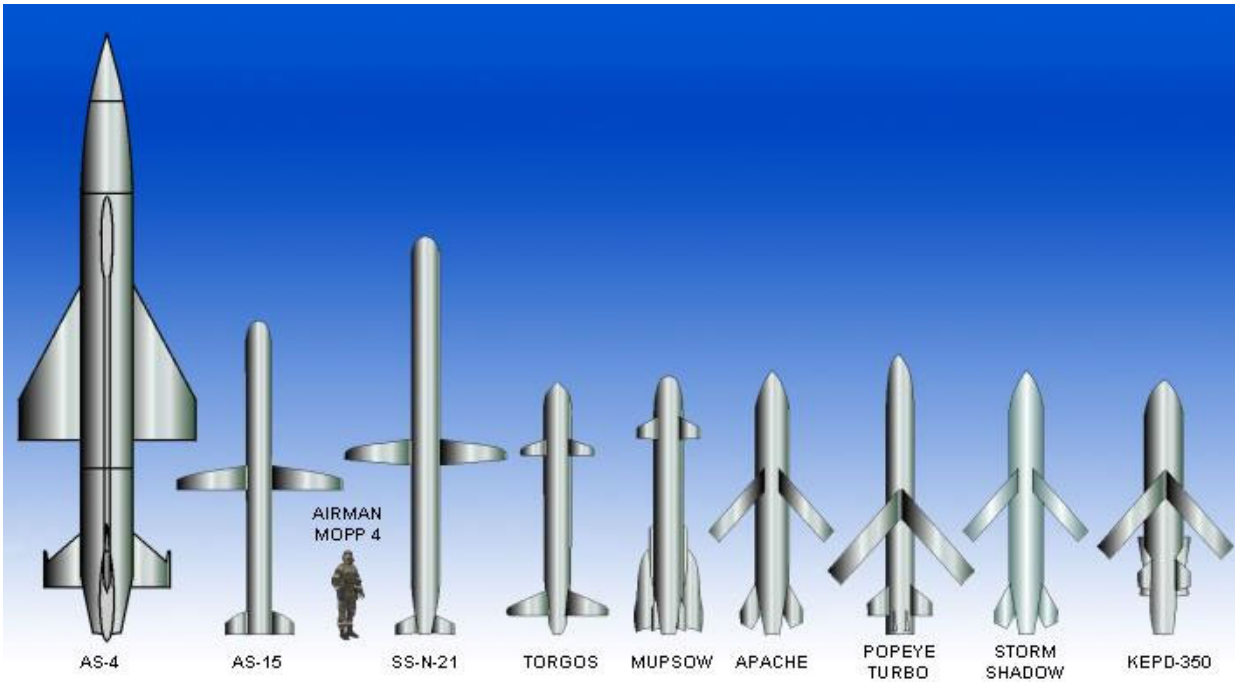
2.9. Cruise Missiles and Unmanned Aerial Vehicles (UAV) Threats:

2.9.1. Description. Cruise missiles (**Figure 2.4.**) and UAVs are pilotless air vehicles that use propulsion and aerodynamic lift during all or nearly all of their flight. The primary purpose of a cruise missile is to place ordnance on a target. UAVs can be employed in numerous missions with various payloads. Consult with the supporting intelligence agency for specific information on cruise missile and UAV types, payloads, flight profiles, and countermeasures.

2.9.2. Cruise Missile Threats. Depending upon the type, cruise missiles may be equipped with NBC or conventional payloads. These missiles are designed to follow a remotely controlled or programmed course that roughly parallels the earth's surface. They are attractive for use as a biological warfare agent delivery platform because they do not expose pilots or aircraft to the agent hazards; and they have a level flight profile that enhances the efficiency of spray dissemination.

2.9.3. UAV Threats. UAVs have not been noted as delivery systems for chemical warfare agents, although much speculation has taken place. To date, most UAVs have had insufficient payload capabilities to make them useful military platforms for delivery of chemical agents. Unless launched in conspicuously large numbers (large enough to become detectable), the best results expected from current UAV designs delivering chemical agents would be for harassment, or, if launched in small numbers, for a covert attack. With recent improvements in the range, size, and payload capacity, modern UAVs may become candidates for militarily useful delivery of chemical agents. These vehicles are attractive for use as a biological agent delivery platform because there is no risk of aircrew or aircraft exposure and the level flight profile enhances the efficiency of spray dissemination. In addition, submunition dispensers are feasible for large-payload capacity UAVs.

Figure 2.4. Typical Land Attack Cruise Missile Systems.



Section 2C—Terrorist Threats

2.10. Terrorism Awareness:

2.10.1. Common terrorist tactics in the 1970s focused on seizing embassies and kidnapping diplomats or business executives. As a result, security increased and embassy takeovers, assassinations, and bombings decreased in the 1980s. Individual assassinations still happen; however, large-scale attacks are now the preferred tactics.

2.10.2. As the September 11, 2001, attacks on America and history have shown, we can no longer assume that only those exposed to locations of international tension are at risk. Terrorists do not honor and are not limited by country borders. They travel widely to bring death and destruction to those they consider their enemies and move freely within and between countries to carry out lethal operations against targets they choose. Terrorism today is a highly organized operation that is conducted with military precision against pre-identified targets. The targets can range from airport terminals, and bus or train stations, to attacks on United States forces, such as the attacks that occurred in Somalia in 1993. These conditions are not all-inclusive and we must expect that terrorists are fully capable of taking any situation and turning it into havoc.

2.11. Terrorist Tactics:

2.11.1. Terrorists operate with a limited tactical repertoire. **Table 2.7.** shows the six basic tactics that comprised 95 percent of all terrorist incidents: bombings, assassinations, armed assaults, kidnappings, barricade and hostage situations, and hijackings. No terrorist group uses them all. Bombings are the most common because they are generally the least demanding of the tactics. Explosives are easy to get

or manufacture, and a bombing requires little organization. Usually, one person can do the job with little risk. Bombings alone account for roughly half of all international terrorist incidents.

Table 2.7. Potential Terrorist Tactics and Weapons.

Tactics	Potential Threat				
	Small Arms	Explosive	Nuclear	Biological	Chemical
Bombing		X	X	X	X
Assassination	X	X			
Armed Assault	X	X			
Hijacking	X	X			
Kidnapping	X				
Barricade or Hostage	X				

2.11.2. When security measures improved, terrorist attacks on diplomats increased. They changed their tactics and turned to assassinations and bombings. This ability to switch tactics is a major reason that defending against terrorism is so hard. Security measures can protect one set of targets against one type of attack, but terrorists can alter their tactics or shift their sights to other targets. That ability makes terrorism a cheap way to fight and a costly threat to defend.

2.12. Target Selection. Terrorists live clandestinely and spend an inordinate amount of time planning operations thoroughly, often over long periods of time. Materials taken from their hideouts and actual testimonies show that they devote considerable attention to target selection. First, potential targets are identified as being politically suitable. For example, a particular government, organization, institution, company, or individual is identified as a potential target. Next, they assess operational feasibility. Terrorists examine each of the initial targets to identify the one most vulnerable. This involves gathering extensive information. They “case” buildings, conduct lengthy surveillance, and try to get more information from inside confederates. Before hitting a target, the terrorist group will make notes of the train or bus schedules, the number of people in or around the intended target, and even the traffic flow in the neighborhood. They will watch routes of travel and schedules and make notes of any deviations. Normally, they will not formulate a plan of attack until sufficient information has been collected on a target. Terrorists will usually seek operations that pose minimum risk.

Chapter 3

COUNTER-NBC PASSIVE DEFENSE PROGRAM

3.1. Counter NBC (C-NBC) Operations and NBC Defense:

3.1.1. The Air Force Counterproliferation Program includes those activities taken to detect, deter, disrupt, deny, or destroy an adversary's NBC capabilities and to minimize the effects of attacks. The primary program elements include proliferation prevention, counterforce, active defense, and passive defense. In addition to these primary elements, two crosscutting elements apply within each of the four primary elements. They are command, control, computers, communication, intelligence, surveillance, and reconnaissance (C4ISR) and C-NBC terrorism. This doctrine incorporates NBC defense operations under the passive defense area of the Air Force Counterproliferation Program. Directive guidance is found in AFDD 2-1.8 and AFPD 10-26.

3.1.2. C-NBC passive defense measures are designed to improve the capability of personnel to survive and sustain operations in NBC environments. The major elements are contamination avoidance, protection, and contamination control. These elements and their subcomponents are an integral part of the joint and Air Force NBCC Defense Program.

3.2. Contamination Avoidance:

3.2.1. Introduction. Contamination avoidance is a broad area that includes all of the actions taken to minimize the impact of NBC contamination on operations. Successful avoidance measures will significantly reduce and often prevent personnel, equipment, vehicle, aircraft, and cargo contamination. Operational advantage is gained through a more rapid reduction of protective measures and a reduced requirement for personnel and equipment decontamination. Measures include actions such as limiting contamination entry into facilities, detection and identification, prediction, marking, dispersal, relocation and rerouting, and sampling. Review specific contamination avoidance actions to ensure they do not conflict with safety (air, ground, or munitions), fire prevention, or functional area technical order requirements. If conflicts arise, contact the responsible safety office or functional area supervisor.

3.2.2. Cover and Limit Entry. The most effective way to avoid contamination is to prevent the asset from becoming contaminated in the first place. Develop low or no-cost standing operating procedures to put equipment that is not being used under overhead cover. If the equipment cannot be placed under overhead cover, wrap or cover it with at least one layer of barrier material to prevent contamination. Use water repellant plastic sheets, canvas, tarpaulins, or specialized NBC protective covers (if available). Use two layers of cover so the top cover, along with any contamination, can be easily removed, safely discarded, and replaced. When removing contaminated barrier material, remove and fold the material in a manner to encapsulate the contaminated surface. Place the covers in containers or plastic bags and neatly stack to simplify waste removal. ***NOTE:*** See **Attachment 4** for cargo and pallet contamination avoidance techniques and procedures. Place aircraft, vehicles, aerospace ground equipment, munitions, and bulk supplies into shelters or under overhead cover. Close all facility windows, turn off (or close outside air intake) ventilation systems at the time of attack, and implement single-entry procedures. Pre-plan specific actions when attack threats increase. Include these actions, for example, within alarm condition checklists. When attack warning is given, personnel should accomplish quick and easy "last second" actions to further protect critical equipment. These actions may

include placing tools, weapons, and equipment under cover; or closing aircraft canopies, building and vehicle windows, and equipment access panels.

3.2.3. Detection and Identification. NBC agent detection and identification activities provide commanders with the information needed to determine protective postures and to tailor protective actions to the specific agent threats. Early detection provides more time to implement protective measures. Accurate identification of agents enables selection of the most effective protective actions, including medical treatment, and limits mission degradation that results from taking unnecessary actions. NBC detection and identification includes the use of point and standoff detection methods, risk assessment, and all available medical and non-medical intelligence assets.

3.2.3.1. Detection for Protection and Warning. Standoff detection provides warning in sufficient time to implement protective measures before exposure to agent contamination occurs. For attacks upwind, detection must occur at sufficient upwind distances to provide a reasonable amount of time for detection, processing, and information transmission. Detection of the leading edge of the cloud is preferable, since it can give more warning time. Warning of an upwind attack may come from upwind detectors placed outside the airbase or from other units monitoring the area upwind.

3.2.3.2. Detection for Treatment. Detection for treatment is focused on identifying the type of biological agent dispersed in an attack so treatment can be rendered as early as possible. Some aspects of treatment are agent-specific; therefore, agent discrimination is extremely important. Agent sampling and analysis continue to be the primary means of accomplishing this detection role. Sampling is a local action, while analysis can occur locally or at designated medical laboratories, depending on capabilities. Medical personnel collect and submit clinical samples from patients and perform environmental sampling and detection functions.

3.2.3.3. Detection for Verification. Detection for verification provides critical information to the President of the United States and United States Secretary of Defense to support decisions concerning the need for tailored response and to select options in a timely manner. Specific procedures for sampling and transporting samples to a laboratory may vary depending upon the airbase location and host-nation requirements. Follow theater and MAJCOM direction for the overall process and responsibilities for the collection and evacuation of samples for analysis.

3.2.3.4. Detection for Dewarning. Detection for dewarning means detecting to identify when contamination reaches levels that enable removal of the protective mask. Use various types of surfaces when conducting agent detection. For example, some chemical warfare agents will remain, or persist, much longer on glass and within shaded areas than on items such as painted surfaces, concrete, and asphalt. This comparison provides valuable insight to commanders when considering appropriate actions (see **Attachment 2**).

3.2.3.5. Detection for Surface Contamination. Detection for surface contamination is the ability to detect deposited contamination on surfaces. The results are used to determine the need for immediate or operational decontamination and appropriate protective equipment. They may support the need to use alternate routes to avoid contaminated terrain if personnel cannot wait the short time period required for agent absorption. Results may also be used to adjust protective measures for people handling contaminated material.

3.2.4. Prediction. NBC contamination hazard prediction allows commanders to determine the probable effect of contamination on current and future operations. Civil Engineer readiness specialists use a combination of both manual and automated methods to predict the location, movement, and persis-

tency of contamination. These methods use post-attack detector data, physical observations, and automated predictions to identify known contamination and likely hazard areas. Prediction tools and specialist expertise enable a rapid assessment of mission impact and a means to quickly communicate contamination information to higher headquarters, joint service, and coalition forces.

3.2.5. Marking. Once contamination is located, it must be marked to notify others that precautions are required. Marking can significantly reduce the spread of contaminants by identifying areas, vehicles, aircraft, equipment, or material to avoid or decontaminate (if possible). NBC contamination normally should be marked immediately upon discovery. This action warns others of the hazard and avoids the need to send personnel back to the site a second time. If evidence of contamination is observed but mission requirements prevent immediate marking, provide the location and type of contamination or observation to the unit control center. Mark contaminated areas using the techniques and procedures in **Attachment 6**.

3.2.6. Relocation, Re-route, and Dispersal. See paragraph **1.16.**

3.2.7. Sampling. Sampling includes field collection procedures that facilitate laboratory analysis and verification of NBC attacks. Sampling is a post-attack action that allows validation of an attack and confirmation that appropriate protective measures were taken.

3.3. Protection:

3.3.1. Protection provides the force with survival and sustainment measures to operate in an NBC environment when contamination cannot be avoided. It includes the physical measures taken to protect people and resources from the effects of NBCC weapons. Protection is provided by individual protective equipment and collective protection. Commanders use a combination of individual and collective protection to optimize performance of mission essential forces. See **Chapter 5** for detailed information on NBCC protection measures.

3.3.2. Some protection measures are threat-specific. Other measures provide broader protection against multiple threats. Theater and Joint Task Force requirements may establish additional requirements beyond AF minimum standards. Individual protection includes ground and aircrew individual protective equipment and specialized IPE, such as the Joint Firefighter Integrated Response Ensemble (J-FIRE). Collective protection may be incorporated into hardened or unhardened facilities or added to field expedient shelters to provide toxic free areas.

3.3.3. Physical protection must be combined with threat-based protective actions and procedures to minimize mission degradation and provide the most effective defense against NBCC weapons effects. Specific protection measures are determined by the expected threat, unit mission, and type of resource to be protected. Other factors also affect the ability to employ the optimum protective measure. They include the availability of equipment, material, manpower, and time to achieve the desired result. For example, the most cost-effective methods to protect facilities or structures are to include it as part of new construction or through expedient modifications prior to the start of hostilities. The next choice is to pre-plan the action, stockpile or contract for resources at or near the required locations, and add manpower and resource needs to the base or joint support plan. However, neither method is fully effective if the facility occupants do not follow established procedures and maintain system serviceability or operate the system properly.

3.4. Contamination Control. Contamination control is a combination of standard disease prevention measures and traditional NBC contamination avoidance and decontamination measures. This includes procedures for avoiding, reducing, removing, weathering, or neutralizing the hazards resulting from the contamination. Effective decontamination operations help sustain or enhance the flow of operations by preventing or minimizing performance degradation, casualties, or loss of material. Ineffective decontamination wastes manpower and material that is better spent on other, more productive missions.

3.4.1. Disease Prevention. Most biological warfare agent effects can be prevented through pre- and post-exposure medical interventions. Communication between commanders and medical personnel is critical in assessing potential and actual exposure risks. Information from post attack reconnaissance, sampling, and agent identification is likewise critical to the success of medical operations.

3.4.2. Decontamination.

3.4.2.1. Purpose. Decontamination operations are intended to help sustain or enhance military operations in NBC environments by preventing or minimizing mission performance degradation, casualties, or loss of resources. They include individual, team, and unit actions to reduce, remove, weather, or neutralize (render harmless) the primary hazards resulting from NBC contamination. The priority for immediate decontamination is exposed skin followed by the protective mask and hood, overgarment (OG), personal weapon, and other individual equipment. Decontamination actions beyond the immediate and operational level are manpower, time, and resource intensive processes. Decontamination efforts should be limited to actions that are necessary to permit mission accomplishment. A more cost-effective approach is to devote these resources to developing and executing an aggressive pre-attack contamination avoidance and cover plan. Successful actions will reduce or eliminate most common airbase contamination hazards and significantly reduce the requirement for decontamination at all levels.

Table 3.1. Joint Service Levels of Decontamination.

Level	Purpose	Who	What	When
Immediate	Minimize casualties, save lives, and help limit contamination exposure and spread	Individuals	Skin, personal clothing and equipment, frequently touched surfaces	As soon as contamination is suspected or detected
Operational	Limit contamination exposure and spread, helps to sustain operations by providing temporary and, in some cases, long-term relief from wearing IPE	Individuals, crews, teams, units	Parts of essential operational equipment, work areas, vehicles, and material	When operations require and resources permit
Thorough	Reduces or eliminates the need for wearing IPE	Units or wings, with or without external support	Personnel (CCA), equipment, material, vehicles, aircraft, work areas, terrain	When required for MOPP reduction; when operations, manning, and resources permit; required for total reconstitution and return to unrestricted use

3.4.2.2. Levels of Decontamination. The Air Force and Joint Services conduct decontamination operations at three levels: Immediate, Operational, and Thorough. **Table 3.1.** outlines the decontamination levels, purpose for each level, who does the task, what is decontaminated, and when the operation will be conducted. Under some conditions, these operations can help sustain or enhance operations by allowing MOPP reductions, preventing contamination spread, and reducing casualties and material contamination. However, there is no single procedure, machine, kit, or technique presently capable of fulfilling all airbase decontamination requirements. Present decontamination methods require that commanders and supervisors evaluate mission needs and the threat situation, identify a desired result from a successful decontamination operation, determine what resources and methods are available, and decide on a course of action that can realistically reach the desired outcome. With the exception of personnel and medical patient decontamination, natural decontamination (use of decay, weathering and time) is the most cost-effective and easiest of the decontamination methods for airbase operations. Immediate and operational decontamination procedures for common individual and unit equipment are provided in the NBCC Defense Course and within equipment technical orders. Under most wartime conditions, commanders should not attempt thorough decontamination operations for material, vehicles, munitions, equipment, aircraft, or terrain unless the anticipated result significantly reduces a mission-degrading hazard or allows a mission-critical MOPP reduction (see **Chapter 5**).

3.4.2.3. Wartime Contamination Control Teams:

3.4.2.3.1. Unit contamination control team (CCT) activation is not normally required for wartime immediate and operational levels of decontamination. All personnel are expected to perform these levels of decontamination using the M291 and M295 decontamination kits or expedient methods. Vehicle, equipment, munitions, and aircraft crew chiefs and personnel are expected to execute immediate and operational decontamination on their assigned assets. Form and activate CCTs if thorough decontamination is required. Consider using this team to re-supply unit members with expendable assets (M8 and M9 paper, M291 and M295 decontamination kits, plastics covers and bags, bleach solution) and sustain unit contamination control and immediate and operational decontamination activities. Also, consider using the team to establish and maintain the unit contaminated waste collection points.

3.4.2.3.2. Units should conduct thorough decontamination planning by identifying command and control relationships, team requirements, equipment requirements, decontamination assets, and contaminated waste collection points. Develop team checklists to guide activities. Focus these plans and checklists on unit tasks such as critical cargo movement and post-conflict decontamination operations. Include requirements in the airbase FSTR Plan 10-2 and base or joint support plan. Do not confuse wartime decontamination requirements presented in this manual with other CCT requirements such as those used for nuclear weapon accidents, terrorist WMD, or hazardous material emergency response.

Chapter 4

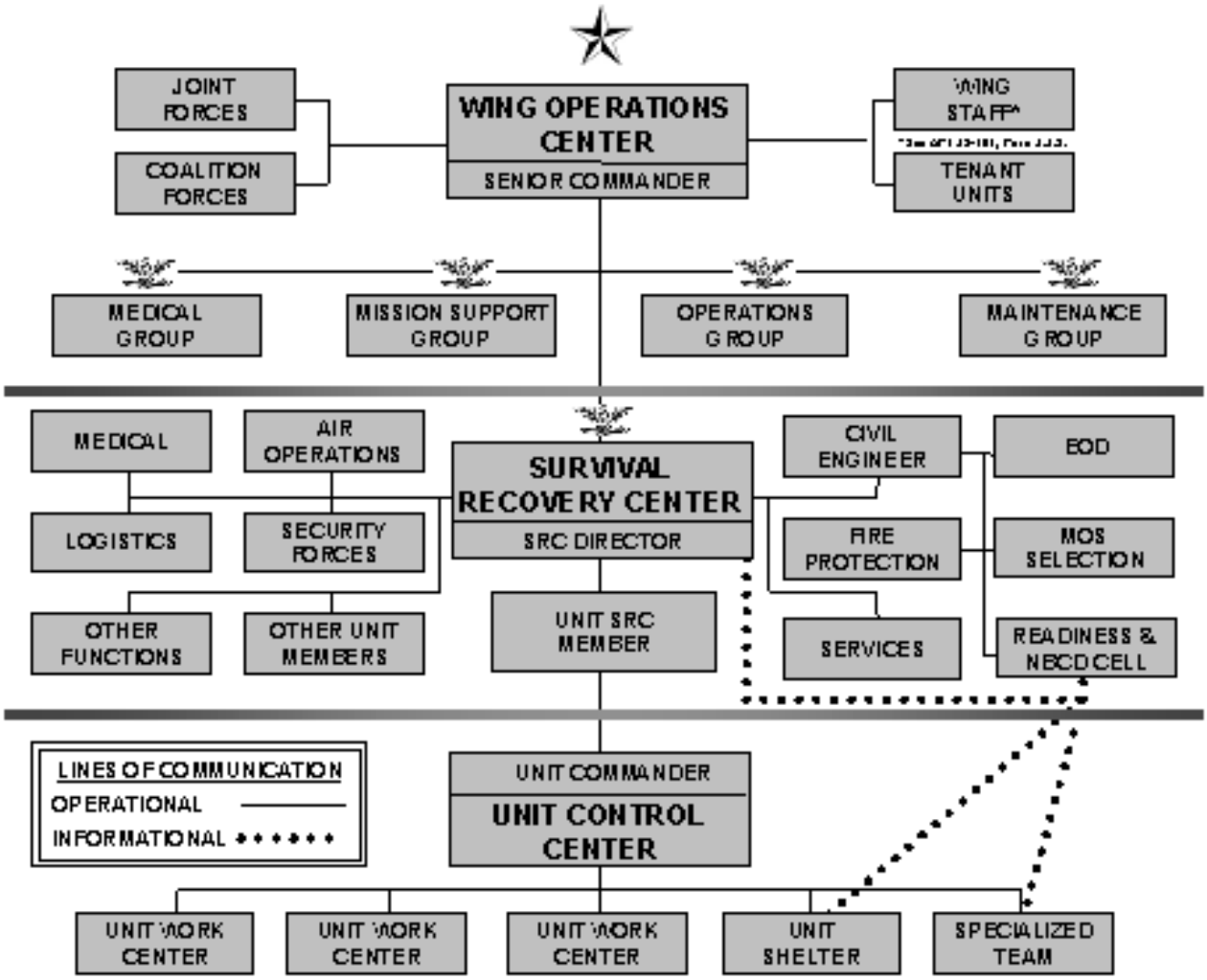
NBCC COMMAND, CONTROL, AND ATTACK WARNING

Section 4A—Command and Control

4.1. Wartime Airbase Command and Control Organization:

4.1.1. Wing Operations Center (WOC). The WOC is the top echelon of airbase NBCC defense operations and is led by the senior Air Force commander. The primary focus of the WOC is flight operations, airbase security, and support to other forces on the airbase. The WOC battle staff includes senior officers from the operations, maintenance, mission support, and medical groups. Members of the wing special staff or senior officers representing major tenant units or host-nation forces may also be present. The battle staff supports the wing commander by assessing the situation, determining mission priorities and defensive actions, and directing subordinate units. Effective response requires a team effort since most NBCC defense countermeasures and response actions have far-reaching impact on mission accomplishment and sustainment. The direction provided by the wing commander and staff integrates actions of all wartime functions. This integration requires direct input and feedback from other command and control centers such as the base defense operations center, air defense element, and host-nation or coalition forces command posts. A typical wartime command and control structure is shown in **Figure 4.1.**

Figure 4.1. NBCC Defense Command and Control Organization (Notional Example).



4.1.2. Survival Recovery Center (SRC):

4.1.2.1. The SRC gathers information, directs, and monitors execution of the installation NBCC defense survivability, recovery, and sustainment operations. The SRC collects, analyzes, prioritizes, displays, and reports information on the status of the base. It recommends courses of action and executes pre-planned and WOC-directed actions. The SRC objective is to concentrate resources and expertise at the right place and at the right time to implement the commander's direction.

4.1.2.2. Collocate the SRC with or near the WOC to permit the battle staff access to SRC displays, allow rapid exchange of information, and ensure close coordination of the pre-, trans-, and post-attack actions. The SRC is the nerve center for airbase ground operations and attack protection and recovery operations. SRC membership varies with base mission but normally includes representatives or designated points of contact from each major functional area as well as tenant and host-nation liaison forces. Representation for a typical primary and alternate SRC at a high threat area base is shown in **Table 4.1.**

Table 4.1. SRC Organization and Manpower (Per Shift).

Function or Representative	Primary SRC		Alternate SRC	
	Required	Desired	Required	Desired
SRC Director	1		1	
Administration	2		1	2
Air Operations (Including Aircrew Life Support)	2		2	
Medical	2		2	
Security Forces	1		1	
Judge Advocate	1		1	
Civil Engineer	1		1	
Explosive Ordnance Disposal	1		1	
Civil Engineer Readiness and NBC Defense Cell	3	5	2	
Minimum Operating Strip Selection Team	1	2	1	2
Fire Protection	1			1
Vehicles	1			1
Communications	1		1	
Services	1			1
Supply		1		1
Munitions		1		1
Personnel		1		1

4.2. WOC and SRC Operations:

4.2.1. The WOC, SRC supporting UCC enabling tasks are outlined in **Table 4.2.** These elements conduct operations under the concept of centralized control and decentralized execution. Centralized control allows the organization to focus scarce or limited resources on those priorities that lead to overall base mission success. Once tasks and priorities are established, the WOC or SRC delegates responsibility to accomplish actions to lower-level commanders or specialized teams. This process achieves an effective span of control and fosters initiative, situational responsiveness, and tactical flexibility. It enables the WOC and SRC to monitor the status of multiple operations and reduce information and task overload. It also allows the members to remain focused on the primary missions and be responsive to changing tactical and operational situations. Conduct integrated exercises and drills during both peacetime training and wartime operations to train the staff, unit control centers, and leaders.

Table 4.2. WOC, SRC, and UCC Enabling Tasks.

Wing Operations Center (WOC)	
Priority	**Tasks**
1	Preserve life
2	Prevent further loss of combat power
3	Maintain or restore base integrity and security
4	Maintain or restore command and control over ground and airborne forces
5	Maintain or restore primary mission capability
6	Provide support to joint service, coalition and host-nation forces
7	Direct airbase alarm conditions and MOPP levels
8	Provide warning to joint service, coalition and host-nation forces
Survival Recovery Center (SRC)	
Priority	**Tasks**
1	Recommend alarm condition and MOPP levels for commander approval
2	Direct forces and monitor status of NBCC pre-, trans-, and post-attack actions
3	Collect, analyze, prioritize, display, record, and report information
4	Develop courses of action to survive attacks and restore operations
5	Coordinate actions with joint service, coalition, and host-nation forces
6	Develop plans and support major accident and natural disaster response
7	Support non-combatant evacuation order operations
8	Operate the NBC Defense Cell and theater warning and reporting system
9	Coordinate installation contamination avoidance, dispersal, and blackout operations
10	Coordinate installation hardening and camouflage, concealment, and deception actions
Unit Control Center (UCC)	
Priority	**Tasks**
1	Provide attack warning and MOPP condition changes to unit personnel
2	Maintain status of zone or sector alarm conditions and MOPP levels
3	Direct forces and monitor status of NBCC pre-, trans-, and post-attack actions
4	Collect, analyze, prioritize, display, record, and report information
5	Develop and initiate courses of action to survive attacks and restore operations
6	Assign, equip, and direct unit PAR and specialized teams (if assigned)
7	Support major accident and natural disaster response
8	Support non-combatant evacuation order operations
9	Implement unit contamination avoidance, dispersal, and blackout actions

10	Implement unit, hardening, and camouflage, concealment, and deception actions

4.2.2. Design operations to allow individuals and functions the flexibility to shift quickly and decisively from one incident or objective to another. Representatives must process and integrate real-time information to produce coherent courses of action or modifications to existing ones.

4.2.3. Post-attack recovery decisions should focus installation resources on lifesaving, preventing the further loss of combat power, maintaining or restoring base integrity and security, restoring command and control over forces, primary mission restoration, and support to other forces. Devote only the minimum resources necessary for secondary missions or those that do not support the larger operational or strategic objectives. This principle requires the WOC and SRC to maintain a broad operational view and clearly articulate and communicate the senior Air Force commander's objectives and priorities to subordinate levels.

4.2.4. The SRC Director and each SRC representative will maintain the necessary maps and status boards to show the status of key operations in their areas of responsibility. Each also maintains a permanent record or log of actions. This log of actions provides continuity between shift changes and assists in the preparation of daily situation reports. Provide the alternate SRC with periodic updates to enable a rapid resumption of operations if the primary SRC is damaged or destroyed.

4.2.5. Several factors should be considered when developing courses of action in the stressful and constantly changing WOC or SRC environment. Consider the impact new orders may have upon operations previously directed or in progress. Also, consider the real-time ability to notify all affected units, teams, and personnel. These considerations are most important when using a progressive notification system requiring each successive link to notify the next link in the chain. For example, rapid changes in alarm condition or MOPP level may result in conflicting information flowing at the same time within the same communications chain.

4.2.6. Effective upward and downward information flow is the foundation of successful operations. If information does not make it to the intended receiver, the primary or supporting mission could fail. Upward information flow begins with an individual, crew, or team, and moves upward to the UCC, the SRC, and WOC. The SRC or WOC assimilates airbase information and forwards essential elements to joint force, theater, and MAJCOM command centers. The process is reversed for downward information flow. The WOC and SRC keep the UCCs informed. The UCCs, in turn, notify their unit personnel.

4.2.7. Develop and use checklists at each command and control level to support general airbase requirements and functional area responsibilities. Checklists, when followed, ensure critical steps are not missed and support continuity of operations over progressive shifts. Organize the checklists to enable users to rapidly identify actions under each alarm condition.

4.3. WOC and SRC Supporting Elements:

4.3.1. SRC Administrative Support Staff. The SRC support staff provides administrative support to the SRC director, staff, and WOC. The staff prepares standard briefings, updates status boards, maintains event logs, and monitors the attainment of directed actions.

4.3.2. NBC Defense Cell:

4.3.2.1. The NBC Defense Cell is subordinate to the Base Civil Engineer (or designated representative) and serves as staff advisor to the SRC. The cell operates within the SRC with manning pro-

vided by Civil Engineer Readiness. Augmentation may be provided from other specialties when required by the situation or threat. The primary purpose of the cell is to advise the commander and staff on wartime hazards, countermeasures, and protective actions and manage NBC specialized team operations. The cell plots and maintains the status of NBC hazards on the airbase, within off-base areas of operational concern, and at potential recovery airbases. The Civil Engineer SRC Readiness representative, through the NBC Defense Cell, directs the Civil Engineer NBC reconnaissance teams and collects information from SRC representatives. The cell manages the base shelter, contamination control area, and contamination control teams. Another key function is to support the airbase responsibilities for theater NBC warning and reporting and to coordinate operations with United States joint service, coalition, and host-nation forces. Consequently, the cell may include host-nation NBC defense specialists and provide reciprocal manning at the host-nation cell. NBC Defense Cell operations are detailed in AFMAN 32-4017, *Civil Engineer Readiness Technician's Manual for NBC Defense.*

4.3.2.2. NBC Warning and Reporting Systems:

4.3.2.2.1. System Description. The NBC Defense Cell is the airbase link with the theater NBC warning and reporting system. Cell personnel use standard plotting tools to plot known and suspected NBC contamination and predict future hazards. Following an NBC event, the cell consolidates information from unit and base PAR reports, analyzes data, and develops standard hazard and warning templates and computer models (see paragraph **4.3.2.2.2.**). The cell also reports NBC events to joint and combined forces units as required by theater guidelines. These tools allow commanders and staffs to better understand and articulate protection needed against likely hazards for specific locations. This understanding provides improved force protection with fewer encumbrances from constant, and largely unnecessary, high states of individual protection for personnel. Both manual and computer models should only be used by trained and experienced Civil Engineer readiness specialists. Verify information generated by any NBC hazard model with available field detectors before reducing protection levels.

4.3.2.2.2. Joint Warning and Reporting System (JWARN). The JWARN is the standard reporting and modeling computer program used by the Air Force and joint service NBC defense forces. It provides the airbase with an integrated and comprehensive analysis and response capability to minimize the effects of NBCC attacks, accidents, environmental hazards, or hazards from TIM. The JWARN includes software and hardware components that link NBC detectors to provide NBC warning, reporting, and battlefield management. The network transfers data automatically to and from the detectors and provides commanders, units, and command and control system operators with analyzed data for disseminating warnings down to the lowest level of the battlefield. It will provide additional data processing, production of plans and reports, and access to specific NBC information to improve the efficiency of Civil Engineer readiness specialists. JWARN falls under the operational control and responsibility of the host installation commander through the Civil Engineer Readiness Flight and the NBC Defense Cell. Certification and accreditation of JWARN to operate on the installation's network is the responsibility of the Designated Approval Authority. Assurance of the network on which JWARN rides is the base Network Control Center's responsibility.

4.3.2.2.2.1. The JWARN is being fielded in three Phases. Phase I is comprised of three government off-the-shelf (GOTS) and one commercial off-the-shelf (COTS) programs. These programs include NBC-ANALYSIS (NBCA), Hazard Prediction and Assessment

Capability (HPAC), Vapor Liquid Solid Tracking (VLSTRACK), and Emergency Management Information System (EMIS).

4.3.2.2.2.2. The NBCA software program provides hazard prediction warning and reporting procedures for NBC attacks based on the North Atlantic Treaty Organization (NATO) Allied Technical Publication-45 (ATP-45). NBC-ANALYSIS has the ability to provide hazard estimates for onset times and duration of hazard and provides database management to store information used to warn units. The program can generate standard ATP-45 format message sets and the accompanying overlays.

4.3.2.2.2.3. HPAC was developed to predict the hazard effects of accidents or incidents that occur in facilities that store NBC materials. It also provides map overlays for nuclear, biological, and chemical hazard calculations.

4.3.2.2.2.4. VLSTRACK provides downwind hazard prediction for a wide range of chemical and biological agents and munitions. The program can determine the likely size, shape, duration, and level of hazard from an NBC event.

4.3.2.2.3. EMIS is a software program developed to assess the effects of chemical agent releases at a chemical storage facility. This program allows the user to predict a downwind chemical hazard, automatically find airbase boundary and zone crossings, view the hazard plume on a map, determine whether population centers are affected, and record additional details about the hazard.

4.4. Unit Control Centers:

4.4.1. Most units are required to maintain a UCC or equivalent command and control function. The UCC provides rapid attack warning to all assigned or attached unit personnel. It maintains the status of unit activities and a permanent log of unit actions. The UCC passes information to and from the SRC and directs and monitors the implementation of unit pre-, trans-, and post-attack actions. UCCs maintain a base map with unit areas of responsibility, structures, shelters, bunkers, and primary operating areas color coded or marked to enable quick identification. UCC checklists outline tasks and responsible unit functions under each alarm condition. Following attacks, the UCC directs unit PAR operations, reports post-attack hazards, and coordinates recovery actions. Large units or those with widely separate functions may designate unit work centers or sub-control centers to assist with UCC responsibilities. Units without a UCC or equivalent function must establish a process to ensure critical attack warning and MOPP information is received and provided to the SRC in a timely manner. If a unit representative is not assigned to the SRC, the SRC must designate an SRC representative to perform this function for the unit.

4.4.2. UCCs track the location of all known post-attack hazards that may affect their unit's personnel or mission. This includes hazards such as contamination and unexploded ordnance. The UCC advises unit personnel of hazard locations and directs the movement of unit assets away from hazard areas. If the base NBC sectors or zone concept is used, the UCC tracks the alarm condition and MOPP for each area and controls movement of unit resources into and out of contaminated areas.

4.5. Continuity of Operations. Develop plans, checklists, and procedures to maintain unit integrity and the continuity of operations for the WOC, SRC, and unit control centers. Establish an alternate control center, or equivalent command and control function, with sufficient manning and redundant communica-

tions systems to maintain unit cohesion and mission continuity. Alternate command and control elements and systems provide the ability to continue operations in the event of failure or damage to the primary element or system. Update status boards and event logs to duplicate information available in the primary function. Locate the alternate function a reasonable distance from the primary to avoid damage or destruction of both functions from a single event. Consider using the alternate function as the off-shift beddown location for primary UCC personnel.

Section 4B—Attack Warning

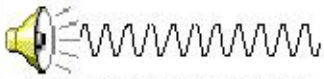
4.6. Attack Warning Signals:

4.6.1. Commanders use Air Force standardized warning signals to posture airbases for attacks, warn of attacks in progress, initiate post-attack recovery actions, and return the air base to a normal wartime state of readiness. The effective use of a rapid, multi-capability airbase warning system is crucial to force protection and mission operations. Without it, airbase actions are slow and disjointed. Control is limited in situations such as an airbase response to a combination missile and ground force attack. **Figure 4.2.** shows AFVA 32-4010, *USAF Standardized Alarm Signals for The United States, Its Territories and Possessions*, for warning signals and required actions for air bases within the CONUS and in United States territories. AFVA 10-2511, *USAF Standardized Attack Warning Signals for Medium and High Threat Areas,* which covers areas subject to NBCC combined weapons attacks, is shown in **Figure 4.3.**

Figure 4.2. AFVA 32-4010, USAF Standardized Alarm Signals for the United States, Its Territories and Possessions.

USAF STANDARDIZED ALARM SIGNALS

FOR THE UNITED STATES, ITS TERRITORIES & POSSESSIONS

WARNING OR CONDITION	SIGNAL	MEANING	REQUIRED ACTIONS
ATTACK WARNING	 3-5 MINUTE WAVERING TONE ON SIREN OR OTHER DEVICES 3-5 MINUTE PERIOD OF SHORT BLASTS FROM HORNS/ WHISTLES OR OTHER DEVICES	ATTACK IS IMMINENT, IN PROGRESS OR ARRIVAL OF NUCLEAR FALLOUT IS IMMINENT	PROCEED IMMEDIATELY TO DESIGNATED SHELTER OR TAKE OTHER APPROPRIATE PROTECTIVE ACTIONS 8 LISTEN FOR ADDITIONAL INSTRUCTIONS
PEACETIME EMERGENCY WARNING	3-5 MINUTE STEADY TONE ON SIREN OR LONG STEADY BLAST ON HORNS, WHISTLES, OR SIMILAR DEVICE	PEACETIME DISASTER THREAT EXISTS 8 POTENTIAL OR CONFIRMED HAZARD TO PUBLIC HEALTH, SAFETY, OR PROPERTY	TUNE INTO LOCAL RADIO, TELEVISION, OR CABLE STATIONS FOR EMERGENCY INFORMATION 8 LISTEN TO PUBLIC ADDRESS SYSTEMS FOR ADDITIONAL INSTRUCTIONS 8 BE PREPARED TO EVACUATE, TAKE IMMEDIATE SHELTER OR OTHER APPROPRIATE PROTECTIVE ACTIONS
ALL CLEAR	DECLARED VERBALLY BY LOCAL OFFICIAL AGENCIES	EMERGENCY TERMINATED	RESUME NORMAL OPERATIONS OR INITIATE RECOVERY IF APPLICABLE

REMARKS: Local, off-base jurisdictions rely on the National Emergency Action Notification (EAN) network and the Emergency Alert System (EAS). List local procedures:

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Supersedes AFVA 32-4010, 2 May 1994
Distribution: F

AFVA 32-4010
1 November 1997

Figure 4.3. AFVA 10-2511, USAF Standardized Attack Warning Signals for NBCC Medium and High Threat Areas.

USAF STANDARDIZED ATTACK WARNING SIGNALS FOR NBCC MEDIUM AND HIGH THREAT AREAS

ALARM CONDITION	IF YOU	THIS INDICATES	GENERAL ACTIONS
GREEN	HEAR: ALARM GREEN SEE: GREEN FLAG	ATTACK IS NOT PROBABLE	· MOPP 0 OR AS DIRECTED [1, 3] · NORMAL WARTIME CONDITION · RESUME OPERATIONS · CONTINUE RECOVERY ACTION
YELLOW	HEAR: ALARM YELLOW SEE: YELLOW FLAG	ATTACK IS PROBABLE IN LESS THAN 30 MINUTES	· MOPP 2 OR AS DIRECTED [1] · PROTECT AND COVER ASSETS · GO TO PROTECTIVE SHELTER OR SEEK BEST PROTECTION WITH OVERHEAD COVER [2]
RED	HEAR: ALARM RED, SIREN - WAVERING TONE SEE: RED FLAG	ATTACK BY AIR OR MISSILE IS IMMINENT OR IN PROGRESS	· SEEK IMMEDIATE PROTECTION WITH OVERHEAD COVER · MOPP 4 OR AS DIRECTED [1] · REPORT OBSERVED ATTACKS
	HEAR: GROUND ATTACK, BUGLE - CALL-TO-ARMS SEE: RED FLAG	ATTACK BY GROUND FORCES IS IMMINENT OR IN PROGRESS	· TAKE IMMEDIATE COVER [2, 3] · MOPP 4 OR AS DIRECTED [1] · DEFEND SELF AND POSITION · REPORT ACTIVITY
BLACK	HEAR: ALARM BLACK, SIREN - STEADY TONE SEE: BLACK FLAG	ATTACK IS OVER AND NBC CONTAMINATION AND/OR UXO HAZARDS ARE SUSPECTED OR PRESENT	· MOPP 4 OR AS DIRECTED [1, 3] · PERFORM SELF-AID/BUDDY CARE · REMAIN UNDER OVERHEAD COVER OR WITHIN SHELTER UNTIL DIRECTED OTHERWISE

NOTES:
1. WEAR FIELD GEAR AND PERSONAL BODY ARMOR (IF ISSUED) WHEN OUTDOORS OR WHEN DIRECTED.
2. COMMANDERS MAY DIRECT MISSION-ESSENTIAL TASKS OR FUNCTIONS TO CONTINUE AT INCREASED RISK.
3. THIS ALARM CONDITION MAY BE APPLIED TO AN ENTIRE INSTALLATION OR ASSIGNED TO ONE OR MORE INDIVIDUAL SECTORS OR ZONES.

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4.6.2. Warning signals quickly communicate the commanders' intentions, direct personnel and units to take pre-planned, time-phased defense actions, or simply notify everyone to take cover. Signals used to initiate pre-planned actions, such air base defense or post attack reconnaissance, may be specific to one or more functional areas. Other actions, such as assuming pre-designated MOPP conditions or seeking protective cover or shelter, may apply to most of the base population. Although warning signals are primarily designed to provide air, missile, artillery, and ground attack warning, they may be used to warn the airbase if a covert attack with a chemical and biological weapon is discovered.

4.6.3. Warning signals are difficult to communicate to personnel within high noise areas, at night, and during bad weather. Develop alternative methods to warn personnel located inside hardened aircraft or personnel shelters, at end-of-runway checkpoints, or performing tasks in high noise areas. Methods may include the use of warning guards, pagers (such as with vibration options), flashing or high intensity lights, vehicle or air horns, or simple hand signals. Aircrew members who receive warning while

inside the aircraft should execute their pre-planned actions and alert passengers and ground support personnel.

4.7. Alarm Conditions. Commanders declare alarm conditions to initiate passive defense actions in wartime. Unless local or theater requirements dictate otherwise, bases in medium and high threat areas use the attack warning signals and alarm conditions in AFVA 10-2511 (see **Figure 4.3.**). Based upon threat, they may be declared for the entire airbase or for one or more defense sectors or zones. Alarm conditions, combined with supplemental instructions through the chain of command, are the most effective way to establish the defensive posture of an airbase. When NBC threats are present, the commander further directs MOPP levels and options (see paragraph **5.3.**) to provide the minimum level of individual protection for the current mission and situation. Simply put, alarm conditions initiate or limit individual and airbase-wide ***MOVEMENT AND ACTION;*** MOPP levels let individuals know ***WHAT TO WEAR*** for minimum protection.

4.7.1. Mission Essential Tasks. Commanders may direct mission-essential tasks or functions to continue during any alarm condition. Develop standing operating procedures to rapidly identify critical missions and develop courses of action that minimize risk.

4.7.2. Warning Systems. Use warning signals that are compatible with host-nation, local, or theater systems. The base warning system must provide effective coverage for all airbase areas. Display warning signal visual aids in all work centers and common use areas (such as billeting tents, post office, latrines, dining facilities, and recreation areas). Provide local warning signal and protective action information, such as a handout, to all permanent party and transient personnel upon arrival. Transient personnel include aircrew, passengers, noncombatants, and all other personnel not assigned to the airbase.

4.7.3. Local Variations. Commanders are authorized wide latitude in determining warning signals and are authorized to overprint the standard Air Force visual aids to incorporate local information. This may include changes in alarm color codes (consistent with theater guidance), audible signals, or supplemental information to respond to specific weapons or threats. Use standard warning signals to the greatest extent possible to reduce training requirements and avoid the confusion that may result from using base-unique or needlessly complicated signals. Regardless of the signals used, commanders are responsible for disseminating the warning signal information to all assigned, attached, and transient personnel. This ensures all personnel take the correct defensive actions (see **Chapter 5**) in response to the base warning signals and do not place themselves or others at unnecessary risk.

4.7.4. Air Force Standard Alarm Conditions for NBCC Medium and High Threat Areas:

4.7.4.1. Alarm Green - Attack Is Not Probable. Alarm Green is the normal condition of readiness in wartime. Although the area could be attacked at any time, there is no active threat of attack at present. NBCC threat hazards (facility damage, UXO, and NBC contamination) from previous attacks may be present. These hazards do not present an operational risk to personnel in MOPP 0 who remain outside marked hazard areas. Continue attack preparations or recovery actions and remain alert for hazards. When Alarm Green is declared, MOPP 0 is in effect unless otherwise directed by the commander.

4.7.4.2. Alarm Yellow - Attack Is Probable In Less Than 30 Minutes. This condition indicates an attack against the airbase or identified location is expected in the near term. Surveillance measures may indicate that an aircraft or missile attack is imminent or that an enemy ground force presents

a direct threat to the airbase. Evaluate current and near term operational requirements, decide what missions to continue or terminate, and direct forces to take actions. The WOC, SRC, and UCCs should implement pre-planned Alarm Yellow actions to protect personnel and material and mitigate the effects of NBCC attack. Develop standard actions that can be executed within 20 to 25 minutes or less of Alarm Yellow declaration. Individuals who are not performing mission essential tasks or functions report to their assigned shelter or seek the best available cover. Direct additional actions based upon the current situation or missions. Assume MOPP 2 or as directed by the commander.

4.7.4.3. Alarm Red. The most effective airbase response to a missile or air attack is not the most effective means to respond to a ground force attack. As such, two conditions of Alarm Red are used to warn the airbase. Knowledge of the specific type of attack allows personnel to respond with the most effective actions to counter the threat. One condition warns of an air or missile attack while the other is used to provide ground attack warning. Individuals and units should assume that a missile attack is imminent or in progress if sufficient information is not provided to determine the type of attack (air, ground, or missile). For example, an individual may hear only the words "Alarm Red" over a radio or public address system, see a red flag, or see other personnel taking cover. Without further information or direction, the individual should assume a missile attack is imminent and take protective actions.

4.7.4.3.1. Alarm Red - Attack by Air or Missile Is Imminent or In Progress. This condition indicates the airbase, or identified location, is under missile or aircraft attack or an attack will begin within minutes. The WOC, SRC, UCCs, and each individual should implement pre-planned protective actions for missile and aircraft threats. Evaluate operational requirements, terminate current missions as safely as possible, and take cover. Where possible, direct aircraft to launch-to-survive or taxi into the nearest protective shelter. Direct additional actions based upon the current situation or missions. Report observed attacks. Assume MOPP 4 or as directed by the commander.

4.7.4.3.2. Alarm Red, Ground Attack - Attack by Ground Force Is Imminent or In Progress. This condition indicates the airbase, or identified location, is under attack by a ground force or an attack will begin within minutes. The WOC, SRC, UCCs, and each individual should implement pre-planned protection actions for ground attack threats. All units evaluate operational requirements and terminate current missions as safely as possible. Direct personnel to assume assigned defensive positions or take cover. Use the S-A-L-U-T-E format (**Table 4.3.**) to report enemy activity. Support security forces operations where possible. Direct additional actions based upon the current situation or missions. Assume MOPP 4 or as directed by the commander.

Table 4.3. S-A-L-U-T-E Format Used to Report Enemy Ground Force Activity.

Report Area	Information to Report
Size	The number of persons and vehicles seen or the size of an object
Activity	Description of enemy activity (assaulting, fleeing, observing)
Location	Where the enemy was sighted (grid coordinate or reference point)
Unit	Distinctive signs, symbols, or identification on people, vehicles, aircraft, or weapons (numbers, patches, or clothing type)
Time	Time the activity was observed
Equipment	Equipment and vehicles associated with the activity

4.7.4.4. Alarm Black - Attack Is Over, NBC Contamination and Unexploded Ordnance Hazards are Suspected or Present. This condition indicates an attack is over and initiates base recovery. NBCC hazards (facility damage, UXO, NBC contamination) are likely to be present but may not yet be marked or reported. Individuals remain under overhead cover until directed otherwise, perform self-aid and buddy care, and perform immediate decontamination (if contaminated). Base specialized and unit PAR teams begin surveys when directed by the commander. All units evaluate operational requirements, determine actions required to resume sortie generation, and direct forces. The WOC, SRC, and UCCs implement pre-planned Alarm Black actions to recover primary mission capability. Direct additional actions based upon the current situation or missions. Assume MOPP 4 or as directed by the commander.

4.8. Warning Time Assessment . Analyze the airbase attack warning process to identify limitations and deficiencies and find opportunities to exploit capabilities and strengths. Warning times will vary by threat and the real-time ability of both theater and installation warning systems to disseminate warning information. Analyze the warning system performance for each primary threat (missile, aircraft, ground) to the airbase. Use the analysis to develop a chain-of-events timeline that identifies each primary and secondary warning event from initial event detection through notification to the lowest level. These timelines enable the WOC or SRC to develop and practice pre-planned scenarios and quickly adjust strategies to react to attack situations. For example, installations may receive little (several minutes) or no warning of missile or artillery attacks. However, aircraft, cruise missile, and remotely piloted vehicle attack warning times (due to different flight profiles) may be long enough (tens of minutes) to allow extensive pre-planned actions. Regardless of the warning times, commanders and their staffs must quickly analyze the available attack information, evaluate the effect on current operations, and decide on the most effective courses of action within the time available.

4.8.1. Analyze the process and determine how long it takes to notify the airbase population under each alarm condition and MOPP change. How long does it actually take to notify 90 percent of the airbase population when the commander directs an alarm condition or MOPP level change? Identify locations where warning signals are difficult to hear or see and take actions to provide supplemental notification for personnel in these areas. Develop procedures to mitigate command, control, and communications difficulties in high noise or hard-to-contact areas such as aircraft shelters, end-of-runway checkpoint, and hardened personnel shelters. Consider also the effect of darkness or bad weather on notification times. **Table 4.4.** and **Table 4.5.** provide a comparison of notional warning timelines for two airbase types. **Table 4.4.** shows a main base with an established warning and reporting infrastruc-

ture. Table 4.5. shows how warning timelines may increase at a bare base that relies only upon deployed assets.

Table 4.4. Main Operating Base (Notional Example) Alarm Notification Times (Seconds from Declaration).

Alarm	Primary Methods	Alternate Methods	50% Warned	90% Warned	100% Warned
Green	Giant Voice	Radio, Phone, Cable TV	30	90	120
Yellow	Giant Voice	Radio, Phone, Cable TV	30	90	120
Red	Siren	Giant Voice, Radio, Phone, Cable TV	15	15	45
Black	Siren	Giant Voice Radio, Phone, Cable TV	15	15	45
NOTE: This example assumes a permanent installation siren system with base-wide, public address system, cable television network, and radio nets available. Determine actual times through airbase exercises and evaluations.					

Table 4.5. Collocated or Bare Base (Notional Example) Alarm Notification Times (Seconds from Declaration).

Alarm	Primary Methods	Alternate Methods	50% Warned	90% Warned	100% Warned
Green	Radio, Phone	Runner	90	150	180
Yellow	Radio, Phone	Runner	90	150	180
Red	Siren	Radio, Phone, Runner	15	15	45
Black	Siren	Radio, Phone, Runner	15	15	45
NOTE: The example assumes an installation siren system, telephone network, and radio system package has been deployed or is available at the site. Determine actual times through airbase exercises and evaluations.					

4.8.2. Evaluate in detail the attack warning and notification process, from theater down to unit and individual level. Determine the actual timelines for the existing warning and command and control systems. Develop a warning time projection for each threat weapon system. Determine if a "window of opportunity" exists to conduct "last minute" attack preparations or to launch aircraft sorties. Implement standing operating procedures to take advantage of any opportunities and reduce local warning delays. Table 4.6. provides a notional example for an attack with a SCUD variant. The missile has a projected flight time, based upon the distance from the launch site and expected missile performance, of 450 seconds. In this example, the airbase has about four minutes to take additional protective actions (missile flight time minus warning time). Although the available time is too short to implement general Alarm Yellow actions (based on voice notification times), there is time to direct specific actions within some functional areas and for individuals and teams to perform “last second” contamination avoidance actions. For example, the operations areas may focus on launching or delaying sorties and sending taxiing aircraft to shelters. Support and logistics areas have time to direct mobile units to move to cover and fuels and munitions forces to safely terminate operations. Personnel on the

flight line can significantly increase protection by using those few extra minutes warning to place critical equipment under cover and close hanger and aircraft shelter doors.

Table 4.6. Tactical Ballistic Missile (SCUD Variant) – Threat Warning Times (Notional Example) (Seconds from Launch).

TBM Flight Time	Launch Detect	WOC Warned	Potential Preparation Time*	Declare Alarm Red	Complete Alarm Red	Impact or Burst
Planned	60	60	240	30	60	450
Actual	(?)	(?)	(?)	(?)	(?)	(?)
* Use actual times for warning and the measured time required to complete actions.						

4.8.3. Develop a "playbook" approach that outlines likely threat scenarios and standard actions for each primary mission profile. Include considerations for daytime and nighttime operations and key responses to alarm conditions. Train the WOC and SRC staffs to quickly adjust standard actions, when required, based upon actual circumstances and mission requirements. Recognize that that the timing of certain activities is situation-dependent and may not be based upon static criteria. For example, the decision to release all or part of the base populace from their protective positions following an attack is based on a balance between mission task criticality and force protection issues.

4.8.4. Test the warning system periodically to verify system operation and warning timelines. Develop alternate notification for areas of the base where the warning systems are not available. Exercises are a simple and effective way to test your people, procedures, and systems, and identify gaps in pre-attack plans and preparation. Conduct limited exercises and immediate action drills to verify the effectiveness of warning and notification systems down to the unit control center and work center levels and reinforce individual knowledge of protective actions. Schedule exercises during both day and night operations. Notify all personnel in advance to avoid confusion over exercise versus actual attack notifications.

4.9. Airbase Sectors or Zones:

4.9.1. Concept:

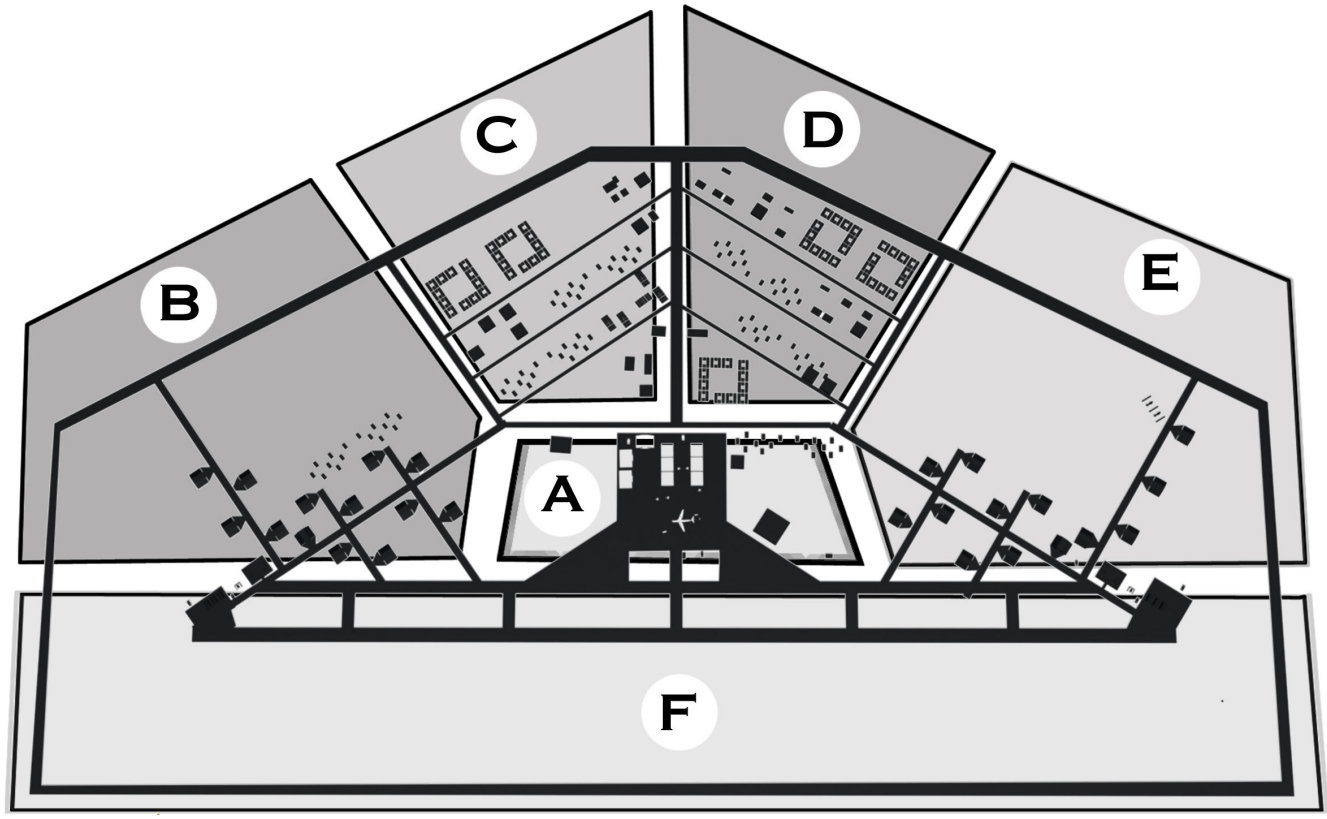
4.9.1.1. Split-MOPP operations are an effective technique to reduce the inefficiencies and mission degradations that result from a "one base, one response" reaction to specific NBC threats. This tactic divides the airbase into multiple sectors or control zones and assigns threat-based protective actions and MOPP for each individual area. It provides the commanders with the flexibility to respond to threats in specific areas and continue operations within areas unaffected by the incident or at lower risk from the threat. Effective operations require an assured, base-wide communications system, a well-trained base population and command and control element, and senior leadership that understands the limitations, as well as the opportunities provided by this technique.

4.9.1.2. Once a split-MOPP capability is established, the commander can rapidly implement defensive actions in areas where threats are present and reduce mission-degrading protective actions in other areas. The need for increased mission accomplishment capability must outweigh the potentially high-risk of split-MOPP implementation.

4.9.2. Operations:

4.9.2.1. Prior to hostilities, the SRC must identify airbase zones or sectors appropriate for the base geography and mission (**Figure 4.4.**). Consider factors such as work center disposition, physical features of the installation, and accessibility for movement between sectors or zones. If possible, use the same sector or zone identifications used by the Security Forces to identify airbase defense sectors. This simplifies preparation, training, and use by the base population and SRC staff. It also reduces map clutter and the potential for confusion if multiple terms and actions are used for the same areas. The objective is to develop easily discernible sector or zone boundaries to simplify understanding by planners, command and control personnel, and the base populace. Once planners develop the sectors, the airbase must conduct training to ensure UCCs and all personnel fully understand and are able to execute their responsibilities.

Figure 4.4. Airbase Sector or Zone Identification (Notional Example).



4.9.2.2. Split-MOPP implementation is a sequential event. It requires a chain of events to occur that provides the commander with the opportunity to implement the tactic. It also requires the WOC and SRC to determine mission priorities and provide course-of-action recommendations to the commander.

4.9.2.3. When an attack warning is declared, all personnel assume the appropriate MOPP and take protective actions (see paragraph **4.7.** and **Attachment 3**). Once the attack is over and Alarm Black is announced, the SRC should direct Civil Engineer NBC Reconnaissance Teams and other specialized teams to conduct NBC reconnaissance and report their results. The SRC staff, in con-

sultation with the NBC Defense Cell and medical representatives, analyzes the post-attack results, considers the sensitivity of available detectors, identifies the contamination footprint(s), downwind hazards, and determine what sectors or zones are affected. For TBM attacks with airburst warheads, the actual liquid contamination footprint may take up to 60 minutes to completely form. Therefore, the commander must know the means of chemical agent delivery before implementing split-MOPP or directing personnel other than those performing mission-essential tasks, to leave shelter or overhead cover.

4.9.2.4. Following the attack analysis and mission assessment, the SRC will provide each UCC with the commander's decision and airbase hazard locations. Each UCC is responsible for controlling their forces and limiting movement between contaminated and non-contaminated sectors or zones during Alarm Black. Unless otherwise directed by their UCC or other authority, individuals are expected to remain in a shelter or under overhead cover. When contamination is present on the airbase and movement is required, individuals do not move between sectors or zones without direction from their UCCs or approval from other authority. When movement is required, use the appropriate contamination control procedures as directed by the SRC.

4.9.2.5. Consider assigning zone or sector chiefs to establish transition points and control the movement of mission critical equipment and personnel between contaminated and uncontaminated areas. These transition points should have instructional signs that direct individual actions. Consider placing individual detection and decontamination assets (M8 and M9 paper, and M291 and M295 decontamination kits) at these areas and ready for immediate use. Also, consider placing notification signs along roadways or taxiways to ensure individuals are aware of the sector contamination status. The NBC Defense Cell must continually monitor weather conditions and use chemical detectors and modeling tools to assess agent contact and downwind hazards. Use these assessments to recommend sector or zone MOPP changes.

Chapter 5

NBCC PROTECTION

Section 5A—Individual Protection

5.1. Introduction:

5.1.1. Protection includes the physical measures and TTP used to protect people and resources from the effects of NBCC weapons. Physical protection is provided through individual protection, collective protection, and hardening (**Figure 5.1.**). Some measures, such as collective protection and hardening, are threat-specific. Other measures provide protection against multiple threats. This combination of physical protection measures and TTP enable commanders to minimize mission degradation and provide the most effective defense against NBCC weapons effects.

Figure 5.1. Individual Protection, Collective Protection, and Hardening.

5.1.2. Standard levels of individual protection and their corresponding individual protective actions are the core elements that enable survival and mission success. Individual protection levels are referred to as mission oriented protective postures (MOPP). These levels are designed to allow commanders to increase or decrease the level of protection rapidly without providing long explanations. The commander determines the initial MOPP level, based on MOPP analysis, and adjusts MOPP levels as NBC risks and mission priorities change. Individual protective actions are taken by personnel in response to an alarm condition change, discovery of unexploded ordnance (UXO) or NBC contamination, or direct attack.

5.1.3. NBC collective protection and conventional hardening measures further enhance survival, limit attack damage and contamination, and support mission sustainment. Specific measures are selected based upon the expected threat, unit mission, and resource to protect. Key factors include the availability of equipment, materials, manpower, and the time needed to implement the desired measure.

5.2. Individual Protective Equipment (IPE):

5.2.1. Basis of Issue:

5.2.1.1. IPE for ground personnel includes the GCE and field gear. It provides individuals with the minimum personal clothing and equipment needed to protect them from most NBCC hazards. IPE requirements and equipage responsibilities for ground personnel are found in AFI 10-2501.

5.2.1.2. The GCE includes the protective mask, C2 series canister (or filter element for M-17A2 protective mask), a second skin (only applies if issued the MCU-2 series or M45 protective mask), overgarment, hood (only used with the battle dress overgarment), gloves, glove inserts, and overboots. It also includes a booklet of M8 paper, roll of M9 paper, and an M291 and M295 decontamination kit. The term overgarment (OG) refers to either the battle dress overgarment (BDO, coat, and trousers) or the chemical protective overgarment (CPO, coat, and trousers). For additional information on IPE, consult T.O. 14P3-1-141, *Groundcrew Chemical Defense Ensemble*; T.O. 14P4-9-31, *Mask, Protective Field, M17, M17A2, and Accessories*; T.O. 14P4-15-1, *Chemical-Biological Mask Type MCU-2/P*; and Army Technical Manual 3-4240-348-10, *Mask, Chemical-Biological, Land Warrior: M45*.

5.2.1.3. Commanders and supervisors must be aware that additional specialized equipment may be required by some functions to perform wartime missions. See T.O. 14P3-1-181, *Joint-Firefighter Integrated Response Ensemble (J-FIRE)*, and Allowance Source Code (ASC) 016, for Firefighter and EOD NBCC IPE requirements for the Joint Service Lightweight Integrated Suit Technology (JSLIST). See AFI 11-301, Volume 1, *Aircrew Life Support (ALS) Program*, for aircrew IPE responsibilities and equipage.

5.2.2. Expeditionary Aerospace Force (EAF) Operations:

5.2.2.1. Contingency and Operations Plan Deployments. All Air Force personnel that deploy to NBCC medium- or high-threat areas (see **Table 2.2.**) aboard military or military contract ships or aircraft will hand-carry one operational GCE. See AFI 10-2501 for the components that make up the GCE. Bulk ship the components of the second authorized ensemble onboard the individuals' deployment aircraft or vessel. Bulk-shipped IPE may be issued to airmen at the deployment site, or centrally stored and distributed by base supply. The troop commander, aircraft commander, or ship's captain will provide troop members or passengers with attack warning signal information for en-route stops and the final destination. Procedures must ensure that personnel assume the required MOPP level before landing and or departing the aircraft or vessel.

5.2.2.2. Other Deployments. Unless directed otherwise, personnel will deploy with one operational GCE when supporting exercise deployments of more than 30 days. This requirement includes all AEF and exercise deployments to NBCC medium or high threat areas. Deploy training GCE components and operational GCE components when directed by the supported command, gaining commander, deployment instruction, or exercise directive. ***NOTE:*** Unless otherwise directed, the GCE does not need to be hand-carried or stored within the passenger compartment during peacetime deployments (such as routine AEF rotations during peacetime), but must be aboard the same aircraft or vessel as the deploying individual.

5.3. Mission Oriented Protective Posture (MOPP):

5.3.1. Introduction:

5.3.1.1. MOPP levels for ground forces are protection options. These options allow commanders to balance protection requirements and performance degradation with mission requirements. Standard MOPP levels also allow commanders to rapidly communicate their decision to their forces.

AFVA 10-2512, *Mission Oriented Protective Postures (MOPP)*, provides standard MOPP levels for Air Force personnel (**Figure 5.2.**). Air Force MOPP levels are consistent with the MOPP levels used by the Army and Marine Corps, with the exception that these forces use the additional term "MOPP Ready." When operating as part of a joint or combined force, Air Force units that are directed to assume MOPP Ready will assume MOPP 0.

5.3.1.2. MOPP levels are always used together with alarm conditions to quickly increase or decrease individual protection against NBCC threats. Higher MOPP levels provide greater protection at the cost of increased performance degradation. MOPP 4, the highest level, provides full respiratory and contact protection against field concentrations of NBC agents. However, it also causes the highest level of performance degradation from increased heat and mental stress, loss of visual and tactile acuity, and reduced hearing. When deciding to increase or reduce MOPP, or implement MOPP options, commanders must consider the specific threat, temperature, work rate, level of task difficulty, and mission requirements.

Figure 5.2. AFVA 10-2512, Mission Oriented Protective Postures (MOPP).

MISSION-ORIENTED PROTECTIVE POSTURES (MOPP)

MOPP LEVEL 0	MOPP LEVEL 1	MOPP LEVEL 2	MOPP LEVEL 3	MOPP LEVEL 4
AVAILABLE FOR IMMEDIATE DONNING	WORN	WORN	WORN	WORN
INDIVIDUAL PROTECTIVE EQUIPMENT (IPE)	OVERGARMENT AND FIELD GEAR	OVERGARMENT, OVERBOOTS AND FIELD GEAR	OVERGARMENT, PROTECTIVE MASK, HOOD, OVERBOOTS AND FIELD GEAR	OVERGARMENT, PROTECTIVE MASK, HOOD, GLOVES, OVERBOOTS AND FIELD GEAR
CARRIED	CARRIED	CARRIED	CARRIED	CARRIED
PROTECTIVE MASK WITH C2 CANISTER OR FILTER ELEMENTS AND HOOD INSTALLED, FIELD GEAR WORN WHEN DIRECTED	OVERBOOTS, PROTECTIVE MASK AND GLOVES	PROTECTIVE MASK AND GLOVES	GLOVES	
PRIMARY USE	PRIMARY USE	PRIMARY USE	PRIMARY USE	PRIMARY USE
PRE-ATTACK DURING PERIODS OF INCREASED ALERT WHEN THE ENEMY HAS A NUCLEAR, BIOLOGICAL, OR CHEMICAL (NBC) OFFENSIVE CAPABILITY THERE IS NO INDICATION OF NBC USE IN THE IMMEDIATE FUTURE	PRE-ATTACK DURING PERIODS OF INCREASED ALERT WHEN AN NBC ATTACK COULD OCCUR WITH LITTLE OR NO WARNING WHEN NBC CONTAMINATION IS PRESENT OR SUSPECTED AND HIGHER LEVELS OF PROTECTION ARE NOT REQUIRED	PRE-ATTACK OR POST-ATTACK DURING PERIODS OF INCREASED ALERT WHEN AN NBC ATTACK COULD OCCUR WITH LITTLE OR NO WARNING WHEN NBC CONTAMINATION IS PRESENT OR SUSPECTED AND HIGHER LEVELS OF PROTECTION ARE NOT REQUIRED	PRE-ATTACK OR POST-ATTACK DURING PERIODS OF INCREASED ALERT WHEN AN NBC ATTACK COULD OCCUR WITH LITTLE OR NO WARNING WHEN NBC CONTAMINATION IS PRESENT OR SUSPECTED AND HIGHER LEVELS OF PROTECTION ARE NOT REQUIRED	POST-ATTACK WHEN AN NBC ATTACK IS IMMINENT OR IN PROGRESS WHEN NBC CONTAMINATION IS PRESENT OR SUSPECTED OR THE HIGHEST LEVEL OF PROTECTION IS REQUIRED

ADDITIONAL INFORMATION
- IPE INCLUDES THE GROUNDCREW CHEMICAL ENSEMBLE AND FIELD GEAR. CARRY M8 AND M9 PAPER, THE M291 AND M295 DECONTAMINATION KITS, AND NERVE AGENT ANTIDOTES IN MOPPS 1-4. REFER TO AFI 10-2501, *FULL SPECTRUM THREAT RESPONSE PLANNING AND OPERATIONS*, FOR IPE COMPONENTS AND BASIS OF ISSUE.
- DEPENDING UPON THE THREAT AND MISSION, MOPP LEVELS MAY VARY WITHIN DIFFERENT AREAS OF THE AIRBASE OR OPERATING LOCATION.
- REFER TO AFMAN 10-2602, *NUCLEAR, BIOLOGICAL, CHEMICAL AND CONVENTIONAL (NBCC) DEFENSE OPERATIONS AND STANDARDS*, FOR OPTIONS TO THE MOPP LEVELS AND TACTICS, TECHNIQUES AND PROCEDURES TO OPTIMIZE THE USE OF MOPP LEVELS AND ALARM CONDITIONS.
- WEAR FIELD GEAR AND PERSONAL BODY ARMOR (IF ISSUED) WHEN OUTDOORS OR WHEN DIRECTED.
- SPECIALIZED CLOTHING, SUCH AS RAIN AND COLD WEATHER GEAR, IS WORN AS THE OUTSIDE LAYER OF CLOTHING OVER THE GROUNDCREW CHEMICAL ENSEMBLE.

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5.3.2. Authority to Declare MOPP. The senior commander determines the MOPP levels for the airbase. Individuals normally receive MOPP direction from their chain of command, the airbase public address system, cable television commander's channel, and battle staff directives. Individuals may increase their MOPP level (and sound the alarm) if they are attacked, they observe attack indications, or are threatened with attack by NBC agents. The senior commander is the authority for MOPP level reductions. Subordinate commanders can be delegated the authority to reduce MOPP levels or employ

MOPP options. Commanders delegated this authority must be provided with the specific conditions under which a MOPP reduction or option is authorized.

5.3.3. MOPP Levels. All Air Force personnel located in or deployable to NBCC medium- and high-threat areas are trained to use standard MOPP levels. **Table 5.1.** shows the estimated time for a trained airman to don the IPE for each MOPP level. After personnel don IPE, they should perform a Buddy Check on other personnel within the immediate area. Use the Buddy Check to verify proper IPE wear and to provide IPE and specialized equipment donning assistance, if needed.

5.3.3.1. MOPP 0. Personnel will inspect issued the IPE and prepare it for use. Keep the field gear and one GCE available for immediate donning. Store the components of the second or subsequent GCE sets (if issued) in each individuals' assigned shelter, duty section, or other area, as directed by the host unit or MAJCOM. Do not remove the operational OG from the vapor bag or install operational C2 series canisters on the protective mask until directed. Install the second skin and protective mask hood (if issued) on the protective mask. Wear the field gear and personal body armor (if issued) when outdoors or when directed. When directed to remove the OG from the vapor bag, inspect it and attach M9 paper as shown in **Figure 5.2.** Adjust the protective mask. Remove contact lenses (if worn). Adjust and wear the protective mask spectacles (if issued) or place them with the IPE that is available for immediate donning. Keep M8 and M9 paper, nerve agent antidotes, and decontamination kits with the IPE that is available for immediate donning. Use MOPP 0 as the normal wartime MOPP level when the enemy has an NBC capability.

Table 5.1. Estimated Time to Assume MOPP Levels.

MOPP Level	From MOPP 0	From Next Lower MOPP
0	0	Not Applicable
1	4	4
2	6	2
3	7	1
4	8	1
Mask With Hood	15 Seconds	15 Seconds
NOTE: Donning times assume the GCE components are removed from their storage containers and the hood installed, if required, on the MCU-2 series, M-17A2, or M-45 protective mask.		

5.3.3.2. MOPP 1. Wear the OG. Carry the protective mask, footwear covers, and gloves. Close all zippers, snaps, and Velcro fasteners. Wear field gear and personal body armor (if issued) when outdoors or when directed. Attach M9 paper to the OG. Carry or keep at hand M8 and M9 paper, nerve agent antidotes, and decontamination kits. Remove contact lenses (if not already done). Wear protective mask spectacles (if issued). Implement forced hydration, work-rest cycles, and buddy checks. Use MOPP 1 when attacks, such as missile attacks, could occur with little or no warning. Also, use MOPP 1 when contamination is present on the airbase or within the surrounding area but it presents no current threat to the individual.

5.3.3.3. MOPP 2. Wear the OG and overboots. Carry the protective mask and gloves. Close all zippers, snaps, and Velcro fasteners. Wear field gear and personal body armor (if issued) when outdoors or when directed. Attach M9 paper to the OG. Carry or keep at hand M8 and M9 paper,

nerve agent antidotes, and decontamination kits. Remove contact lenses (if not already done). Wear protective mask spectacles (if issued). Implement forced hydration, work-rest cycles, and buddy checks. Use MOPP 2 when attacks, such as missile attacks, could occur with little or no warning. Individuals assume MOPP 2 when Alarm Yellow is declared, unless otherwise directed. Use MOPP 2 to provide additional protection to personnel when crossing or operating in previously contaminated areas.

5.3.3.4. MOPP 3. Wear the OG, overboots, and protective mask. Carry the gloves. Close all zippers, snaps, and Velcro fasteners. Configure the mask hood according to technical order guidance. Wear field gear and personal body armor (if issued) when outdoors or when directed. Carry or keep at hand M8 and M9 paper, nerve agent antidotes, and decontamination kits. Remove contact lenses (if not already done). Wear protective mask spectacles (if issued). Enforce hydration standards, work-rest cycles, and buddy checks. MOPP 3 is a post-attack protective posture that has very limited application. Use it at additional risk when personnel performing essential tasks require increased dexterity. Use MOPP 3 when a negligible contact or percutaneous (skin absorption) vapor hazard is present.

5.3.3.5. MOPP 4. Wear the OG, overboots, protective mask, and gloves. Configure the mask hood according to technical order guidance. Close all zippers, snaps, and Velcro fasteners. Wear field gear and personal body armor (if issued) when outdoors or when directed. Carry or keep at hand M8 and M9 paper, nerve agent antidotes, and decontamination kits. Remove contact lenses (if not already done). Wear protective mask spectacles (if issued). Enforce hydration standards, work-rest cycles, and buddy checks. Use MOPP 4 when attacks are imminent or in progress or when contamination is suspected or present. Individuals will assume MOPP 4 when Alarm Red is declared, unless otherwise directed. Use MOPP 4 to provide the maximum individual protection to personnel.

5.3.4. MOPP Options. For some missions, commanders may need to reduce the heat burden for personnel. They may be forced to choose between the possibility of increased NBC casualties or the certainty of increased heat casualties. The senior commander may accept the increased risk and authorize MOPP options to provide flexibility and to minimize MOPP-related degradation. MOPP options may also be used when agent threats do not require full body protection. Consult with Civil Engineer Readiness and medical personnel to determine the most effective course of action.

5.3.4.1. Mask-Only Option. Wear the protective mask only without the hood. Wear the battle dress uniform (BDU) or flight suit with sleeves rolled down. Use the mask-only option to provide respiratory protection against biological agents, nuclear fallout, and chemical agent downwind hazards that do not include a danger from percutaneous exposure. Use the mask-only option after post-attack reconnaissance is complete. This variation may be used when personnel are protected from direct contact with solid or liquid contamination or within areas with low vapor concentrations. Examples include personnel within structures, vehicles, and aircraft. During attacks, personnel using the mask-only option should assume the directed MOPP level.

5.3.4.2. No Battle Dress Uniform or Flight Suit Option. Under this option, individuals do not wear the BDU or flight suit under the OG. This option reduces heat stress but is not a substitute for work-rest cycles (see **Attachment 5**). This option also increases the risk of skin contamination and the level of vapor exposure. The BDO may also cause skin irritation from direct contact of the skin with activated charcoal in the cloth. Do not use this option for personnel who are reusing previously contaminated IPE.

5.3.4.3. Ventilation Option. Under some conditions, personnel may open the OG jacket to aid ventilation and reduce thermal build-up. The ventilation option involves risk because some chemical vapors can be absorbed through the skin and may cause casualties over time. Ventilation periods when agents are present must be limited to the minimum amount of time needed for heat relief. The ventilation option is automatically revoked with each MOPP level increase, unless specifically reauthorized by the commander.

5.3.5. Wearing Specialized Clothing and Field Gear. Specialized clothing and field equipment is normally worn over the OG. Examples are personal body armor, cold weather parkas and pants, hats and hoods, work gloves, load bearing equipment, and field accessories. Size this equipment to the individual while they are wearing the OG, gloves, and protective mask. In most cases, larger sizes are required to enable a functional fit and unrestricted movement. Adjust load bearing equipment and position field accessories to allow proper positioning and carrying of the protective mask and canteen. Clothing intended for wear underneath the BDU uniform, flight suit, or against the skin may be worn underneath the OG. Examples include the cold weather shirt and pants, personal body armor (T-shirt style), heating or cooling vests, and undergarments. Consider that some of these additional items may increase heat buildup. Specialized equipment must be removable during Contamination Control Area (CCA) processing without compromising the integrity of the IPE. Regardless of the method of wear, specialized clothing must not prevent proper wear of the individual protective equipment.

5.4. Task Performance in MOPP. NBCC task qualification training prepares individuals and teams to perform wartime tasks in contaminated environments. Supervisors should focus efforts on tasks that are the most essential for mission accomplishment. They should develop alternate task timelines or workarounds to prevent mission delays. For MOPP operations, review the individual and unit tasks, sort them into categories, and target the appropriate tasks for increased training emphasis. Include consideration for climatic conditions (current or deployment locations) and adjust requirements to reflect seasonal changes. Train leaders, especially first-line supervisors, to recognize these situations and adjust manpower, material, or task timelines to reflect lower or higher priorities. Use the following guidelines to identify and prioritize tasks:

5.4.1. Tasks that can be done in MOPP 3 or 4 and require little or no change in performance (normally routine and commonly practiced tasks). Most tasks will fall into this category.

5.4.2. Tasks that cannot be delayed and performance is severely degraded in MOPP 4. Increase the emphasis on training and the development of manpower or material work-around. Train leaders and supervisors to recognize these situations and adjust normal task completion timelines to reflect MOPP-related delays.

5.4.3. Tasks which cannot be done effectively in MOPP 3 or 4, but can be delayed until the threat allows reduction to MOPP 2 or lower. Train leaders and supervisors to recognize these situations and adjust work requirements to reflect lower priorities.

5.4.4. Tasks that cannot be delayed and performance is severely degraded in MOPP 3 or 4. Performance cannot be improved through training or work-around methods. Identify these as shortfalls or limiting factors and forward through the chain of command for resolution.

5.5. Forced Hydration . Dehydration is a severe problem when people work in moderate or high temperatures while wearing the GCE. Properly hydrated personnel not only perform better in MOPP, but also recover more quickly after strenuous activity. Ensure personnel drink water regularly before donning

MOPP and while in MOPP. Use the hydration guidelines in **Attachment 5** and guidance provided by the medical staff.

5.6. Work-Rest Cycles. Use work-rest cycles as a tool to maintain consistent work levels and prevent heat-related casualties. Verify the effectiveness of recommended work-rest times by direct observation of the personnel performing the task. Use the buddy system to enforce hydration requirements, quickly identify problems, and obtain assistance. Provide potable water that is readily accessible to personnel working on the flightline or in other areas where water resources are scarce. Whenever possible, keep personnel out of direct sunlight and take advantage of periods of low activity to provide rest and recovery time. Erect tents or shelters to provide shade and place personnel within air-conditioned or heated (as appropriate) vehicles, tents, or facilities to enhance recovery. **Table A5.1.** provides the estimated work intensity levels for common tasks and activities in different MOPP levels. Use the table to determine the work intensities for tasks normally performed by unit personnel. Use **Table A5.2.** to determine the estimated work-rest cycle times for the BDO and chemical protective overgarment (CPO) under different work intensities and environmental conditions. These estimates assume that personnel who begin the cycle are healthy, properly hydrated, and have recovered from the effects of previous activity.

5.7. MOPP Analysis and Management:

5.7.1. The projected threat environment at an airbase will not always call for extended MOPP 4 conditions. During the pre-attack phase, Civil Engineer Readiness personnel can use intelligence information and current weather conditions to provide detailed information on protection requirements and predict agent persistence. Medical personnel can provide recommendations to ensure safe and sustained operations under various climatic conditions. The commander and staff should use this information to develop standard responses and courses of action for each primary airbase mission. After an attack, Civil Engineer Readiness personnel will use the information collected from base and unit PAR teams to identify the type of agents used, the likely duration of exposure, and minimum protection requirements. The commander and staff can then determine what courses of action to employ. Civil Engineer Readiness technicians can further assist the commander to determine risk and assist units develop threat-based courses of action.

5.7.2. Most, if not all, airbase missions can be done in contaminated environments if the base populace is well trained and leadership understands the threat environment. Through a combination of training and leadership, all mission essential tasks can be completed while wearing IPE or using approved MOPP options. Most senior leaders know they cannot expect the same work rates in MOPP 4 as they achieved in MOPP 0. They must re-evaluate their ability to meet mission requirements and communicate changes to their forces. Depending on the task and climate, the short and long-range consequences to personnel may range from insignificant (cool or mild conditions) to catastrophic (hot and dry conditions).

5.7.3. There will be situations--especially in high heat conditions-- where the mission cannot be accomplished within required times because of the IPE degradation. MOPP options can be used to extend operations, but they are not the solution for every situation. When contamination is present, the commander must be prepared to choose between mission accomplishment or agent effects on personnel. The decision may be relatively minor and focus on a single mission or function or affect large segments of the airbase. Commanders should prepare for these situations during the pre-attack phase by training the staff to quickly develop alternate courses of action for likely post-attack scenarios. When

faced with decisions, the staff will be prepared with the information the commander needs to select a course of action.

5.7.4. MOPP reduction decisions are among the most difficult to make because of the many considerations that affect the final decision. Commanders must evaluate the situation from both the airbase survivability and mission perspective. Factors include the criticality of the current missions, the airbase contribution to theater war plan execution, detector capabilities, potential effects of personnel exposure, and the impact on the casualty care system. Courses of action should consider the likely trade-offs between short- or intermediate-term results and the intermediate and long-term effects on airbase mission sustainment.

Section 5B—Collective Protection

5.8. Collective NBC Protection:

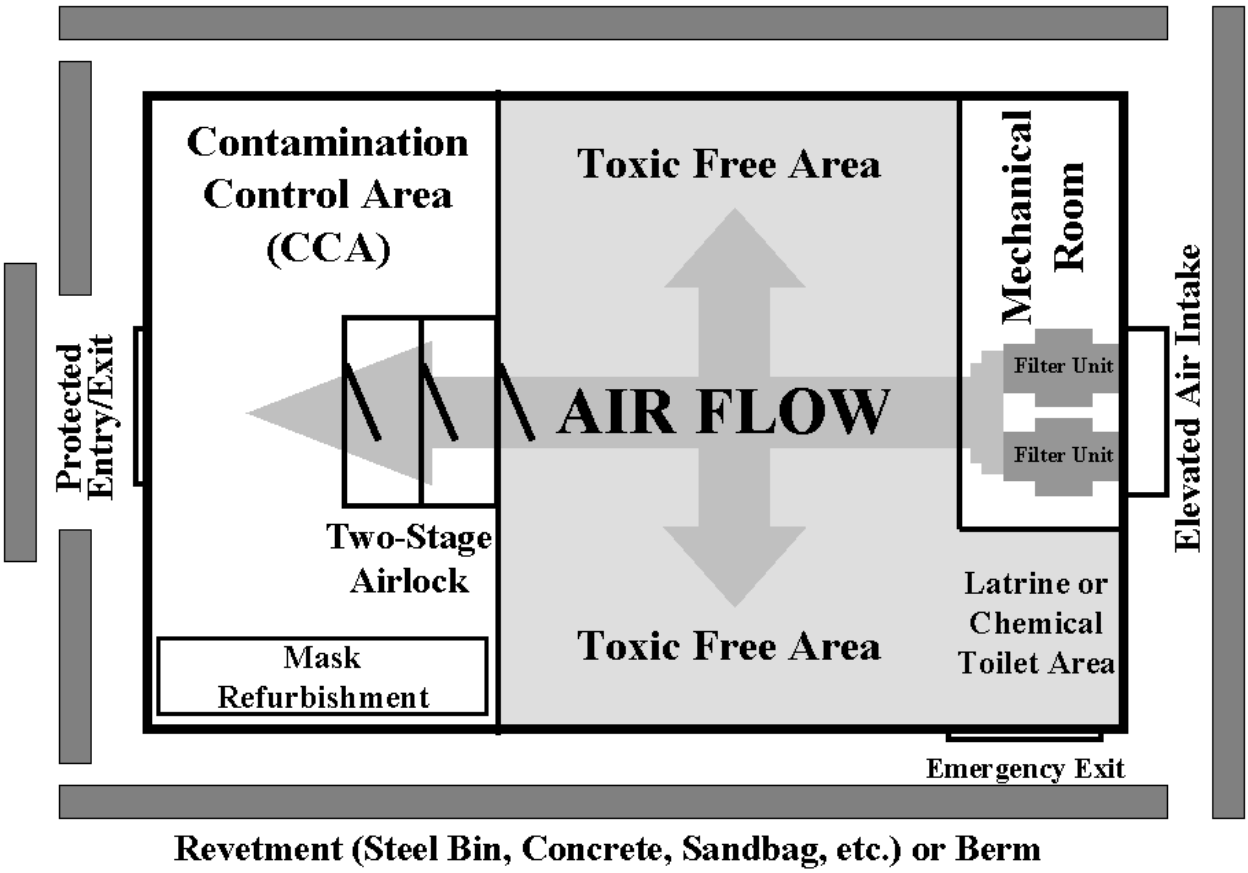
5.8.1. Introduction. Collective NBC protection is an important aspect of airbase NBC defense. Ideally, it provides a temperature-controlled, contamination-free environment to allow personnel relief from continuous wear of IPE. The basic concept for most facility collective protection solutions is to provide overpressure, filtration, and controlled entry and exit. Maintaining a higher internal air pressure than external pressure and filtering incoming air prevents contaminated external air from infiltrating the shelter. The result is a toxic-free area (TFA) where personnel can operate without protective equipment. One or more self-purging airlocks provide controlled entry and exit. **Figure 5.3.** shows the layout of a typical structure equipped with an overpressure collective protection system. Other types of collective protection rely upon the facility structure to provide short-term protection. They are not equipped with positive pressure air filtration systems or airlocks and use shelter-in-place techniques to limit or delay the entry of contamination.

5.8.2. Purpose. Collective protection supports two mission sustainment areas that quickly erode in an NBC environment: personnel rest and relief (breaks and sleeping), and work relief (command and control, medical treatment, MOPP recovery time after maximum work effort). Each airbase must assess collective protection requirements based upon the likely threats and mission requirements. Specific collective protection solutions may include a mixture of permanent, mobile or transportable, or expedient or temporary collective protection systems.

5.8.3. Types of Collective Protection:

5.8.3.1. Collective protection requirements for permanent and fixed site structures are outlined in **Attachment 3** and **Attachment 7**. Commanders should use transportable and expedient collective protection measures to augment existing capabilities. **Table 5.2.** provides descriptions of the five classes of collective protection. Commanders may use any combination of Classes I through IV collective protection to meet the requirement to protect the in-place and deployed base population. Use Class V shelters to enhance protection for personnel that are not afforded Classes I through IV collective protection.

Figure 5.3. Typical Collective Protection System Floor Plan.



5.8.3.2. Medical facilities must be collectively protected to enable medical forces to conduct sustained operations in NBC-contaminated environments. The medical commander and airbase must plan for degradation of clinical operations in event of NBC attack, and identify alternate medical treatment facilities in case primary facilities are contaminated to the extent they become unusable.

5.8.4. Operating Collective Protection Systems. Unit shelter management teams must be assigned and trained to operate and maintain Classes I through IV collective protection systems. For Class V collective protection facilities, the teams must be able to configure the facility to provide maximum protection. The Base Civil Engineer is responsible for training unit teams on system operations, maintenance, contamination control area processing, facility configuration, and shelter management techniques and procedures. **Table 5.3.** outlines general actions for collective protection shelter operations.

Table 5.2. Classes of Collective Protection.

Classes and Characteristics	Available Solutions
Class I - Fully Integrated System	
Permanent modifications to structures or stand-alone collective protection systems	Hardened and unhardened structures with integral systems, Survivable Collective Protection System, Interim Transportable Collective Protection System, Joint Transportable Collective Protection System, Chemically Protected EMEDS
NBC filter units fully integrated with existing heating, ventilating, and air conditioning (HVAC) systems	
Air dampers control ventilation openings	
Permanent airlock and CCA integration	
Class II – Partial Integration	
Permanent modifications and sealing measures made to all or part of a structure	Hardened and unhardened structures with partially integrated systems, KMU-450 Shelter Modification Kit
Partial integration of HVAC filter units or alternate systems allow heating and cooling	
Air dampers control ventilation openings	
Permanent or partial airlock integration	
Permanent or temporary CCA	
Class III - Expedient	
Selected portions sealed by temporary measures such as plastic sheeting, barriers, and tape	Expedient or retrofit modifications
Uses mobile or transportable filter units	
HVAC integration may or may not be employed	
Temporary Airlock and CCA	
Class IV - Secondary Enclosure	
Structure unsuitable for expedient collective protection but suitable for housing internal enclosures or liner systems	M20/M28 Liner System, Interim Transportable Collective Protection System, Joint Transportable Collective Protection System erected inside structures
May allow use of existing HVAC	
Temporary Airlock and CCA	
Class V – Shelter In-Place	
Fully enclosed, unpressurized structure that prevents the entry of liquid contamination	Applicable to most permanent airbase structures when other methods are unavailable; applicable to some temporary structures with low air leakage rates
Portions may be expediently sealed, such as with plastic sheeting and to delay entry of vapor or particulate material	
Turn HVAC system off or place in recirculation mode	
Decontaminate with the M291 and M295 decontamination kit or 5% bleach solution prior to entry	
Personnel move to higher floors in multi-storied structures	
May enable temporary MOPP reduction or mask removal	

Table 5.3. Collective Protection Operations - General Actions.

Alarm Green
Operationally check shelters with overpressure systems and upgrade configuration to ready status
Set up CCA for operations and install serviceable filters as directed by SRC
Shelters teams without collective protection seal the building, locate the building HVAC shutoff, and establish entry decontamination station
Test standby power and check fuel levels
Report shelter status to the UCC and NBC Defense Cell
Assign unit personnel to shelters
Stock shelter with CCA supplies, IPE, detectors, and other assets required in FSTR Plan 10-2
Place shelter on standby if warning time is sufficient to place system in operation prior to attack
Action to accomplish if the previous condition was Alarm Black
Shelters without collective protection turn HVAC systems on, open doors and windows, and ventilate the structure for at least 30 minutes before personnel remove the masks
Replenish supplies used in previous operations, refill fuel tanks, replace filters when directed
Operationally check shelters with overpressure systems
Alarm Yellow
Activate collective protection system
Control entry and exit
Shelters teams without collective protection filtration systems shut off HVAC and close all doors, windows, and other vents or exterior openings
Personnel not assigned essential tasks enter and remain in shelter until directed otherwise
Report shelter status to the UCC and NBC Defense Cell.
Alarm Red
Notify personnel and direct all to take cover if within unhardened structure
Direct shelter occupants to assume the appropriate MOPP
Allow personnel entry until the attack begins, then secure entry and exit
Monitor system operation throughout the attack
Alarm Black
Report shelter status to the UCC and NBC Defense Cell, and SRC
Verify system operation and check available detectors
Observe personnel for agent effects
Direct personnel to unmask if system operation remains normal (shelters with filtration systems only)
Direct personnel to don the protective mask if agent effects are observed
Direct PAR team to begin their survey when directed by the UCC
Begin entry and exit operations to support mission requirements

5.9. Collective Protection Planning Factors. Use the planning factors in **Table 5.4.** to identify collective protection requirements for fixed-site structures. Use technical manuals or manufacturer guidelines for systems such as the Survivable Collective Protection System, M28 Simplified Collective Protection System, Chemically Protected EMEDS, and KMU-450 Shelter Modification Kit.

5.10. Shelter-In-Place Procedures. In-place sheltering is a means to providing low-cost, short-term protection for people against the effects of NBC agent or the accidental or deliberate release of toxic industrial materials. During wartime, use this method to limit the entry of airborne contamination when other protection is unavailable. Under emergency conditions, it may provide limited protection to unprotected personnel or casualties that cannot wear the protective mask. The concept assumes that the techniques can be applied rapidly, require little or no specialized training, and use common skills and supplies. Specific methods will vary based on the building or area to be protected and the ability to provide advanced warning to the occupants. Detailed procedures and facility assessment checklists are provided in the HQ AFCESA publication, *Protective Actions for a Hazardous Materials Release: A USAF Protective Actions Planning Guide For Individuals and Facility Managers.*

Table 5.4. Design and Planning Standards for Classes I through IV Collective Protection.

Component	Minimum Standard
Air Filtration	Military specification filter or commercial filters that meet MIL-PRF-32016; spare filters to enable operations for up to 96 hours under local threat and environmental conditions
Ventilation	10 cubic feet per minute, per occupant
Toxic Free Area (TFA)	0.2 iwg overpressure, 30-35 square feet floor space per occupant, recirculation filters desirable, pressure and airflow gauges visible to personnel in the TFA, audible and visual alarm to warn of low air pressure or system malfunction
Contamination Control Area (CCA)	Overhead cover for removal, storage, decontamination, and disposal of IPE, expendable material to support the planned entry and exit rate, CCA procedures according to AFMAN 32-4005
Airlock	Allows movement with purging airflow between CCA and TFA, timer to indicate completion of purging cycle, pressure and airflow gauges visible to personnel in the TFA. Match airlock entry and exit rate to support planned processing over 24 hours.
Detection	Detector for monitoring the TFA
Hardening	See **Attachment 7**
Latrine Capability	One per 20 occupants
IPE Storage in TFA	Two cubic feet per occupant desirable
Food, Potable Water, and Expendable Material	Up to 96 hour supply per occupant, based on current environmental conditions
Backup Electrical Power	Desirable
Protective Mask in TFA	One in possession of each occupant (may be personal mask or any other mask approved for Air Force use)
Food Storage	As required to support planned occupancy
NOTE: Reference AFTTP(I) 3-2.33, *Multiservice Procedures for NBC Defense of Theater Fixed Sites, Ports, and Airfields*, and United States Army Report ERDEC-TR-520, *Applying Collective Protection to Existing Buildings at Osan and Kunsan AB Korea.*	

5.10.1. Units prepare shelters for operation by sealing cracks and holes, closing all doors and windows, locating HVAC shutoff (may be more than one) and preparing entry decontamination stations. The innermost rooms of a structure provide the best protection against contamination hazards.

5.10.2. When Alarm Yellow or Red is declared, turn the HVAC system off. This prevents the system from drawing contaminants into the building and increasing agent concentrations if a NBC attack or hazardous materials release occurs.

5.10.3. If contamination is present on the airbase, decontaminate personnel entering the structure to limit the entry of liquid or particulate contamination. If chemical detectors had previously indicated that vapor contamination was inside the shelter, personnel must verify that no residual contamination

remains before they remove their protective masks. Once the contamination outside the facility has dissipated, turn the HVAC system on, open all doors and windows, and ventilate the facility to speed to removal of any remaining internal airborne contamination.

Section 5C—Hardening

5.11. Introduction:

5.11.1. Permanent and expedient hardening measures are used to strengthen buildings and utility systems or provide barriers to resist the destructive effects of weapons. Successful hardening measures will protect people and weapons systems from primary and secondary weapons effects. Permanent hardening may be incorporated into structures during initial construction or added later as a modification or retrofit. Expedient hardening, such as rapid erection of sandbag walls or building soil berms, is the primary hardening method for expeditionary forces.

5.11.2. The selection of specific hardening measures will depend upon the threat, facility construction, type of vehicle or equipment to protect, and available resources. In general, the most cost effective method is to include hardening requirements into new facility construction or initial force bed down requirements during peacetime. Expedient hardening methods provide increased protection for expeditionary forces but require a significant commitment of manpower, specialized equipment, and material. At the lowest level, units and airmen construct expedient bunkers, earth berms, sandbag walls, fighting positions, and foxholes to protect people and resources.

5.11.3. Airbase hardening is not a new concept. Throughout history, defenders of fixed positions have gone to great lengths to increase the survivability of vital assets. During the Vietnam War, virtually all theater airbases had implemented some form of hardening. Hardening efforts also received priority consideration during Operation DESERT STORM. As recently as 1993, Air Force personnel deployed to Somalia protected themselves from ground force threats by constructing expedient personnel and equipment shelters using sandbags and locally available materials. At the same time, Civil Engineer Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer (RED HORSE) forces constructed steel bin revetments and earth berms to protect joint forces fuel storage areas, support equipment, and aircraft. Airbases in the Republic of Korea and Southwest Asia incorporate extensive hardening into the airbase infrastructure. These include hardened aircraft shelters, revetments, and facilities; construction continues today. In future conflicts, we will undoubtedly need to match the scope and extent of hardening activities in the past. At most locations, the scope of initial hardening needs will far exceed our actual construction capability. Consequently, units will be expected to implement expedient hardening measures to protect unit resources from attacks. Include unit expedient hardening tasks as part of pre-deployment training and exercises.

5.12. Hardening Criteria:

5.12.1. Criteria. See **Attachment 7** for the wartime hardening criteria for permanent, temporary, and expeditionary structures. **Table 5.5.** summarizes sources for NBCC hardening construction standards and expedient methods. DoD Antiterrorism force protection standards for buildings are outlined in AFMAN 32-1071V1, *Security Engineering Project Development;* AFMAN 32-1071V2, *Security Engineering Concept Design Manual;* AFMAN 32-1071V3, *Security Engineering Final Design Manual,* and in DoD Unified Facilities Criteria 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*. Integrate antiterrorism and wartime requirements to simplify construction and reduce over-

all costs. Use available resources to incorporate the highest hardening level possible if required hardening levels cannot be achieved. Hardening definitions enable planners to determine a general level of hardening for a specific facility, function, or resource. Use the design and analysis processes for hardened structures in AFPAM 32-1147(I), *Design and Analysis of Hardened Structures to Conventional Weapons Effects*, and the supporting publications, to determine the appropriate hardening measures to defeat specific threats.

Table 5.5. NBCC Hardening Publications.

Title	Measures*				
	N	B	C	CV	TIM
DoD 0-2000.12-H, *Protection of DoD Personnel and Activities Against Acts of Terrorism and Political Turbulence*	X	X	X	X	X
DoD Unified Facilities Criteria 4-010-01, *Minimum Antiterrorism Standards for Building*				X	
AFPAM 10-219V2, *Pre-Attack and Pre-Disaster Preparations*	X	X	X	X	
AFTTP(I) 3-2.33, *Multiservice Procedures for NBC Defense of Theater Fixed Sites, Ports, and Airfields*	X	X	X		X
AFPAM 10-219V3, *Post-Attack and Post-Disaster Procedures*	X	X	X	X	
AFH 10-222V3, *Guide To Civil Engineer Force Protection*	X	X	X	X	
AFH 10-222V14, *Guide to Fighting Positions, Obstacles, and Revetments*	X			X	
AFH 10-2502, *USAF Weapons of Mass Destruction Threat Planning and Response Handbook*					X
AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*	X	X	X	X	X
AFMAN 32-1071V1, *Security Engineering Project Development*	X	X	X	X	X
AFMAN 32-1071V2, *Security Engineering Concept Design Manual*	X	X	X	X	X
AFMAN 32-1071V3, *Security Engineering Final Design Manual*	X	X	X	X	X
US Army Corps of Engineers, UFC 3-340-01, *Design and Analysis Of Hardened Structures To Conventional Weapons Effects*.	X	X	X	X	
Engineer Technical Letter 1110-3-490, 13 May 98, *Design of Chemical Agent Collective Protection Shelters for New and Existing Facilities*	X	X	X		
Engineer Technical Letter 1110-3-498, 24 Feb 99, *Design of Collective Protection Shelters to Resist Chemical, Biological, and Radiological Agents*	X	X	X		
HQ AFCESA, *Protective Actions for a Hazardous Materials Release: A USAF Protective Actions Planning Guide For Individuals and Facility Managers*, 22 Oct 01	X	X	X		X
* N - Nuclear, B - Biological, C-Chemical, CV - Conventional, TIM - Toxic Industrial Material					

5.12.1.1. Hardened. A hardened structure allows the occupants, systems, and supporting infrastructure to continue to operate during and after attacks. The structures may include a Class I collective protection systems and typically are constructed below ground level and under rock or concrete cover. These structures provide substantial protection against direct attacks with current and projected chemical, biological, and conventional weapon threats for that location. They provide complete protection against direct and indirect small arms fire. They also provide protection against the collateral effects (blast, heat, fallout, radiation, electromagnetic pulse) of nuclear weapons. When combined with standard DoD force protection measures, hardened structures provide the highest level of facility protection for wartime operations.

5.12.1.2. Semi-Hardened. Semi-hardened structures allow the occupants, systems, and supporting infrastructure to survive attacks and continue to operate immediately following attacks. They may be constructed at or below ground level and include Class II or better collective protection system. These structures provide protection against the collateral effects (blast, heat, broken glass/glass shards, fragmentation, shock, and contamination) of attacks with current and projected chemical, biological, and conventional weapon threats for that location. They provide complete protection against direct and indirect small arms fire. They also provide limited protection against the collateral effects (blast, heat, fallout, radiation, electromagnetic pulse) of nuclear weapons. When combined with standard DoD force protection measures, these structures provide a high level of protection for wartime operations.

5.12.1.3. Splinter Protected. Use splinter protection to protect structures, people, and resources. When combined with standard DoD force protection measures, these structures provide a moderate level of protection for wartime operations. Splinter protection allows the occupants to survive attacks and limits damage to systems, supporting infrastructure, and resources. It limits the collateral effects (blast, heat, fragmentation, and shock) of conventional weapon attacks. It also provides limited protection against direct and indirect small arms fire and provides limited protection against the collateral effects (blast, heat, fallout, radiation, electromagnetic pulse) of nuclear weapons. Splinter protected structures may include collective protection.

5.12.1.4. Siting Consideration. Evaluate the location and natural protection of the assets in their function. As a minimum, site these facilities or assets to enhance physical protection, facilitate defense, and reduce vulnerability to uncontrolled vehicle or pedestrian access. When combined with standard DoD force protection measures, there structures provide a limited level of protection for wartime operations.

5.12.2. Execution. The most cost-effective method is to incorporate hardening into new facility construction. Modify or retrofit existing structures to meet minimum standards. Plan to implement expedient hardening for expeditionary operations or when hardened structures are not provided by the host-nation. Follow guidance within AFI 10-404 to identify hardening requirements within base and joint support plans. Where appropriate, include theater and MAJCOM requirements for hardening and construction standards. Base protection actions on an analysis of the expected cost, degree of risk, and the expected benefits. Continually reassess these decisions and actions as the threat environment changes.

5.12.3. Construction Standards:

5.12.3.1. New Construction and Retrofit Hardening. Construction standards for hardening new and existing structures are in AFPAM 32-1147(I). This publication provides a standard method to

analyze full spectrum threats and integrate both NBCC protection into the total facility design or modification. It also provides technical data to enable Civil Engineers to assess threat weapons effects and identify countermeasures. The biggest drawback to permanent hardening is the lengthy construction time. In most cases, permanent hardening must be complete before hostilities begin. Once deployment begins and an enemy threatens, there is little or no time for detailed engineering designs or elaborate construction.

5.12.3.2. Expedient Hardening. Expedient hardening includes both standard and non-standard hardening techniques. Improvisation is often required to compensate for the lack of traditional construction materials or specialized equipment. Use expedient methods to take advantage of available local materials and terrain features. AFH 10-222V14, *Guide to Fighting Positions, Obstacles, and Revetments*, and AFPAM 10-219V2, *Pre-Attack and Pre-Disaster Preparation,* provide methods to select and construct expedient hardening measures. These methods are suitable for expeditionary operations and effective against a wide range of airbase threats. Most methods require only a simple analysis and plan. Unit personnel with minimal training can accomplish expedient hardening. Recognize that the most effective hardening measures may not be best to employ under every situation. Once the threat is identified, prepare a prioritized list of resources to protect. Consider factors such as the estimated construction time, manpower and equipment availability, life-span requirement, and availability of materials. Implement specific actions based these considerations and the decision of the senior Air Force commander.

5.13. Special Considerations for NBC Threats:

5.13.1. Bunker and defensive fighting position (DFP) construction complicates the use of standard protective actions in a contaminated environment. Many structures are located below ground level and have limited ventilation. As a result, chemical agent vapors are concentrated and remain hazardous for longer periods. In addition, the durable, non-porous construction materials used to construct most of these structures do not readily absorb liquid agents. Finally, personnel normally remain inside these structures for extended periods and contamination sources are relatively close the occupant's respiratory tract. These factors require personnel working in these structures to adhere to strict contamination avoidance measures, and to keep the structure well-ventilated. Continue these precautions even after outside MOPP levels are reduced. Use automatic and manual agent detectors to verify that contamination levels within these structures and upon non-porous surfaces are at or below safe levels.

5.13.2. Unpainted concrete is the material of choice for bunker and DFP construction in NBC environments. It provides suitable conventional protection and is one of the best materials for liquid chemical agent absorption. If sandbags are used, use the older burlap bags in lieu of the newer plastic versions. Burlap absorbs liquid chemical agents at a faster rate than plastic sandbags. Construct bunkers and DFPs with a 2- to 3-foot overhang for observation ports and doors. Construct doors with a small L-shaped entryway. Both of these methods minimize the amount of agent contamination that enters the structure. Use a non-porous surface, such as AM-2 matting, to construct the floor and simplify decontamination. Avoid using camouflage netting unless the tactical situation requires netting.

Camouflage nets are made of non-porous materials and liquid chemical agents hazards remain for longer periods.

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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

Department of Defense:

DoD Directive (DoDD) 2000.12, *DoD Antiterrorism/Force Protection (AT/FP) Program*

DoDD 5530.3, *International Agreements*

DoD Instruction (DoDI) 2000.14, *DoD Combating Terrorism Program Procedures*

DoDI 2000.16, *DoD Combating Terrorism Program Standards*

DoDI 3020.37, *Continuation of Essential DoD Contractor Services During Crises*

DoD O-2000.12-H*, Protection of DoD Personnel Against Acts of Terrorism and Political Turbulence*

DoD Publication, *Proliferation: Threat and Response*

DoD Publication, *The Effects of Nuclear Weapons*, Third Edition, 1997

DoD Unified Facilities Criteria 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*

Chairman of the Joint Chiefs of Staff (CJCS) Concept Plan (CONPLAN) 0400-00, *Counterproliferation of Weapons of Mass Destruction (S)(Draft).*

Joint Publication (JP) 3-01, *Joint Doctrine for Countering Air and Missile Threats*

JP 3-01.5, *Doctrine for Joint Theater Missile Defense*

JP 3-07.2, *Joint Tactics, Techniques, and Procedures for Antiterrorism*

JP 3-10, *Doctrine for Joint Rear Area Operations*

JP 3-11, *Joint Doctrine for Operations in NBC Environments*

JP 3-40, *Joint Counterproliferation Operations (Draft)*

JP 4-06, *Joint Tactics, Techniques, and Procedures for Mortuary Affairs in Joint Operations*

NATO:

North Atlantic Treaty Organization (NATO) Allied Tactical Publication-45B (ATP-45B), *Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas (Operator's Manual)*

Standardization Agreement (STANAG) 2103, *Reporting Nuclear Detonations, Radioactive Fallout, and Chemical Attacks*

STANAG 2002, *Warning Signs for the Marking of Contaminated or Dangerous Land Areas, Complete Equipment, Supplies, and Stores,* Edition 7

STANAG 2083, *Commanders' Guide on Nuclear Radiation Exposure of Groups During War*, Edition 6

STANAG 2143, *Explosive Ordnance Reconnaissance/Explosive Ordnance Disposal,* Edition 4

US Air Force:

AF Doctrine Document (AFDD) 2-1.8, *Counter Nuclear, Biological, and Chemical Operations*

AFDD 2-4, *Combat Support*

AFDD 2-4.1, *Force Protection*

AF Policy Directive (AFPD) 10-25**,** *Full Spectrum Threat Response (FSTR*)

AFPD 10-26, *Counter-Nuclear, Biological, and Chemical (C-NBC) Operational Preparedness*

AFPD 51-4, *Compliance with the Law of Armed Conflict*

AFPD 51-7, *International law*

AF Instruction (AFI) 10-212, *Air Base Operability*

AFI 10-216, *Evacuation and Repatriation of Air Force Family Members and Other US Non-Combatants*.

AFI 10-217, *Resource Augmentation Duty (READY) Program*

AFI 10-245, *Air Force Force Protection Standards*

AFI 10-400, *Aerospace Expeditionary Force Planning*

AFI 10-402, *Mobilization Planning*

AFI 10-403, *Deployment Planning*

AFI 10-404, *Base Support and Expeditionary Site Planning*

AFI 10-2501, *Full Spectrum Threat Response, Planning and Operations*

AFI 10-2601, *Counter Nuclear, Biological, and Chemical Operations (Draft)*

AFI 11-301V1, *Aircrew Life Support (ALS) Program*

AFI 11-303V3, *Aircrew Life Support (ALS) Combat Operations*

AFI 31-101, *The Air Force Installation Security Program*

AFI 31-301, *Air Base Defense*

AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*

AFI 33-202, *Computer Security*

AFI 33-115V1, *Network Management*

AFI 34-242, *Air Force Mortuary Affairs Program*

AFI 33-360V1, *Communications and Information*

AFI 36-2201, *Developing, Managing, and Conducting Training*

AFI 41-106, *Medical Readiness Planning and Training*

AFI 48-101, *Aerospace Medical Operations*

AFI 48-116, *Food Safety Program*

AFI 51-401, *Training and Reporting to Ensure Compliance with the Law of Armed Conflict*

AFI 51-701, *Negotiating, Concluding, Reporting, and Maintaining International Agreements*

AFI 51-703, *Foreign Criminal Jurisdiction*

AF Joint Instruction (AFJI) 31-304, *Enemy Prisoners of War, Retained Personnel, Civilian Internees and Other Detainees*

AFJI 51-706, *Status of Forces Policies, Procedures, and Information*

AF Manual (AFMAN) 10-100, *Airman's Manual*

AFMAN 10-222V14, *Defensive Fighting Position Construction*

AFMAN 23-110, US*AF Supply Manual, Volume 5, Air Force Medical Materiel Management System*

AFMAN 32-1038, *Military Construction Planning and Programming Manual*

AFMAN 32-1071V1, *Security Engineering Project Development*

AFMAN 32-1071V2, *Security Engineering Concept Design Manual*

AFMAN 32-1071V3, *Security Engineering Final Design Manual*

AFMAN 32-4002, *Hazardous Materials Emergency Response Planning*

AFMAN 32-4005, *Personal Protection and Attack Actions*

AFMAN 32-4006, *NBC Mask Fit and Liquid Hazard Stimulant Training*

AFMAN 32-4017, *Civil Engineer Readiness Technician's Manual for NBC Defense*

AFMAN (I) 44-156, *Treatment of Biological Warfare Agent Casualties*

AFMAN (I) 44-161, *Treatment of Radiological Casualties (Draft*)

AF Joint Manual (AFJMAN) 44-149, *Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries*

AFJMAN 44-151, *NATO Handbook on the Medical Aspects of NBC Defensive Operations Treatment*

AF Pamphlet (AFPAM) 10-219V2, *Pre-Attack and Pre-Disaster Preparation*

AFPAM 10-219V3, *Post-Attack and Post-Disaster Procedures*

AFPAM 32-1147(I), *Design and Analysis of Hardened Structures to Conventional Weapons Effects*

AF Handbook (AFH) 10-222V3, *Guide to Civil Engineer Force Protection*

AFH 10-222V4, *Environmental Guide for Contingency Operations*

AFH 10-222V14, *Guide to Fighting Positions, Obstacles, and Revetments*

AFH 10-2502, *Weapons of Mass Destruction Threat Planning and Response Handbook*

AFH 32-1084, *Air Force Standard Facility Requirements*

AFH 32-4014V4, *USAF Ability to Survive and Operate Procedures In A NBC Environment*

AFH 32-4016V1, *Civil Engineer Readiness Emergency Management Planning and Analysis Handbook*

AFH 36-2218V1 and V2, *Self-Aid and Buddy Care*

AF Tactics, Techniques and Procedures (Interservice) (AFTTP)(I) 3-2.24, *Multiservice Procedures for Joint Theater Missile Target Development*

AFTTP(I) 3-2.33, *Multiservice Procedures for NBC Defense of Theater Fixed Sites, Ports, and Airfields*

AF Tactics, Techniques, and Procedures (AFTTP) 3-42.1, *Medical Command and Control*

AFTTP 3-42.3, *Air Force Health Service Support in NBC Environments (Draft)*

AFTTP 3-42.8, *Medical Logistics and Blood Support Operations*

AF Visual Aid (AFVA) 10-2511, *USAF Standardized Attack Warning Signals for NBCC Medium and High Threat Areas.*

AFVA 10-2512, *Air Force Mission Oriented Protective Postures*

AFVA 32-4010, U*SAF Standardized Alarm Signals for the US and its Territories and Possessions*

AFVA 32-4022, *USAF Unexploded Ordnance Recognition and Reporting Chart*

Technical Order (T.O.) 00-20-5, *Aerospace Vehicle/Equipment Inspection and Documentation*

T.O. 00-35A-39, *Instructions for Procurement, Issue, User, and Maintenance of Medical Kits*

T.O. 11C15-1-3, *Chemical Warfare Decontamination, Detection and Disposal of Decontamination Agents*

T.O. 11H2-20-1, *Operator's Manual for the Chemical Agent Monitor (CAM)*

T.O. 14P3-1-131, *Operations and Maintenance Instruction with Illustrated Parts Breakdown Air Crew Chemical Defense Ensemble*

T.O. 14P3-1-141, *Groundcrew Chemical Defense Ensemble*

T.O. 14P3-1-151, *Operations and Maintenance Instruction with Parts Breakdown Air Crew I-Respiratory Protection (AERP) Equipment*

T.O. 14P3-1-181, *Joint-Firefighter Integrated Response Ensemble (J-FIRE)*

T.O. 14P4-9-31, *Mask, Protective Field, M17, M17A2, and Accessories*

T.O. 14P4-15-1, *Chemical-Biological Mask Type MCU-2/P*

HQ PACAF, *Proposed USAF Chemical Warfare Concept of Operations, Technical Report*

HQ AFCESA, *Protective Actions for a Hazardous Materials Release: A USAF Protective Actions Planning Guide For Individuals and Facility Managers*

HQ AMC, *Air Mobility Operations Chemical and Biological Environment (CB CONOPS)*

Threat Environment Projection: Chemical and Biological Warfare 2000-2021 (S)

USAF War and Mobilization Plan, Volume 1 (WMP-1)

US Army:

Field Manual (FM) 3-11, *Potential Military Chemical/Biological Agents and Compounds*, August 20019 (Draft)

FM 3.11.4, *Multiservice Procedures for NBC Protection (Draft)*

FM 8-10-7, *Health Service Support In a Nuclear, Biological, and Chemical Environment*

FM 8-33, *Control of Communicable Diseases Manual* (16th Edition)

Technical Report ERDEC-TR-520, *Applying Collective Protection to Existing Buildings at Osan and Kunsan AB Korea*

Technical Manual (TM) 3-4240-348-10, *Mask, Chemical-Biological, Land Warrior: M45*

Engineer Technical Letter (ETL) 1110-3-490, 13 May 98, *Design of Chemical Agent Collective Protection Shelters for New and Existing Facilities*

ETL 1110-3-498, 24 Feb 99, *Design of Collective Protection Shelters to Resist Chemical, Biological, and Radiological Agents*

United States Army Medical Research Institute of Infectious Diseases (USAMRIID) Textbook of Military Medicine, R. Zajtchuk (ed), Office of the Surgeon General, Department of the Army

Field Management of Chemical Casualties Handbook, Chemical Casualty Care Division, USAMRIID

Medical Aspects of Chemical and Biological Warfare, Part 1, 1997, Office of the Surgeon General, Department of the Army

Medical Management of Biological Casualties Handbook, Fourth Edition, Feb 2001, USAMRIID

Medical Management of Chemical Casualties Handbook, Chemical Casualty Care Division, USAMRIID

Medical Management of Radiological Casualties Handbook, First Edition, Dec 1999, Armed Forces Radiobiology Research Institute

Other:

National Institute for Occupational Safety and Health, *Pocket Guide to Chemical Hazards*

U.S. Department of Transportation, *North American Emergency Response Guidebook*

Control of Communicable Diseases in Man, A. Benenson (ed), American Public Health Association

Acronyms and Abbreviations

ABD—Air Base Defense

ACCA—Aircrew Contamination Control Area

ACDE—Aircrew Chemical Defense Equipment

ADAT—Airfield Damage Assessment Teams

AFDD—Air Force Doctrine Document

AFMAN—Air Force Manual

AFRC—Air Force Reserve Command

AFOSI—Air Force Office of Special Investigations

AFS—Air Force Specialty

AFTTP(I)—Air Force Tactics, Techniques and Procedures (Interservice)

ALS—Aircrew Life Support

AMC—Air Mobility Command

ANG—Air National Guard

AOR—Area of Responsibility

ASC—Allowance Source Code

ASF—Aeromedical Staging Facility

AT/FP—Anti-Terrorism/Force Protection

ATC—Air Traffic Control

ATC—Air Transportable Clinic

ATP—Allied Tactical Publication

BDO—Battle Dress Overgarment

BDOC—Base Defense Operations Center

BDU—Battle Dress Uniform

BEE—Bio Environmental Engineer

BTB—Believed-to-Be

BW—Biological Warfare

C2—Command and Control

C4I—Command, Control, Communications, Computers, and Intelligence

C4ISR—Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance

CAM—Chemical Agent Monitor

CAPS™—Contaminant Air Processing System™

CARC—Chemical Agent Resistant Coating

CB—Chemical-Biological

CBRNE—Chemical, Biological, Radiological, Nuclear and High-Yield Explosive

CCA—Contamination Control Area

CCD—Camouflage, Concealment, and Deception

CCP—Casualty Collection Point

CCT—Contamination Control Team

CE—Civil Engineer

CFETP—Career Field Education and Training Plan

cfm—Cubic Feet Per Minute

CHA—Contact Hazard Area

C-NBC—Counter Nuclear, Biological, and Chemical

COA—Course of Action

CONOPS—Concept of Operations

CONUS—Continental United States

COTS—Commercial Off the Shelf

CPO—Chemical Protective Overgarment

CRAF—Civil Reserve Air Fleet

CSS—Contingency Staff Support

CV—Conventional

CW—Chemical Warfare

DFP—Defensive Fighting Position

DNBI—disease and non-battle injuries

DoD—Department of Defense

DODI—Department of Defense Instruction

DOS—Department of State

EAF—Expeditionary Aerospace Force

ECP—Entry and Exit Control Points

ECS—Environmental Control System

EMP—Electromagnetic Pulse

EMEDS—Expeditionary Medical Support

EMIS—Emergency Management Information System

EOD—Explosive Ordnance Disposal

EOR—End of Runway

EPW—Enemy Prisoner of War

FAM—Functional Area Manager

FOL—Forward Operating Location

FPCONs—Force Protection Conditions

FSTR—Full Spectrum Threat Response

GCE—Groundcrew Chemical Ensemble

GEMS—Global Expeditionary Medical System

GOTS—Government Off the Shelf

GRL—Global Reach Laydown

HAS—Hardened Aircraft Shelter

HD—Distilled Mustard

HN—Host Nation

HNS—Host Nation Support

HPAC—Hazard Prediction and Assessment Capability

HQ—Headquarters

HTA—High Threat Area

HTH—High Test Hypochlorite

HVAC—Heating, Ventilating, and Air Conditioning

ICt_{50}—Median Incapacitating Dosage (of a Vapor or Aerosol)

IDMT—Independent Duty Medical Technician

IPE—Individual Protective Equipment

JFC—Joint Force Commander

J-FIRE—Joint-Firefighter Integrated Response Ensemble

JP—Joint Publication

JRAC—Joint Rear Area Coordinator

JRA—Joint Rear Area

JSLIST—Joint Service Lightweight Integrated Suit Technology

JWARN—Joint Warning and Reporting Network

kph—Kilometers Per Hour

LCt_{50}—Median Lethal Dosage (of a Vapor or Aerosol)

LD_{50}—Median Lethal Dosage (of Liquid Agent)

LFA—Large Frame Aircraft

LTA—Low Threat Area

MADCP—Mortuary Affairs Decontamination Collection Point

MAJCOM—Major Command

MC&A—Maintenance Control and Analysis

MCP—Mortuary Collection Point

MEL—Minimum Essential Level

MFST—Mobile Field Surgical Team

$mg\text{-}min/m^3$—Milligram-Minutes Per Cubic Meter

MOC—Maintenance Operations Center

MOOTW—Military Operations Other Than War

MOPP—Mission-Oriented Protective Posture

MOS—Minimum Operating Strip

MRE—Meal, Ready to Eat

m/s—Meters Per Second

MTA—Medium Threat Area

MTF—Medical Treatment Facility

MWD—Military Working Dog

NATO—North Atlantic Treaty Organization

NBC—Nuclear, Biological, and Chemical

NBCA—Nuclear, Biological, and Chemical Analysis

NBCC—Nuclear, Biological, Chemical, and Conventional

NBCWRS—Nuclear, Biological, and Chemical Warning and Reporting System

NEW—Net Explosive Weight

OCONUS—Outside the Continental United States

OG—Overgarment

OLVIMS—On-Line Vehicle Interactive Management System

OPLAN—Operation Plan

PAM—Preventive Aerospace Medicine

PAR—Post Attack Response

POL—Petroleum, Oil, and Lubricants

psi—Per Square Inch

READY—Resource Augmentation Duty Program

RED HORSE—Rapid Engineers Deployable Heavy Operations Repair Squadron Engineers

RDD—Radiological Dispersal Device

RWR—Radar Warning Receiver

SABC—Self-Aid and Buddy Care

SALUTE—Size, Activity, Location, Unit, Time, and Equipment

SBCCOM—US Army Soldier and Biological Chemical Command

SCUD—Surface-to-Surface Missile System

SME—Squadron Medical Element

SLUD—Salivation, Lacrimation, Urination, and Defecation

SMT—Shelter Management Team

SOF—Special Operations Forces

SOP—Standing Operating Procedure

SPEARR—Small Portable Expeditionary Aeromedical Rapid Response Team

SPOD—Sea Port of Debarkation

S&R—Search and Recovery

SRC—Survival Recovery Center

SRCC—Supply Readiness Control Center

STANAG—Standardization Agreement (NATO term)

STB—Supertropical Bleach

STEP—Stepping to Fly

TBM—Theater Ballistic Missile

TDY—Temporary Duty

TEL—Transporter-Erector-Launcher

TFA—Toxic-Free Area

TIM—Toxic Industrial Material

TM—Technical Manual (United States Army)

TNT—Trinitrotoluene

T.O.—Technical Order

TOW—Tube-Launched, Optically-Tracked, Wire-Guided

TPFDD—Time-Phased Force and Deployment Data

TQT—Task Qualification Training

TRANSCOM—United States Transportation Command

TTP—Tactics, Techniques, and Procedures

UAV—Unmanned Aerial Vehicle

UCC—Unit Control Center

UGR—Unitized Group Rations

US—United States

USAF—United States Air Force

USAMRIID—United States Army Medical Research Institute of Infectious Diseases

USARIEM—United States Army Research Institute of Environmental Medicine

UTC—Unit Type Code

UV—ultraviolet

UXO—Unexploded Ordnance

VHA—Vapor Hazard Area

VLSTRACK—Vapor Liquid Solid Tracking

WBGT—Wet Bulb Globe Temperature

WOC—Wing Operations Center

WMD—Weapons of Mass Destruction

WMDT—Wartime Patient Decontamination Team

WMP—War and Mobilization Plan

Terms

Acclimatization—The physiological adjustment by an individual to environmental change.

Aerosol—A liquid or solid composed of finely divided particles suspended in a gaseous medium. Examples of common aerosols are mist, fog, and smoke. (JP 3-11, this term and its definition are approved for inclusion in the next edition of JP 1-02.)

Antiterrorism (AT)—Defensive measures used to reduce the vulnerability of individuals and property to terrorist acts, to include limited response and containment by local military forces. Also called AT. (JP 1-02)

Allied Tactical Publication-45B (ATP-45(B))—NATO document that prescribes Joint NBC procedures regarding prediction and warning of hazard areas, reporting of all NBC attacks and the resulting contamination, and the interchange of reports between NATO, and national military and civilian personnel and agencies. (ATP-45B)

Area of Responsibility—1. The geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations. 2. In naval usage, a predefined area of enemy terrain which supporting ships are responsible for covering by fire on known targets or targets of opportunity and by observation. Also called AOR. (JP 1-02)

Base Defense Forces—Troops assigned or attached to a base for the primary purpose of base defense and security, and augmentees and selectively armed personnel available to the base commander for base defense from units performing primary missions other than base defense. (JP 1-02)

Base Defense Operations Center (BDOC)—A command and control facility established by the base commander to serve as the focal point for base security and defense. It plans, directs, integrates, coordinates, and controls all base defense efforts. It also coordinates and integrates into area security operations with the rear area operations center/rear tactical operations center. (JP 1-02)

Battledress Overgarment (BDO)—Specific reference to the camouflage (woodland green or desert pattern) overgarment coat and trousers. (T.O. 14P3-1-141)

Biological Agent—A microorganism that causes disease in personnel, plants, or animals, or causes the deterioration of materiel. (JP 1-02)

Chemical Agent—Any toxic chemical intended for use in military operations. (JP 3-11, this term and its definition modify the existing term and its definition and are approved for inclusion in the next edition of JP 1-02)

Chemical Protective Overgarment (CPO)—Specific reference to the Joint Service Lightweight Integrated Suit Technology Chemical Protective Overgarment. (T.O. 14P3-1-141)

Collective Nuclear, Biological, and Chemical Protection—Protection provided to a group of individuals in a nuclear, biological, and chemical environment that permits relaxation of individual nuclear, biological, and chemical protection. Also referred to as collective protection. (JP 1-02).

Contingency—An emergency involving military forces caused by natural disasters, terrorists, subversives, or by required military operations. Due to the uncertainty of the situation, contingencies require plans, rapid response, and special procedures to ensure the safety and readiness of personnel, installations, and equipment. (JP 1-02)

Contamination—1. The deposit and/or absorption of radioactive material or biological or chemical agents on and by structures, areas, personnel, or objects. 2. Food and/or water made unfit for consumption by humans or animals because of the presence of environmental chemicals, radioactive elements, bacteria, or organisms. 3. The by-product of the growth of bacteria or organisms in decomposing material (including food substances) or waste in food or water. (JP 1-02)

Contingency Support Staff (CSS)—A command and control element of the command post. It consists of the commander and designated staff members and is interchangeable with the survival recovery center.

Control Center—A unit command and control function. Control centers monitor unit resources and mission capability, and coordinate unit activities during disaster operations. Also called unit control centers. (AFI 10-2501)

Conventional Weapon—A weapon which is neither nuclear, biological, nor chemical. (JP 1-02)

Course of Action (COA)—1. Any sequence of activities that an individual or unit may follow. 2. A possible plan open to an individual or commander that would accomplish, or is related to the accomplishment of the mission. 3. The scheme adopted to accomplish a job or mission. 4. A line of conduct in an engagement. 5. A product of the Joint Operation Planning and Execution System concept development phase. Also called COA. (JP 1-02)

Cruise Missile—Guided missile, the major portion of whose flight path to its target is conducted at approximately constant velocity and depends on the dynamic reaction of air for lift and upon propulsion forces to balance drags.

Decontamination—The process of making any person, object or area safe by absorbing, destroying, neutralizing, making harmless, or removing chemical or biological agents, or by removing radioactive material clinging to or around it. (JP 1-02)

Dispersal—Relocation of forces for the purpose of increasing survivability. (JP 1-02)

Dispersion—1. A scattered pattern of hits around the mean point of impact of bombs and projectiles dropped or fired under identical conditions. 2. In antiaircraft gunnery, the scattering of shots in range and deflection about the mean point of explosion. 3. The spreading or separating of troops, materiel, establishments, or activities which are usually concentrated in limited areas to reduce vulnerability. 4. In chemical and biological operations, the dissemination of agents in liquid or aerosol forms. 5. In airdrop operations, the scatter of personnel and/or cargo on the drop zone. 6. In naval control of shipping, the

reberthing of a ship in the periphery of the port area or in the vicinity of the port for its own protection in order to minimize the risk of damage from attack. (JP 1-02)

Electromagnetic Pulse (EMP)—The electromagnetic radiation from a strong electronic pulse, most commonly caused by a nuclear explosion that may couple with electrical or electronic systems to produce damaging current and voltage surges. (JP 1-02)

Evacuation—1. The process of moving any person who is wounded, injured, or ill to and/or between medical treatment facilities. 2. The clearance of personnel, animals, or materiel from a given locality. 3. The controlled process of collecting, classifying, and shipping unserviceable or abandoned materiel, United States and foreign, to appropriate reclamation, maintenance, technical intelligence, or disposal facilities. (JP 1-02)

Field Gear—Individual equipment that supports operations in NBCC environments. It includes a web belt, canteen with M1 canteen cap, and helmet. It also includes additional field gear, such as personal body armor and load carrying equipment and accessories, if issued. (AFI 10-2501)

Fixed Site—Developed real estate (facilities and supporting equipment) required to accomplish an operational mission; for example: C4I, SPOD, and APOD sites; ammunition storage points/depots; hospitals; supply depots; maintenance sites; bridges. Fixed sites can be further categorized as permanently or operationally fixed. (Proposed in JP 3-11 revision and FM 3-4-1)

Full Spectrum Threat Response (FSTR)—A cross-functional program that integrates procedures and standards for planning, logistical requirements, emergency response actions, exercises and evaluation, training of personnel, detection, identification, and warning, notification, and enemy attack actions. It establishes responsibilities, procedures and standards for Air Force consequence management, which includes mitigation and emergency response to major accidents, natural disasters, WMD, and wartime passive defense actions. (AFDD 10-25)

Full Spectrum Threat Response (FSTR) Plan 10-2—Previously titled Disaster Preparedness OPLAN 32-1. The plan provides comprehensive guidance for response to NBCC attacks, major accidents, natural disasters, and terrorist use of WMD and will list key actions that the commander or units are to accomplish based on conditions or events that may affect the installation. (AFI 10-2501)

Groundcrew Chemical Ensemble (GCE)—A whole body protective system that includes a protective mask (MCU-2 series, M45, or M17A2), a second skin (only applies if issued the MCU-2 series or M45), C2 series canister or filter set, hood (only applies if issued the BDO), overgarment, protective gloves with cotton inserts, and footwear covers or overboots. It also includes a booklet of M8 Paper, a roll of M9 Paper, and an M291 and M295 Decontamination Kit. (AFI 10-2501 and T.O. 14P4-1-141)

Host Nation (HN)—A nation which receives the forces and/or supplies of allied nations and/or NATO organizations to be located on, to operate in, or to transit through its territory. (JP 1-02)

Host-Nation Support—Civil and/or military assistance rendered by a nation to foreign forces within its territory during peacetime, crises, emergencies, or war based on agreements mutually concluded between nations. (JP 1-02)

Immediate Decontamination—Decontamination carried out by individuals immediately upon becoming contaminated. It is performed in an effort to minimize casualties, save lives, and limit the spread of contamination. Also called emergency decontamination. (JP 1-02)

Intelligence—The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign countries or areas. 2. Information and knowledge about an adversary obtained through observation, investigation, analysis, or understanding. (JP 1-02)

Individual Protective Equipment (IPE)—1. In nuclear, biological, and chemical warfare, the personal clothing and equipment required to protect an individual from biological and chemical hazards and some nuclear effects. (JP 1-02) 2. For Air Force units, this includes the groundcrew chemical ensemble or specialized equipment such as the J-FIRE, and field gear. (AFI 10-2501)

Joint-Firefighter Integrated Response Ensemble (J-FIRE)—This ensemble includes the firefighter Interspiro protective mask, canisters, hood, chemical protective overgarment, protective gloves with glove inserts, and footwear covers. In addition, fire protective clothing, such as the proximity suit and fire boots, are worn over the overgarment to provide fire protection capability. (T.O. 14P3-1-181)

Joint Rear Area Coordinator (JRAC)—The officer with responsibility for coordinating the overall security of the joint rear area in accordance with joint force commander directives and priorities in order to assist in providing a secure environment to facilitate sustainment, host nation support, infrastructure development, and movements of the joint force. The joint rear area coordinator also coordinates intelligence support and ensures that area management is practiced with due consideration for security requirements. Also called JRAC. (JP 1-02)

Joint Rear Area (JRA)—A specific land area within a joint force commander's operational area designated to facilitate protection and operation of installations and forces supporting the joint force. (JP 1-02)

MCt50—The product of concentration of the agent times the length of exposure time to the agent which causes miosis (pupil constriction) or eye irritation in 50% of the exposed population. (AFIERA)

Median Lethal Dosage (LD50) (of a Liquid Agent)—LD_{50} is the liquid dose which produces death in 50% of the exposed population. (AFIERA)

Median Lethal Dosage (LCt50) (of a Vapor or Aerosol)—LCt_{50} is the product of concentration of the agent times the length of exposure time to the agent that causes lethal casualties in 50% of the exposed population. (AFIERA)

Median Incapacitating Dosage (ICt50) (of a Vapor or Aerosol)—ICt_{50} is the product of concentration of the agent times the length of exposure time the agent which causes non-lethal incapacitation casualties in 50% of the exposed population. (AFIERA)

Medical Intelligence—That category of intelligence resulting from collection, evaluation, analysis, and interpretation of foreign medical, bio-scientific, and environmental information which is of interest to strategic planning and to military medical planning and operations for the conservation of the fighting strength of friendly forces and the formation of assessments of foreign medical capabilities in both military and civilian sectors.

Mission-Oriented Protective Posture (MOPP)—A flexible system of protection against nuclear, biological, and chemical contamination. This posture requires personnel to wear only that protective clothing and equipment (mission-oriented protective posture gear) appropriate to the threat level, work rate imposed by the mission, temperature, and humidity. Also called MOPP. (JP 1-02)

MOPP-Ready—This condition applies to US Army and US Marine Corps forces only. When operating as part of a joint or combined force, Air Force units that are directed to assume MOPP Ready will assume MOPP 0. For US Army and US Marine Corps personnel, MOPP Ready requires them to carry their protective masks with their load carrying equipment. The individual's MOPP gear is labeled and stored no further back than a logistics site, such as the brigade support area, and is ready to be brought forward to the individual when needed. Pushing MOPP gear forward should not exceed two hours. Units in MOPP Ready are highly vulnerable to persistent agent attacks and will automatically upgrade to MOPP Zero when they determine, or are notified, that NBC weapons have been used or that the threat for use of NBC weapons has risen. When a unit is at MOPP Ready, personnel will have field-expedient items such as wet weather gear identified for use in the event of an unanticipated NBC attack. (FM 3-11.4 (Draft))

Noncombatant Evacuation Operations—Operations directed by the Department of State, the Department of Defense, or other appropriate authority whereby noncombatants are evacuated from foreign countries when their lives are endangered by war, civil unrest, or natural disaster to safe havens or to the United States. (JP 1-02)

Notional—Speculative or theoretical.

Nuclear, Biological, and Chemical Environment—Environments in which there is deliberate or accidental employment, or threat of employment, of nuclear, biological, or chemical weapons; deliberate or accidental attacks or contamination with toxic industrial materials, including toxic industrial chemicals; or deliberate or accidental attacks or contamination with radiological (radioactive) materials. (JP 1-02)

Operational Decontamination—Decontamination carried out by an individual and/or a unit, restricted to specific parts of operationally essential equipment, materiel and/or working areas, in order to minimize contact and transfer hazards and to sustain operations. This may include decontamination of the individual beyond the scope of immediate decontamination as well as decontamination of mission-essential spares and limited terrain decontamination. (JP 1-02)

Overgarment (OG)—A generic term used to reference the chemical protective overgarment (CPO) and battledress overgarment (BDO). (T.O. 14P3-1-141)

Physical Security—That part of security concerned with physical measures designed to safeguard personnel; to prevent unauthorized access to equipment, installations, material and documents; and to safeguard them against espionage, sabotage, damage, and theft. (JP 1-02)

Presumptive Identification—The identification process using aerosol samples collected in a liquid medium to detect unique chemical antibody markers to determine the presence of a specific antigen (e.g., BW agent).

Release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles) of any hazardous chemical, extremely hazardous substance, or toxic chemical.

Retained Personnel—Enemy personnel who come within any of the categories below are eligible to be certified as retained personnel.

a. Medical personnel exclusively engaged in the: (1) Search for collection, transport, or treatment of the wounded or sick; (2) Prevention of disease; and/or (3) Staff administration of medical units and establishments exclusively.

b. Chaplains attached to enemy armed forces.

c. Staff of national Red Cross societies and other voluntary aid societies duly recognized and authorized by their governments. The staffs of such societies must be subject to military laws and regulations. (JP 1-02)

Retrograde Cargo—Cargo evacuated from a theater. (JP 1-02)

Second Skin—The second skin is an accessory for the MCU-2 series and M45 protective mask. It provides additional liquid agent protection for the protective mask face blank material and is compatible with the JSLIST overgarment hood. Second skins are issued in three sizes: extra small/small, medium and large. (TM 3-4240-348-20&P)

Security—1. Measures taken by a military unit, activity, or installation to protect itself against all acts designed to impair its effectiveness. 2. A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences. 3. With respect to classified matter, it is the condition that prevents unauthorized persons from having access to official information that is safeguarded in the interests of national security. (JP 1-02)

Split-MOPP—A tactic that divides an airbase or operating location into two or more sectors or zones to enable a commander to tailor mission oriented protective posture (MOPP) levels and alarm conditions within each sector to reflect the current hazard and mission priorities within that area.

Tactical Level of War—The level of war at which battles and engagements are planned and executed to accomplish military objectives assigned to tactical units or task forces. Activities at this level focus on the ordered arrangement and maneuver of combat elements in relation to each other and to the enemy to achieve combat objectives. (JP 1-02)

Tactics, Techniques, and Procedures (TTP)—Applies basic and operational doctrine to military actions by describing the proper use of specific weapons systems or detailed tactics, techniques, and procedures to accomplish specific military operations. (AFI 33-360V1)

Terrorist—An individual who uses violence, terror, and intimidation to achieve a result. (JP 1-02)

Theater Ballistic Missile (TBM)—A missile that does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated.

Thorough Decontamination—Decontamination carried out by a unit, with or without external support, to reduce contamination on personnel, equipment, materiel, and/or working areas equal to natural background or to the lowest possible levels, to permit the partial or total removal of individual protective equipment and to maintain operations with minimum degradation. This may include terrain decontamination beyond the scope of operational decontamination. (JP 1-02)

Time-Phased Force and Deployment Data (TPFDD)—The Joint Operation Planning and Execution System data base portion of an operation plan; it contains time-phased force data, non-unit-related cargo and personnel data, and movement data for the operation plan, including in-place units, units to be deployed to support the operation plan with a priority indicating the desired sequence for their arrival at the port of debarkation, routing of forces to be deployed, movement data associated with deploying forces, estimates of non-unit-related cargo and personnel movements to be conducted concurrently with the deployment of forces, and estimate of transportation requirements that must be fulfilled by common-user lift resources, as well as those requirements that can be fulfilled by assigned or attached transportation resources. Also called TPFDD. (JP 1-02)

Toxins—Poisonous substances produced by living organisms. A toxin is a toxic substance that can be produced by an animal, plant or microbe. Some toxins can also be produced by molecular biologic techniques (protein toxins) or by chemical synthesis (low molecular weight toxins).

Unit Control Center (UCC)—See control center.

Weapons of Mass Destruction (WMD)—Weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Weapons of mass destruction can be high explosives or nuclear, biological, chemical or radiological weapons, but exclude the means of transporting or propelling the weapons where such means is a separable and divisible part of the weapons. (JP 1-02)

Attachment 2

NBCC WEAPONS CHARACTERISTICS

A2.1. Overview . This attachment provides a basic reference for NBCC weapon effects and characteristics. It also covers threats from an accidental or deliberate release of TIM. Although there are significant differences between NBC weapons and TIM, a common concern is that many substances in each category are airborne hazards and may leave some degree of residual contamination that is hazardous to humans. The mechanisms for dissemination of NBC contamination are somewhat different. For example, nuclear weapons must undergo a low- or high-order nuclear detonation to produce radioactive contamination that exceeds the radioactive source within the weapon. Biological and chemical weapons are disseminated either through low-order detonations or by employing some other form of release mechanism to discharge the agent without destroying it. TIM considerations are primarily for an accidental release but the potential for a deliberate release, such as from a terrorist attack, is a realistic possibility. For expanded information, refer to the publications and technical data references provided within each section or contact the CE Readiness and Medical technicians.

A2.2. Nuclear and Radiological Weapons:

A2.2.1. Introduction:

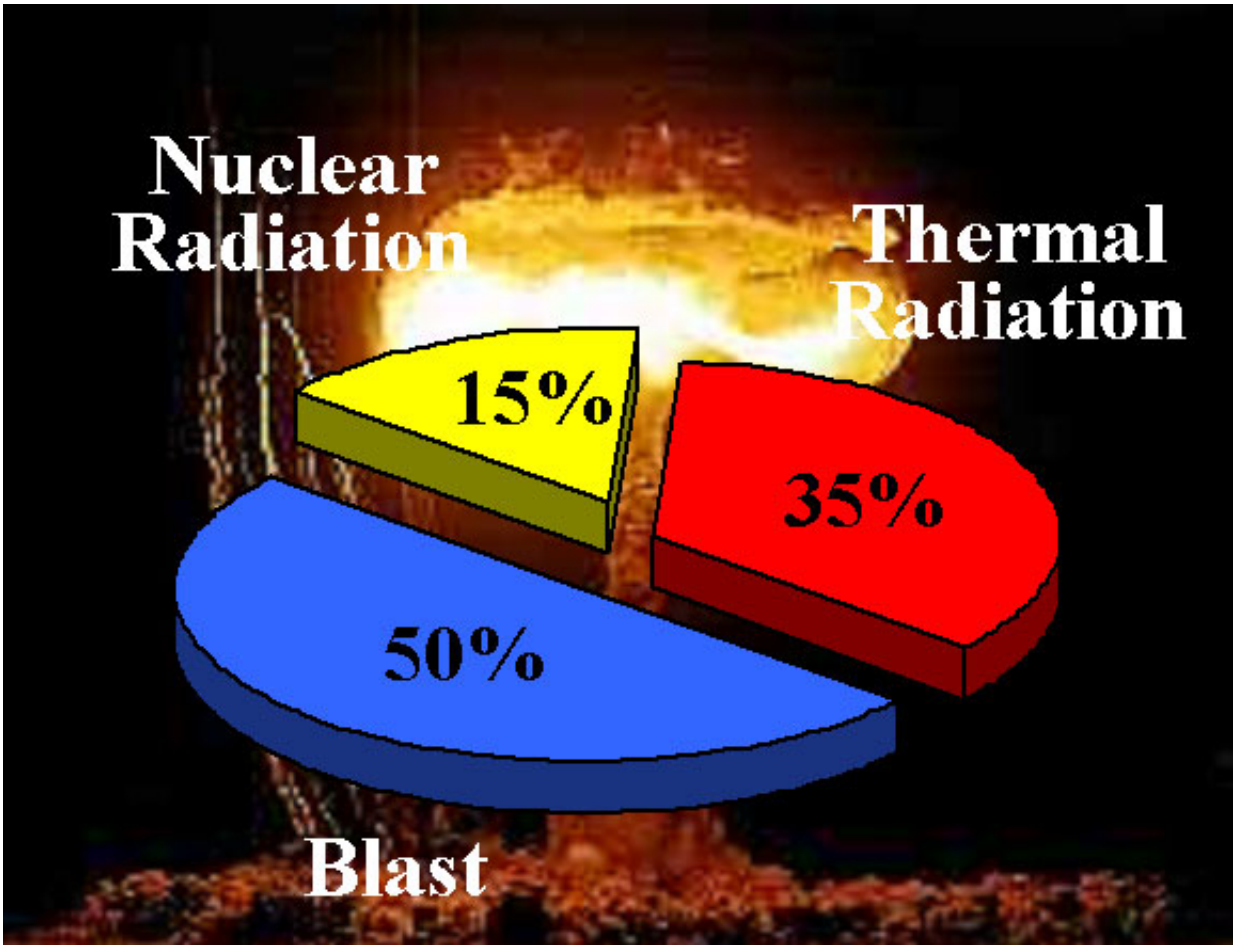
A2.2.1.1. Nuclear weapons have an enormous potential for physical damage. Even the simplest of these devices can destroy or damage major portions of a city or, if used in a different manner, could greatly impair the communications and electronics infrastructure of a large area. Logistics centers, such as airfields and ports, are especially vulnerable because of their value as reinforcement points. Military forces in or deployable to areas with a nuclear-capable adversary must also take precautionary measures and develop plans to mitigate the effects and recover from the results of a nuclear detonation. For additional information on nuclear weapons effects, consult *The Effects of Nuclear Weapons.*

A2.2.1.2. A radiation dispersal device (RDD) is any device that causes the purposeful dissemination of radioactive material across an area without a nuclear detonation. An RDD could function as either a terror weapon or terrain-denial mechanism. Such a weapon can be easily developed and used by any combatant with conventional weapons and access to radioactive material. The material dispersed can originate from any location that uses radioactive sources. Examples include a nuclear waste processor or storage facility, nuclear power plant, university research facility, medical radiotherapy clinic, nuclear weapon storage area, or an industrial complex. An RDD functions by using conventional explosives to blow up and scatter the radioactive source debris across the targeted area. Conventional explosives could be placed with the radioactive source by terrorist or SOF forces or deliberately targeted by enemy artillery, rockets, or bombs. This type of weapon may also cause conventional casualties to become contaminated with radioactive material and would complicate rescue, medical evacuation, and recovery actions within the contaminated area.

A2.2.1.3. Significant amounts of radioactive material may be deposited on surfaces after the use of any nuclear weapon or RDD. Military operations in these contaminated areas will require an evaluation of potential hazards and may require mission-degrading protective actions. Operations could result in military personnel receiving sufficient radiation exposure or contact with particulate contamination to warrant medical evaluation and remediation.

A2.2.2. Nuclear Weapons. Nuclear weapons cause damage and destruction mainly from blast or shock. Their relative effect is largely determined by the yield (strength) of the warhead and the altitude at which the warhead detonates. Blast, thermal radiation (heat), and nuclear radiation energy are released from a nuclear detonation. **Figure A2.1.** shows the approximate percentage of the energy released.

Figure A2.1. Energy Released From a Nuclear Detonation.



A2.2.3. Weapon Effects. The yield of a nuclear weapon is measured by the amount of explosive energy it can produce. The usual practice is to state the nuclear yield in terms of the quantity of Trinitrotoluene (TNT) that would generate the same amount of blast energy when it explodes. For example, a 1-kiloton (a kiloton equals 1,000 tons) nuclear weapon is one that produces the same amount of energy, as does 1 kiloton of TNT.

A2.2.3.1. Blast. The blast effect occurs very quickly following detonation and will cause significant amounts of damage and personal injury. The force of the blast can be much greater than any force experienced in the strongest hurricane. Unprotected individuals in open areas can be seriously injured or killed by flying debris or by being blown by the force of the blast into other objects. Lung damage and eardrum ruptures are likely.

A2.2.3.2. Heat. Heat injuries result from direct thermal absorption of thermal energy. Injuries also result from indirect causes such as flash fires, burning structures, and vegetation. Thermal radiation travels in a straight line from the center of the detonation. Consequently, barriers provide the best protection. Any solid, opaque material, such as a wall, hill, or tree, will act as a shield and provide some level of protection from thermal radiation.

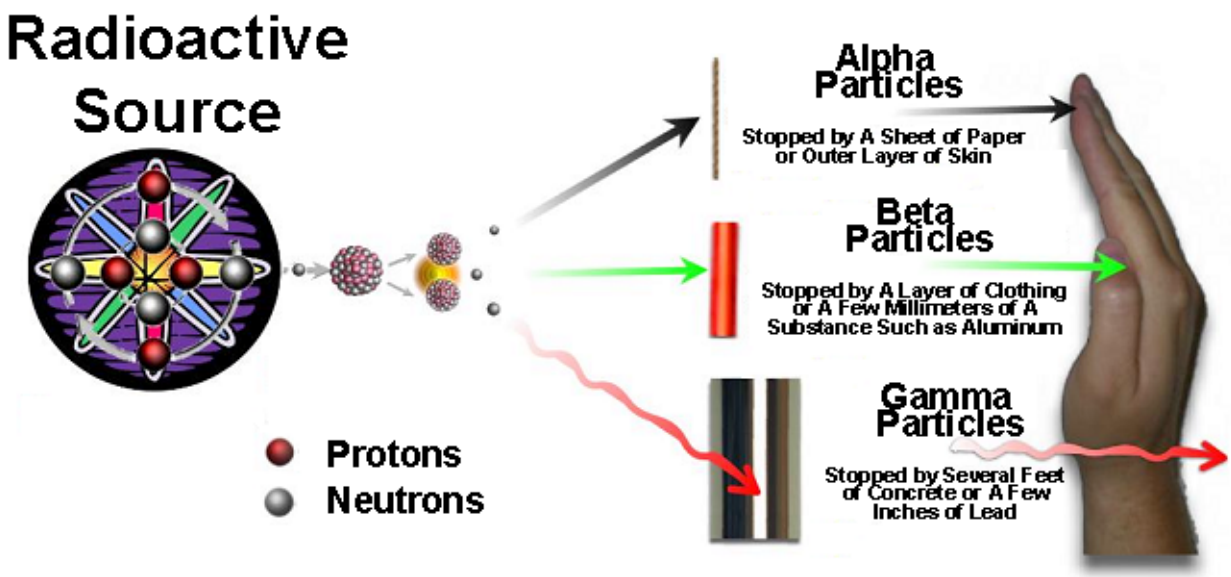
A2.2.3.3. Nuclear Radiation. The radiation effects of a nuclear weapon include nuclear (**Figure A2.2.**) and electromagnetic energy. Nuclear radiation is categorized as either initial or residual. The initial radiation is produced within a minute or so of the explosion. Residual radiation, also referred to as delayed fallout, occurs over a period of time. Fallout is composed of radioactive particles from the bomb and material from the surface of the earth is carried into the air by the explosion. The larger particles return to earth within 24 hours, but the smaller dust particles take several months to fall. When fallout occurs, radioactive material may enter the body through inhalation, ingestion, or absorption. Radiation sickness can result from a single exposure to high-energy radiation, exposure to high-levels of fallout, or from repeated exposures to both. In most circumstances, exposure to gamma radiation from early fallout will represent the major external hazard from a nuclear detonation. Other hazards include the presence of radioactive material on or in exposed sources, such as food and water. The types of ionizing radiation are described below.

A2.2.3.3.1. Alpha. Alpha particles are charged particles that are about four times the mass of a neutron. Because of their size, alpha particles cannot travel far and are stopped by the dead layers of the skin or by a uniform. Alpha particles are a negligible external hazard, but when they are emitted from an internalized source, they can cause significant cellular damage in the region immediately adjacent to their physical location.

A2.2.3.3.2. Beta. 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, beta particles can damage the skin and produce a “beta burn” that can appear similar to a thermal burn.

A2.2.3.3.3. Gamma. Gamma rays, emitted during a nuclear detonation and from fallout, are uncharged radiation similar to X rays. They are highly energetic and pass easily through most materials. Because of their high penetration ability, exposure to a gamma radiation source can result in whole-body exposure.

Figure A2.2. Nuclear Weapon Radiation Hazards.



A2.2.3.3.4. Neutrons. Neutrons, like gamma rays, are uncharged, are only emitted only during the nuclear detonation, and do not present a fallout hazard. Compared to gamma rays, neutrons can cause 20 times more damage to tissue.

A2.2.3.4. Electromagnetic Pulse (EMP). A sharp pulse of radio-frequency electromagnetic radiation is produced when a nuclear detonation occurs, especially when the detonation is at or near the earth's surface or at high altitudes. This strong electronic pulse may couple with electrical or electronic systems to produce current and voltage surges that can damage unprotected electrical and electronic equipment.

A2.2.4. Terms and Radiation Units of Measurement. The radiation absorbed dose (rad) is a measure of the energy deposited in matter by ionizing radiation. This terminology is being replaced by the International System Skin Dose Unit for Radiation Absorbed Dose, the gray (Gy). The dose in Gy is a measure of the absorbed dose in any material. The Gy is not restricted to any specific radiation, but can be used for all forms of ionizing radiation. Dose means the total amount of energy absorbed per gram of tissue. The exposure could be single or multiple and either short or long in duration. Dose rate is the dose of radiation per unit of time. Free-in-air dose refers to the radiation measured in air at a certain point. Free-in-air dose is exceedingly easy to measure with current field instruments. Military tactical dosimeters measure free-in-air doses. Different radiation types have more effects as their energy is absorbed in tissue. This difference is adjusted by the use of a quality factor (QF). The dose in rads times the QF yields the rem, or radiation equivalent man. The international unit for this radiation equivalency is the sievert (Sv). The sievert is used when estimating long-term risks of radiation injury. Since the QF for gamma radiation = 1, then for gamma radiation: 100 rad = 100 cGy = 1000 mGy = 1 Gy = 1 Sv = 100 rem.

A2.2.5. Nuclear Detonation Types:

A2.2.5.1. High Altitude. A high altitude detonation, or burst, occurs at an altitude greater than 30,000 meters or about 100,000 feet above surface level. A high energy electromagnetic pulse

(EMP) is produced that can damage electrical, solid state, and unprotected electronic components. Wide-ranging communications interruptions may result and last for many hours. The light or "flash" from the weapon's fireball may produce eye injuries to personnel witnessing the burst even though they are many miles away.

A2.2.5.2. Air. An air burst occurs at an altitude below 30,000 meters, but its fireball does not contact the earth's surface. The fireball and blast will destroy nearly all unhardened structures and military equipment at ground zero. Further out, some of the greatest damage will be from secondary fires. Little or no fallout is generated by an airburst. While the fireball is still glowing, a tremendous amount of radioactive energy is released. The blast destroys buildings, overturns vehicles, shatters glass, and can splinter wood creating a lethal shower of debris for anyone caught in its path. The blast wave can cause broken bones, head trauma, or internal injuries with a high potential for sudden death.

A2.2.5.3. Surface.

A2.2.5.3.1. A surface burst warhead detonates on or slightly above the surface of the earth. The fireball will actually touch the surface of land or water. On land, the detonation forms a large crater and carries tons of earth and debris into the air and forms the characteristic mushroom-shaped cloud. The cloud from a surface burst over land will be black or very dark. Over water, the cloud color is almost white. The heaviest amount of fallout occurs within 24 hours in the immediate area of ground zero (the point of detonation). Lighter fallout, in the form of a radioactive cloud, creates a residual radiation hazard, or footprint, that can extend hundreds of kilometers downwind. Airbases within the downwind footprint of a surface burst must take protective actions appropriate for the threat. This includes actions to limit personnel exposure to radiation or the evacuation of personnel and equipment to safer locations.

A2.2.5.3.2. **Table A2.1.** provides an estimate of the downwind radiation hazards resulting from different sized nuclear weapon detonations (in kilotons). One kiloton equals the explosive energy of 1000 tons of Trinitrotoluene (TNT). These estimates are for planning purposes and subject to change based upon variables such as environmental conditions and height of weapon detonation. Within Zone I, exposed, unprotected personnel may receive 150 centigrays of radiation or greater in 4 hours or less after the arrival of fallout. Zone II is the area of secondary hazard. The total dose of radiation received by exposed, unprotected personnel within Zone II is not expected to reach 150 centigrays within a period of 4 hours after the arrival of fallout. However, personnel in Zone II may receive a total dose of 50 centigrays or greater within the first 24 hours after the arrival of fallout. Outside of the two prediction zones, exposed, unprotected personnel may receive a total dose of 50 centigrays in the first 24 hours after the arrival of fallout.

A2.2.5.4. Subsurface. A subsurface burst occurs beneath the surface of land or water. Cratering will generally result. If the fireball does not penetrate above the surface, the primary hazard is from the heavy ground or water shock. If the burst is shallow enough to vent to the surface, then blast, heat, ground shock, and very heavy local radioactive fallout will be present.

A2.2.6. Protection.

A2.2.6.1. Principles. The three principal means of protection against nuclear weapon effects are time, distance, and shielding. Situational actions that employ the best elements of these principals provide the best available protection. Civil Engineer NBC Reconnaissance teams provide the air-

base with radiation detection and measurement capabilities and recommends protective actions. Medical forces provide the capability to quantify individual or group radiation exposure using dosimeters and to advise the commander and staff on health related issues.

Table A2.1. Nuclear Weapon Detonation Downwind Radioactive Fallout Hazard Estimate.

Weapon Yield (In Kilotons[1])	Wind Speed (In Kilometer Per Hour)	Downwind Distance (In Kilometers)	
		Zone I - Immediate Operational Concern	Zone II - Secondary Hazard
2	10	5	10
	25	8	16
	50	12	24
5	10	8	16
	25	13	26
	50	19	38
30	10	19	38
	25	30	60
	50	42	84
100	10	33	66
	25	55	110
	50	80	160
300	10	55	110
	25	90	180
	50	130	260
1000	10	100	200
	25	155	310
	50	230	460

Source: Allied Tactical Publication 45B (ATP-45B), *Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas.*

A2.2.6.1.1. Time. Minimize your time outside of a protective shelter. Remain inside unless directed otherwise through the chain of command. If you must work outside, do so as quickly as possible and get back inside without delay. **Table A2.2.** shows the projected effects of time on radiation intensities following a nuclear weapon detonation.

Table A2.2. Projected Radiation Intensities After a Nuclear Weapon Detonation.

Projected Radiation After Detonation (In Centigrays Per Hour)					
1 Hour	**5 Hour**	**25 Hours**	**50 Hours**	**100 Hours**	**300 Hours**
1000	100	21	9	4	1
500	75	11	5	2	<1
250	37	5	3	1	<1
100	15	2	1	<1	<1
50	8	1	<1	<1	<1
10	2	<1	<1	<1	<1

Source: Allied Tactical Publication 45B (ATP-45B), *Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas*

NOTE: This chart shows a normal decay rate (1.2). The actual decay rate may be slower or faster. Refer to ATP-45B for detailed information on decay rates and radiation prediction methods.

A2.2.6.1.2. Distance. Maximize the distance to the hazards. Take shelter within the inner portions of buildings to increase the distance to the hazard. For example, even a simple shelter such as a wood frame structure can reduce your exposure by a factor of 10 or more.

A2.2.6.1.3. Shielding. Protective shelters with thick concrete provide the best protection. Otherwise, concentrate on efforts to prevent physical contact with fallout. As a minimum, wear IPE (MOPP 4, see **Chapter 5**) when outside. Standard issue chemical protective masks afford excellent protection from inhalation and ingestion of radioactive material. The protective mask and collective protection filters will prevent inhalation of any particulate contamination. Commercial anti-contamination suits (Tyvek® Anti-C Suits) are ideal but offer little advantage over the IPE. If IPE or commercial anti-contamination suits are unavailable, wear gloves, a field jacket and hood, blouse your pants, and tape all uniform openings to prevent the entry of fallout particles. Wear a dust mask or tie a cloth or handkerchief over your mouth and nose to avoid inhaling airborne fallout particles. Cover open cuts or wounds and seek overhead cover.

A2.2.6.2. Individual Protective Actions.

A2.2.6.2.1. Initial Actions. The most important initial action is to seek protection from the blast wave, heat, and flying debris. If advanced warning of a detonation is received, find shelter that provides the greatest protection against these effects. Use window barriers and shielding to improve protection for buildings or shelters. Store or remove flammable materials from the populated shelter areas and work centers. If time permits, expedient shelters can be constructed with accessible materials in a relatively short time. If all else fails or if a detonation occurs without warning, immediately drop to the ground in prone position. Tightly cover your face with both hands. Do not move from a protective position until the initial blast wave and any reflected blast waves have completely passed. Flammable objects that are within a direct line of sight to a burst may ignite and burn. Indirect burns and other injuries may result from the weapon effects upon surrounding objects and structures.

A2.2.6.2.2. Follow-on Actions. Remain within protected areas or shelters until directed otherwise. Perform damage assessment, self-aid/buddy care, and reporting actions as outlined in **Chapter 5** and **Attachment 3** and **Attachment 6**. Decontaminate yourself when necessary to remove or reduce contact or long-term exposure hazards from fallout particles. Avoid initial and long-term exposure to radiation hazards by using time, distance, and shielding avoidance techniques.

A2.2.7. Command Radiation Exposure Guidance. Line commanders will require advice from their medical officers concerning radiation effects (**Table A2.3.**) on their personnel. Medical advice must be practical, based upon both the requirements of the mission and the diversity of human response to radiation. Overreaction to contamination could make enemy use of an RDD more tenable. The effects of radiation that exceeds normal occupational exposure levels must not be either minimized or exaggerated. NBC risks must be in their proper places relative to the other hazards of combat. Widespread environmental radiological contamination can never be so great as to preclude mandatory mission accomplishment.

A2.2.8. Radiation Exposure During War. **Table A2.3.** provides an overview of the physiological effects of radiation exposure during wartime. Consult with medical specialists for medical assessments and recommendations. With exposures below 1.25 Gy, the overall effectiveness of combat units will not be degraded. However, above this threshold, commanders must be aware that their forces' capability to fight will be diminished. The term "combat effective" is used for personnel who will be suffering radiation sickness signs and symptoms to a limited degree and who will be able to maintain their performance at least 75% of their pre-exposure performance level. Those individuals who are predicted to be "performance degraded" would be operating at a performance level between 25% and 75% of their pre-exposure performance. Those predicted as "combat ineffective" should be considered as capable of performing their tasks at 25% (at best) of their pre-exposure performance level.

Table A2.3. Physiological Effects of Radiation.

Dose Estimate (In Gy)	Performance Capability	Initial Symptoms	Initial Symptoms Interval (Hours) [1]		Disposition Without and With Medical Care [2]	
			Onset	End	Without	With
0 - .35	CE	None	N/A	N/A	Duty	Duty
.35 - .75	CE	Nausea, Mild Headache	6	12	Duty	Duty
.75 - 1.25	CE*	Transient Mild Nausea, Vomiting in 5-30% of personnel	3-5	24	Restricted Duty[3]	Restricted Duty[3]
1.25 - 3	DT: PD 6 Hrs - 24 Hrs and 6 Wks - Recovery UT: PD From 6 Hrs - 24 Hrs and 6 Wks - Recovery UT: CE 24 Hrs - 6 Wks	Transient Mild to Moderate Nausea and Vomiting in 20-70% of Personnel; Mild to Moderate Fatigability and Weakness in 25-60% of Personnel	2-3	2 Days	LD_5 to LD_{10} Restricted Duty[3]	Restricted Duty[3]
3 - 5.3	DT: PD 3 Hours - Recovery UT: PD From 4 Hrs - 2 Days, and 7 Days - Recovery; Then CE 3-7 Days	Nausea/Vomiting Diarrhea Fatigue and weakness in 80-100% of personnel	2 10	3-4 Days 2-3 Wks	LD_{10} to $LD_{50,}$ Survivors May Be Able to Return to Light Duty >5 Wks**3,** May Require Evac	LD_5 to LD_{10} Restricted Duty, May Require Evac
5.3 - 8	DT: PD 3 hrs - 3 Wks, Then CI - Death or Recovery UT: PD 4 Hrs - 3 Days and 7 Days - 4 Wks CE 4-7 Days, then CI 4 Wks Until Death or Recovery	Moderate to Severe Nausea and Vomiting in 50-90% of Personnel Fatigue and weakness in 80-100% of personnel	<1	Indeter-minate	LD_{50} -LD_{90} Low End, Death May Occur 6 Wks in >50%; High End, Death May Occur 3-5 Wks in 90%	Early Evac to Tertiary Medical Center Before Onset of Illness

Dose Estimate (In Gy)	Performance Capability	Initial Symptoms	Initial Symptoms Interval (Hours) [1]		Disposition Without and With Medical Care [2]	
			Onset	End	Without	With
8 - 30+	DT: PD From Symptom Onset, Then CI From 3 Hrs Until Death UT: PD From Symptom Onset, Then CI From 7 Hrs Until Death	Severe Nausea, Vomiting, Fatigability, Weakness, Dizziness, and Disorientation, Possible High Fever and Sudden Vascular Collapse	<3 Min	Death	LD_{90} To LD_{100} Death Expected	If Assets Available, Early Evac To Tertiary Medical Center, Most Will Not Survive

Abbreviation Key: CE - Combat Effective = > 75% of full capacity, DT - Demanding Task = heavy physical work, PD - Partially Degraded = 25%–75% of full capacity, CI - Combat Ineffective = < 25% of full capacity, UT - Undemanding task = Sedentary or cognitive.

Primary Source: *Medical Management of Radiological Casualties Handbook,* First Edition, Dec 1999, Armed Forces Radiobiology Research Institute

NOTES:

1. Time is in hours unless otherwise indicated.
2. Consult source publications for detailed information.
3. No further radiation exposure allowable; personnel very susceptible to disease and non-battle injuries (DNBI) due to infections.

A2.3. Biological Warfare Agents.

A2.3.1. General.

A2.3.1.1. Biological warfare (BW) agents (**Table A2.4.**) are organisms or chemicals produced by organisms that affect humans in different ways. BW agents are either pathogens or toxins. Some kill while others incapacitate; some act quickly while others incubate for several weeks; and some are contagious while others are not. Vaccinations, prophylaxis (medicines given before sickness), and treatments (after sickness) exist for some, but not for others. Before assessing the impacts of biological weapon use, one must first understand the nature of the likely biological agents and how they work.

A2.3.1.2. BW events and agents vary so dramatically that a “one size fits all” response to a BW event will not work. The commander must be conversant with the basic technical parameters associated with BW in order to think through and to shape an effective response. To aid in developing this understanding, this section covers basic information on BW agents, likely delivery systems, operational impacts, attack indications, and mitigation strategies.

A2.3.2. Types of Agents. **Table A2.4.** provides a summary of selected biological agents and their characteristics.

A2.3.2.1. Pathogens. Pathogens are microorganisms that directly attack human tissue and biological processes. They vary in their characteristics and in their treatments and include four categories: bacteria, viruses, Rickettsia, and prions.

A2.3.2.1.1. Bacteria (e.g., anthrax, tularemia, plague) are living single cell organisms, which can grow and reproduce in the environment, in plants, animals, or humans. Bacteria are susceptible to antibiotics, but can develop resistance to antibiotics as strains evolve in nature, or as the result of the intentional genetic manipulation of strains. Vaccines exist for some bacteria as well.

A2.3.2.1.2. Viruses (e.g., VEE, smallpox) are smaller than bacteria, do not grow, and require a living host cell to make new copies of themselves. Antibiotics have no effect on viruses, but anti-viral agents such as vaccines can limit some viral illnesses.

A2.3.2.1.3. Rickettsia (e.g., Q-fever, Rocky Mountain Spotted Fever) are intermediate in size, contain nearly everything necessary to make new copies of themselves, but rely on infected cells to make new copies. Antibiotics are effective against Rickettsia.

A2.3.2.1.4. Prions have recently been identified as an "infective chemical." Transmission of the prion from cows to man is suspected to cause human illness in a similar fashion. There are no known therapies effective against prions.

A2.3.2.2. Toxins. Toxins are poisonous substances naturally produced by bacteria, plants, fungi, snakes, insects, and other living organisms. Common toxins include Botulinum toxin (produced by bacteria); Staphylococcus Enterotoxin B, or SEB (produced by bacteria); and ricin (produced by a plant). Toxins act to destroy organisms by overwhelming the organism's ability to rid itself of the poison it produces (intoxication). Bacteria can destroy organisms by both infection and intoxication. Plants, fungi, snakes, insects, and other living organisms intoxicate their victims via more direct means (injection, contact, ingestion), while viruses have no ability to intoxicate whatsoever.

A2.3.3. Agent Effects. How devastating a BW agent will be on the human body depends on a number of variables. ***NOTE***: Minor changes in any one variable can result in a significant difference in the effectiveness of the attack, as well as in the effectiveness of the appropriate response. Five key variables are outlined below.

A2.3.3.1. Exposure Levels. Since many medical countermeasures are time sensitive, how much of a particular pathogen or toxin an individual is exposed to affects both the lethality and the timing of the onset of symptoms.

A2.3.3.2. How the Biological Agent Enters the Body. The point of entry of the pathogen or the toxin often determines the lethality of the disease or poison. For example, anthrax has three possible points of entry: openings in the skin (cutaneous anthrax), ingestion (gastrointestinal anthrax), or inhalation (inhalational or pulmonary anthrax). The three forms of anthrax differ in number of organisms necessary to cause infection, fatality rate, and responsiveness to antibiotic therapy after onset of symptoms.

A2.3.3.3. Time to Onset of Symptoms and Incubation Periods. Some agents work within hours while others have incubation periods as long as several weeks. This complicates determining whether or when an attack occurred, how widespread are the effects, and what are the available treatment strategies.

A2.3.3.4. Extent of Communicability. Certain diseases, such as smallpox and hemorrhagic fever, which are contagious, pose a greater challenge. These challenges include the risk to those in close contact, including medical care-givers, and the problems of separating the ill from those susceptible to becoming ill if exposed.

A2.3.3.5. Incapacitation Versus Lethality. Some agents kill while others only incapacitate their victims. Again, treatment and operational strategies are influenced by these factors. Where fatalities occur, there are varying periods of incapacitation prior to death.

A2.3.4. Weaponization and Dissemination. Knowing how an agent can be disseminated is critical to shaping an effective response. The size, shape, intensity, and overall effectiveness of the agent deposition pattern are influenced by the delivery method. The attacker is likely to consider a number of issues when choosing a means of delivery, including ease of accessing, cost of weapons systems, size of targeted area, likelihood of successful delivery (i.e. penetration of defenses, susceptibility to meteorological uncertainties), covertness, and safety to the delivery team.

A2.3.4.1. Weaponized BW Agent Delivery

A2.3.4.1.1. Theater Ballistic Missiles (TBM). TBM are a viable delivery means for many agents. With bulk warheads, release can be an explosive or line release.

A2.3.4.1.2. Submunitions. The size of the submunition pattern allows area targets to be more effectively contaminated. Coordinated salvos of TBMs, which would likely ensure at least one missile penetrating active defenses, pose even a greater challenge. Intercepted bulk-filled missiles do not affect the targeted airbase. However, in many designs, the submunitions may be released above the intercept altitude. In this case, only a small number of the submunitions become damaged by current active defense systems.

A2.3.4.1.3. Ground sprayers. These devices can also be used to deliver agents. Because ground sprayer attacks will be initiated relatively close to the target, precise, real-time wind data can be used to select a place and time of release to optimize accuracy. Ground sprayers can be stationary or vehicle-mounted. If released from a moving vehicle, the attackers risk being detected. However, the resulting line source can cover a very large area.

A2.3.4.1.4. Aircraft sprayers, as an airborne line source, can yield dosage patterns that cover very large areas. Since these patterns can be several hundred kilometers long, agents can be released far upwind of the intended target area. Remote releases may allow attackers to avoid having to penetrate air defenses. Warning and alert of attacks of this type depend on the ability to closely monitor enemy air traffic patterns and identify suspicious flight profiles.

Table A2.4. Properties of Selected Biological Pathogens and Toxins.

Disease And Type	Comm-unicable To Man	Infective Dose[1] (Aerosol)	Incubation Period	Lethality (Fatality Rates)	Organism Persistence	Possible Means of Delivery[2]
Bacteria						
Inhalation Anthrax	No	8000-50000 spores	1-6 days average.(up to 40+ days)[3]	High	Very stable; viable for >40 yrs in soil	Aerosol
Brucellosis	No	10-100 organisms	5-60 days (usually 1-2 months)	<5% untreated	Very stable	Aerosol
Cholera	Rare	10-500 organisms	4 hrs - 5 days (usually 2-3 days)	Low with treatment, high without	Unstable in aerosols & fresh water; stable in salt water	Aerosol; sabotage food/ water supply
Glanders	Low	Assumed low	10-14 days via aerosol	>50%	Very stable	Aerosol
Pneumonic Plague	High	100-500 organisms	2-3 days	High unless treated in 12-24 hrs	Up to 1 year in soil; 270 days in live tissue	Contaminated vectors; aerosol likely
Tularemia	No	10-50 organisms	2-10 days (average 3-5 days)	Moderate if untreated	Months in moist soil or other media	Aerosol
Virus						
Smallpox	High	Assumed low (10-100 organisms)	7-17 days (average 12)	High to moderate	Very Stable	Airborne spread possible
Venezuelan Equine Encephalitis	Low	10-100 organisms	2-6 days	Low	Relatively unstable	Airborne spread possible
Viral Hemorrhagic Fevers	Moderate	1-10 organisms	4-21 days	High/ Zaire, moderate Sudan strain	Relatively unstable, depends on agent	Airborne spread possible
Toxin						
Botulinum	No	.001 ug/kg Type A LD_{50}	1-5 days	High w/o respirator support	Weeks in nonmoving water or food	Aerosol; sabotage food/ water supply

Disease And Type	Comm-unicable To Man	Infective Dose[1] (Aerosol)	Incubation Period	Lethality (Fatality Rates)	Organism Persistence	Possible Means of Delivery[2]
Staphylococcal Enterotoxin B	No	.03 ug/person incapacitation	3-12 hrs after inhalation	<1%	Resistant to freezing	Aerosol; sabotage food/ water supply
Ricin	No	3-5 ug/kg LD_{50} for mice	18-24 hrs	High	Stable	Aerosol
T-2 Myco-toxins	No	Moderate	2-4 hrs	Moderate	Years at room temperature	Aerosol; sabotage food/ water supply
Primary Source: *Medical Management of Biological Casualties Handbook,* 4th Edition, USAMRIID, Feb 01						

NOTES:

1. The term ug/kg means the quantity of agent per kilogram (kg) of body weight of the subject that is required to produce the indicated effect
2. Data within this column was provided by Dr. Ngai Wong, SBCCOM, excerpt from *Selected Biological Agent Characteristics,* Sep 01.
3. Data from HQ AF/SGXR, 27 Aug 02.

A2.3.4.1.5. Mortar, artillery, and multiple rocket launchers (MRL) are well suited to deliver biological agents. Artillery attacks can deliver an extremely large amount of agent very accurately. Shells filled with biological agents can be used in a combined attack with chemical and conventional explosive shells, making it difficult to recognize the event as a BW attack.

A2.3.4.1.6. Covert Attack. Small amounts of BW agent can be very effective. Thus, the agent can be easily concealed, transported and released by adversaries. The delayed effects of BW mean that the attackers can escape undetected, allowing plausible deniability. Delayed effects also mean that infected individuals with contagious agents might unwittingly disperse during the incubation time, making it difficult to investigate and counter the attack. Because of these factors, biological weapons are particularly suited for covert attacks.

A2.3.4.2. Other Means Delivery. In addition to weapons-associated delivery of BW, BW agents can be disseminated through other means.

A2.3.4.2.1. Vector-Mediated. Vector-mediated delivery occurs when insects or other animals are utilized to disseminate BW agents. This method allows for clandestine release that is hard to identify or to attribute to a specific adversary.

A2.3.4.2.2. Fomite Spread. Using inanimate objects (fomites) to spread agents is another potential way to disseminate biological agents, such as smallpox. Evidence suggests that while the primary means of transmission of smallpox is person-to-person contact, smallpox virons can also be spread via human contact with contaminated surfaces or by aerosolization, increas-

ing the hazard of the spread of contagion. The recent case of anthrax-mixed powders shows the efficacy of fomite spread.

A2.3.4.2.3. Food or Consumer Product Contamination. Food or other products for human consumption are also a group vulnerable to BW agent contamination. Many can be laced with pathogens, such as the salad bar contaminated with Salmonella to keep voters away from the polls. Another example would be the inadvertent contamination in a meat processing plant utilized by food chains for their hamburger supply that resulted in Escherichia coli illnesses. Other products can also be contaminated with chemical agents or commercial poisons.

A2.3.4.2.4. Water contamination. Water supplies are a potential means for biological attack. Some pathogens can grow in water, survive for considerable lengths of time, or survive the normal chlorination and filtration treatments in municipal water supply systems. Similarly, toxins, which are generally unresponsive to normal water treatment, can be transported via water supplies. However, the amount of agent required to have an operational impact make this a less likely means of delivery. On the other hand, attacking a specific building by creating a high-pressure "tap" of the water supply is technically straightforward and requires less agent.

A2.3.5. Operational and Force Protection Impacts. It is critical to note that biological weapons differ from chemical weapons in operationally significant ways. These differences dictate different responses and risk trade-offs. A few key differences are illustrated in **Table A2.5.** A biological attack is a very complex process that depends on several technical factors, all of which determine its operational impact. These factors fall into three categories: lethality factors, environmental factors, and source factors.

A2.3.5.1. Lethality. The lethality of an agent, or the rate at which it kills its victims, has an obvious impact on force protection and operations. Many factors contribute to the lethality of the event, including agent effects, as discussed Para **A2.3.3.** Additional considerations include:

A2.3.5.1.1. Potency. The potency of the agent will partially dictate the number of casualties relative to agent delivered. Highly infective agents are more lethal because less mass is required.

A2.3.5.1.2. Particle Size. Only small particles (1-10 microns) will reach the lower lungs, where they can cause harm. Size is a function of how the agent is manufactured and processed for weaponization.

Table A2.5. Operational Differences Between Chemical and Biological Warfare Agent Attacks.

	Chemical Warfare Agent	Biological Warfare Agent
Release Site of Weapon	Quickly discovered, possible to cordon off contaminated/ attack areas	Difficult to identify, probably not possible or useful to cordon off area of attack
Manifestation of Symptoms	Rapid, usually minutes to hours after an attack	Delayed, usually days to weeks after an attack (except toxins)
Distribution of Affected Patients	Downwind area near point of release	Widely and rapidly spread, difficult to track or predict
Signatures	Easily observed (colored residue, dead foliage, pungent odor, dead insect and animal life)	Typically no characteristic signatures immediately after attack
Medical Countermeasures	Chemical antidotes	Limited vaccines, antibodies, and/or antitoxins and antivirals for some agents
Casualty Management and Contamination	After decontamination and or weathering, no further need for protective measures or risk of further contamination	Patient isolation/quarantine crucial if communicable disease is involved

A2.3.5.1.3. Means of Entering the Body. Almost all BW agents are more effective if inhaled. For physical reasons, different sized particles will become embedded in different parts of the respiratory system. Therefore, for any batch of agent, the distribution of particle size is a key lethality factor. Anthrax is a good example. The lower respiratory system provides the conditions for anthrax to survive, grow, and multiply. Anthrax spores must reach this area to cause inhalational anthrax and only particles in the 1-5 microns range will reach these areas with high efficiency. Therefore, lethal dose is dependent on particle size distribution. Other agents infect different sections of the respiratory system and must be released in appropriate particle sizes to be effective.

A2.3.5.2. Source Factors. Source factors expand the number of possible scenarios that must be considered before a response is structured. More specifically, source factors include fill type (or how the agent is manufactured) and release mechanism.

A2.3.5.2.1. Fill Type. Agents can be produced in a variety of forms depending on the manufacturing process. For example, anthrax can be manufactured as a wet slurry or as a dry powder. Anthrax transport and diffusion is much more efficient as a dry powder than as a wet slurry, but it is more difficult to weaponize and to handle. Thus, how it is manufactured depends on the expertise of the attacker and his equipment/infrastructure.

A2.3.5.2.2. Release Mechanism. The mechanism for release has a significant impact on how much of the agent survives the release event and the size, shape, and concentration of the pattern of dispersion.

A2.3.5.3. Environmental Factors. Environmental factors encompass agents' interaction with the ambient environment, from the point of release until inhaled by a human. Environmental factors will dictate the size, shape, dosage at inhalation, height of agent deposition, and concentration of agent deposition patterns on the ground. Thus, environmental and weather conditions can be critical to determining how effective the attack will be, particularly with certain delivery systems. Some have suggested that this factor is so critical that weather and time of day can provide a guide to protection options in a high threat situation. More specifically:

A2.3.5.3.1. Wind Speed and Direction. Since BW agents are released as small particles and aerosols, they tend to move with the winds. Stronger winds move the clouds faster, resulting in lower exposure. In calm conditions, the agent cloud stays close to the release site. This results in a significantly higher risk of exposure, which lasts until the wind speed increases enough to move the agent containing air package downwind.

A2.3.5.3.2. Atmospheric stability, layering, and mixing. A successful attack requires the agent mixing with air. This is caused by turbulence in the atmosphere. Stable layers restrict vertical movement of agent particles, so agent released below an inversion remains available for inhalation, and causes a higher likelihood of exposure. Agent released above an inversion may not be able to penetrate the inversion layer, so mixing down to the ground would occur only when the inversion layer is broken, perhaps at dawn, well downwind from the release point.

A2.3.5.3.3. Terrain. Landforms, buildings and surface coverings (trees, brush, sand, asphalt) influence the channeling of local wind, and affect spatial agent distribution.

A2.3.5.3.4. Rates of Biological Decay or Inactivation in the Atmosphere. Biological warfare agents decay in the atmosphere at different rates based on heat, humidity, and exposure to ultraviolet (UV) light. But, most BW agents will survive for relatively short periods (minutes to hours) in the open atmosphere. The relatively low rate of biological decay of anthrax spores makes anthrax an attractive BW agent. Anthrax can survive between 1 and 2 days in the air. Since UV light is the primary cause of anthrax spore decay, night attacks would likely be most effective, but daytime attacks can still be effective on a fixed site target. SEB and Ricin decay very little. Ricin is not very toxic, so this benefit is offset.

A2.3.5.3.5. Rates of Decay in Soil, Water, and On Surfaces. In a weaponized release, the level of deposition onto ground surfaces is very low. Agent survival on surfaces is an important characteristic for considering the risk from reaerosolization and the need for decontamination. Anthrax spores and smallpox virons have been found to be quite stable in soil (many years).

A2.3.5.3.6. Time of Day. The time of day affects the operational impacts of an attack because each agent biologically decays at a different rate depending upon temperature, humidity, and UV light intensity. In general, nighttime or early morning, with its lower temperatures and UV light, provides the best conditions for successful BW agent attacks because of lower biological decay. During this period, neutral and inversion conditions (especially with low wind speeds) result in agent clouds, which maintain lower physical decay (i.e. spreading of the biological agent over time.).

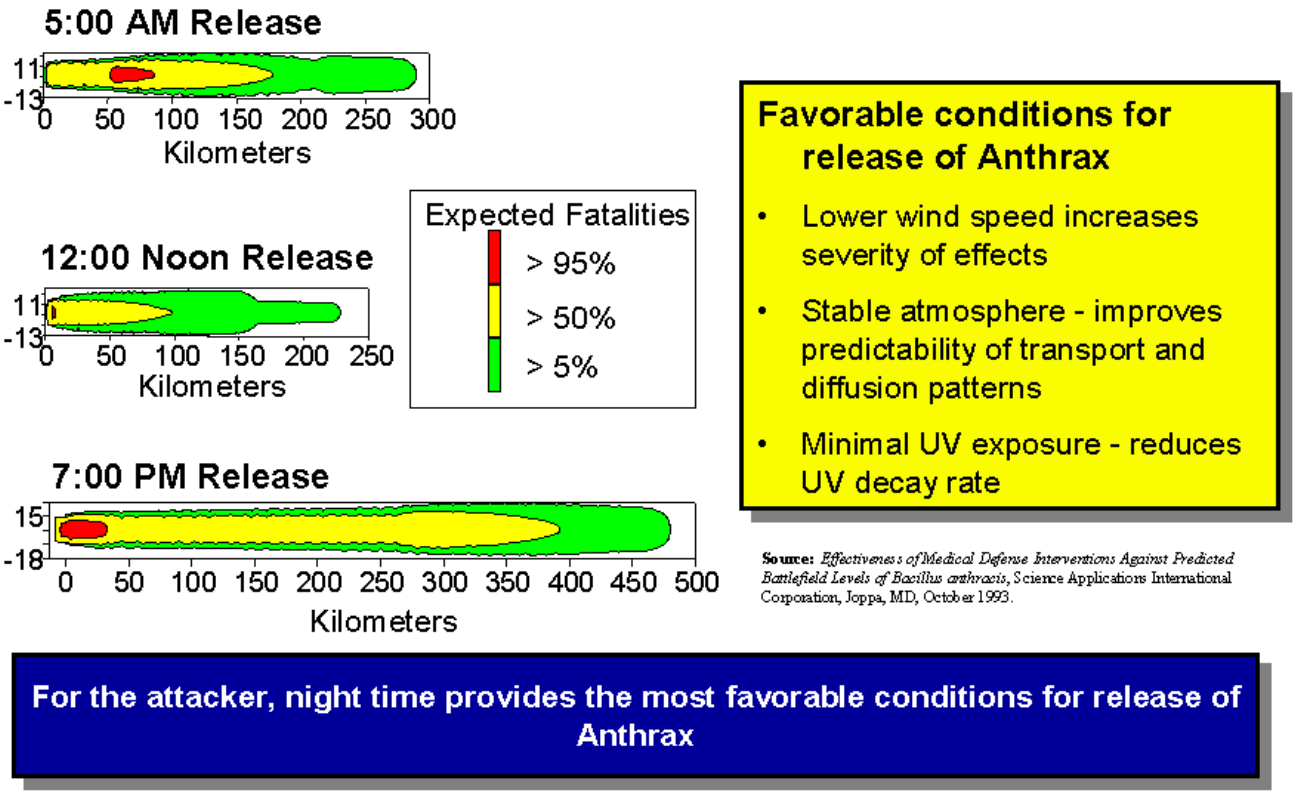
A2.3.5.4. Example Using An Anthrax Release. **Figure A2.3.** shows the significance of the time of attack for a successful anthrax release. In this example, a nighttime mobile sprayer attack produces a large hazard area and the high dosages due to weak, stable near-surface air typically found on a clear night, at a lower temperature and humidity; and under minimal UV intensity. The conver-

gence of these environmental conditions at nighttime would optimize the results of an attack. The chart demonstrates the dramatic improvement in the size of the affected area (almost double) and the intensity of dosage of a nighttime attack compared to a daytime attack.

A2.3.5.5. Potential for Reaerosolization.

A2.3.5.5.1. Most biological agents are not persistent, and will decay within hours or days under exposure to the environment. However, anthrax spores can survive in a non-vegetative state for years if embedded just beneath the surface where they would be shielded from UV radiation, temperature, and humidity effects. Some evidence, including the recent experience with anthrax, suggests that, if disturbed, anthrax can reaerosolize, possibly generating a local dosage hazard.

Figure A2.3. Environmental Implications for Anthrax Release By Aircraft Sprayer (10 Km Line).



A2.3.5.5.2. The conditions necessary to cause an operationally significant reaerosolization hazard are not completely understood. However, reaerosolization is most likely in areas where the agent is highly concentrated and where there is low UV light, and where favorable temperature and humidity conditions ensure its longevity. Thus, the form of the agent at the time of delivery is significant. Dry anthrax may be deposited over large areas with relatively small deposition levels on the ground. It is unlikely that reaerosolization of anthrax from these depositions will generate an operationally significant hazard. An initial deposition of wet anthrax, however, can result in high, localized concentrations of agent directly around the release point.

Such high agent depositions around the source in a small area of the surface, could, if disturbed, reaerosolize hours to days after an attack.

A2.3.6. Detection and Identification:

A2.3.6.1. DoD Biological Sampling Kit:

A2.3.6.1.1. The DoD Biological Sampling Kit provides a simple and inexpensive presumptive identification capability for a limited number of biological agents (both pathogens and toxins). The kits include all components necessary to acquire a sample and provide presumptive identification of biological agents under field conditions. The kit should not be used as the single means to deny the presence of biological agents and is never to be used for diagnostic purposes.

A2.3.6.1.2. The DOD Biological Sampling Kit is normally employed for field screening of suspect munitions and munitions fragments, suspicious liquids, and suspicious powders (or suspensions). The kit may also be used to screen terrorist laboratories or weapons materials that might be associated with the manufacture or delivery of BW agents. Another use is for sampling indoor or outdoor surfaces where it is suspected that BW agents were released in fairly high concentrations.

A2.3.6.1.3. The Civil Engineer Readiness Flight at most airbases maintains a small number of these kits for emergency response. They are also deployed with Civil Engineer NBC defense teams in wartime. Trained personnel collect and analyze suspected biological agent samples from relatively clean, non-porous surfaces. The kits are not designed for soil, skin, wood, food or water sampling. One of the reasons for this limitation is that a number of biological warfare agents are closely related to benign soil microbes. These “close cousins” can cause false positive readings. Test results should be carefully considered before follow-on action is initiated. To increase test reliability, current procedures dictate the use of two assay panels simultaneously. If the results of both assay panels indicate a positive for the same agent, the probability of the indicated agent being present is greater than 97 percent. The use of assay panels from separate lot numbers will further increase test reliability.

A2.3.6.2. Other Biological Agent Detectors. Some airbases are also equipped with military and commercial biological agent detection equipment. Units that have these detectors should develop attack warning and notification procedures that leverage the capabilities of the specific equipment. Air Force systems include the Portal Shield Advanced Concept Technology Demonstration, Portable Biological Agent Sampler, and several developmental systems. If available, augment available detection capabilities with host-nation or coalition forces biological agent detection systems.

A2.3.6.3. Another detection method is medical surveillance. If an attack is not detected directly, first indications may be an increase of illness among the affected population. Most BW agents induce symptoms after an incubation period. An influx of patients reporting similar symptoms may indicate an attack has occurred. Although it may be too late for medical countermeasures to help individuals who already show symptoms, the trend can alert the medical system to initiate protective measures such as vaccines or antibiotics for those who are exposed but not yet sick.

A2.4. Chemical Agents:

A2.4.1. Introduction. This appendix presents a brief overview of chemical weapons to enable leaders and supervisors to better understand the nature of chemical warfare agents and their effects. More

detailed information is available in AFMAN 32-4017, *Civil Engineer Readiness Technician's Manual*, T.O. 11C15-1-3, *Chemical Warfare Decontamination, Detection and Disposal of Decontaminating Agents*, *Medical Management of Chemical Casualties Handbook,* and the sources in **Attachment 1**.

A2.4.2. Airbase Chemical Threats.

A2.4.2.1. An adversary's use of chemical weapons is one of the greatest challenges to effective airbase operations. The use or threat to use chemical weapons will force the airbase population to conduct mission operations while wearing IPE. Factors such as hazard duration, climatic conditions, the amount and type of resources contaminated, the number of personnel who physically come in contact with contamination, and the number of chemical agent, heat, or psychological casualties will combine to strain existing command and control, mission production, post-attack recovery, and medical support activities. Leaders with a properly trained and equipped base population can implement effective pre- and post-attack TTP that ensure force survivability and enable minimal disruption to mission operations. The key to chemical attack response is effective risk management.

A2.4.2.2. The primary chemical warfare agents of concern to most airbases during wartime are the nerve and blister agents. At present, the primary threat is from TBM warheads filled with a V-series nerve agent. The use of other chemical warfare agents, such as blood or choking agents, is possible but not operationally feasible. Current weapons systems are unable to deliver enough of these agents to achieve effective and sustained area coverage in rear areas where airbases are typically located. Further, weapon systems used by special operations forces (SOF) are poor candidates for blood and/or choking agent dissemination.

A2.4.3. Chemical Weapon Employment.

A2.4.3.1. Adversaries will seek to increase their effectiveness of chemical agents by employing them, where possible, under favorable weather conditions. Weather factors that affect chemical agent employment include wind speed, air stability, temperature, humidity, and precipitation. Conditions that favor direct placement of agent upon an area are calm winds with a strong, stable temperature gradient. Low-speed winds and stable or neutral weather conditions are most favorable for spreading an agent cloud evenly over a larger target area, such as an airbase.

A2.4.3.2. TBMs may be targeted to deliver the agent upwind of the airbase or may simply miss the intended target and achieve the same effect. Conditions most favorable for this scenario are stable or neutral conditions with low to medium winds of 5-13 kilometers per hour (kph). Marked turbulence, winds above 13 kph, moderate to heavy rain, and an air stability category of "unstable" result in unfavorable conditions for downwind movement of chemical clouds. Civil Engineer Readiness can provide additional information on the times and conditions where chemical agent employment is most and least effective.

A2.4.4. Chemical Agent Characteristics.

A2.4.4.1. Threat to Personnel. The chemical agents that are threats to airbase operations adversely affect personnel through three principal routes of entry: inhalation, absorption of liquid/solid agent through the skin, and/or absorption of vapor through the skin. It requires differing amounts of agent to produce threshold, incapacitation, or lethal effects for each of these routes of entry. In many cases, repeated exposure to chemical agents can have a cumulative effect on the body and several smaller exposures may result in an overall dosage capable of incapacitation or death. CE

Readiness and Medical specialists consider these and other factors when developing MOPP level recommendations for the commander and staff and predicting likely effects upon personnel.

A2.4.4.2. Methods of to Enhance Effectiveness and Dissemination.

A2.4.4.2.1. The primary threat chemical agents have historically been released in neat liquid form but can be disseminated in thickened or solid particulate (dusty) form. Agents disseminated in neat form initiate a hazard cycle wherein the droplets settle to the ground after detonation, posing a direct contact hazard to people and equipment while the droplets are airborne. The agent is also beginning to evaporate during the droplet fall phase so a vapor hazard starts to emerge. The largest vapor concentrations and probabilities of cross contamination (agent transfer from one surface to another) remain highest while the droplets remain on the surface, generally a period of seconds to approximately an hour depending on the agent and surface involved. In varying degrees of time, the agent will sorb into all but the most non-porous surfaces (glass, unpainted metal, etc.). Once this occurs the contact and transfer potential becomes operationally insignificant but the agent still presents a hazard because it continues to give off toxic vapors from the contaminated surface.

A2.4.4.2.2. Thickened agents are created by adding small amounts of selected compounds to the agent and thoroughly mixing the substances. This is not an easy process to master and sometimes requires very controlled environments (constant elevated temperature for extended periods of time for instance). There can be several objectives behind an adversary's thickening efforts. These include an increase in the time required for the agent to sorb into major terrain surfaces (from seconds to almost an hour) and/or a capability for the agent to be disseminated from delivery systems that are not suited for neat agents. Thickening an agent can have drawbacks. For example, while it may take longer for an agent to sorb into a surface, the vapor concentrations arising from the dispersed agent can be dramatically reduced (by factors of approximately 2 to over 100). Personnel must minimize contact with items that still retain chemical agents on the surface.

A2.4.4.3. Chemical agent penetration of materials presents challenges that personnel must recognize. Toxic vapors from absorbed liquid agents can penetrate non-porous materials and create a residual vapor hazard, even though physical contact with the liquid agent never occurred. Further, work center personnel must be aware that chemical agents can penetrate barrier materials such as plastic sheeting and release toxic vapors on the underside of the material. **Table A2.6.** provides examples of agent penetration times for common materials. Agent penetration over time is one of the reasons that contaminated barrier materials be replaced as soon as feasible after an attack.

Table A2.6. Protective Capability of Common Barrier Material (In Minutes).

Barrier Material	Soman (GD)	Thickened Soman (TGD)	Distilled Mustard (HD)	VX
Wool Blanket	2	84	84	600
Helicopter Cover	29	Data Not Available	Data Not Available	600
Heavy Tarp	120	120	120	600
Plastic Pallet Cover	180	180	180	600
NOTE: The criteria for these examples are penetration of toxic vapor through the material.				
Source: *Effectiveness of Protective Covering,* (DPG/JOD-92-013), March 1992.				

A2.4.5. Chemical Agent Types. Chemical warfare agents are poisonous chemicals that can produce irritating effects, make materials or areas unusable, and cause death. The severity of the injuries depends on the type of agent, concentration of the agent used, and the method of dissemination. Lethal chemical warfare agents are divided into the following four categories - nerve, blood, blister, and choking. Although an adversary could employ any agent against an airbase, nerve and blister agents are the primary agents of concern for missile and air attacks. **Table A2.7.** lists selected chemical warfare agents that are of primary concern to airbases. See AFMAN 32-4017 and the *Medical Management of Chemical Casualties Handbook* for expanded information on chemical warfare agents.

A2.4.5.1. Nerve Agents. Nerve agents attack the nervous system and affect muscle control, vision, heart, and lung functions.

A2.4.5.2. Blood Agents. Blood agents disrupt the oxygen-carrying properties of the blood. These are fast acting, deadly agents, that vaporize and dissipate quickly (seconds to minutes) in the open air. Blood agents are most effective when employed in mass applications, such as an artillery attack, or when released within confined areas that concentrate the agent.

A2.4.5.3. Blister Agents. Blister agents attack and destroy cell tissue. They cause skin and eye irritation, inflammation, and severe blisters. This tissue damage increases the chance of infection and may ultimately cause death. In most cases, pain and blisters may not occur until long after exposure.

A2.4.5.4. Choking Agents. Choking agents cause irritation and inflammation of the bronchial tubes and lungs. If a sufficient amount enters the lungs, liquid may gather there. Death results from lack of oxygen.

A2.4.6. Characteristics.

A2.4.6.1. General Characteristics of Chemical Warfare Agents.

A2.4.6.1.1. Chemical agents, like all other substances, may exist as solids, liquids or gases, depending upon temperature and pressure. Most wartime chemical agents used in munitions are liquids although some may be in a solid or dusty form. Following detonation of the munitions container, the agent is primarily dispersed as liquid or as an aerosol. The agent in aerosol form is a collection of very small solid particles or liquid droplets suspended in a gas (in this case, the explosive gases and the atmosphere). For example, the “tear gas" used in the NBCC Defense Course is not really a gas at all, but rather an aerosolized solid. Likewise, mustard

"gas" and nerve "gas" do not become true gases, even when hot enough to boil water (212°F at sea level).

Table A2.7. Toxicity of Selected Chemical Agents and Compounds.

Agent	Agent Toxicity[1]				Rate of Action
	Vapor (mg-min/m^3)			Liquid (mg/70kg man)	
	LCt_{50}	ICt_{50}	MCt_{50}	LD_{50}	
Nerve					
GA Tabun	70	50	1	1,500	Very Rapid
GB Sarin	35	25	1	1,700	Very Rapid
GD Soman	35	25	0.4	350	Very Rapid
GF Cyclosarin	35	25	0.4	350	Very Rapid
VX	15	10	0.1	5	Very Rapid
Blister					
H Sulfur Mustard	1,500[3]	200[3](Eye) 1,500[3] (Skin)	Data Not Validated	7,000[3]	
HD Distilled Mustard	1,000	100	25 (Eye Irritation)	1,400	Delayed 4-6 Hours
HN-1 Nitrogen Mustard	1,500[4] (Inhaled) 20,000[2] (Skin)	200[3](Eye) 9,000[2] (Skin)	Data Not Validated	Data Not Validated	Delayed 12 Hours or Longer
L Lewisite	1,400[4]	>1,500[2]	Data Not Validated	2,100[4]	Rapid
Blood					
AC Hydrogen Cyanide	2,000-4,500[2,5]	Varies Widely By Concentration[6]	Data Not Validated	Not Applicable[7]	Very Rapid
CK Cyanogen Chloride	11,000[2]	7,000[2]	Data Not Validated	Not Applicable[7]	Immediate and Intense
Choking					
CG Phosgene	3,200[4]	1,600[4]	Data Not Validated	Not Applicable[7]	Delayed 3-4 Hours

Agent	Agent Toxicity[1]				Rate of Action
	Vapor (mg-min/m^3)			Liquid (mg/70kg man)	
	LCt_{50}	ICt_{50}	MCt_{50}	LD_{50}	

NOTES:

1. Unless otherwise noted, the source for toxicity values is the *Report of the Workshop on Chemical Agent Toxicity for Acute Effects*, Institute for Defense Analyses, May 11-12, 1998.
2. FM 3-9, *Potential Military Chemical/Biological Agents And Compounds,* December 1990.
3. *Detailed Facts About Sulfur Mustard Agents,* 218-08-1096*,* USACHPPM.
4. *Strategies to Protect the Health of Deployed U.S. Forces: Detecting, Characterizing, and Documenting Exposures* (2000).
5. Varies widely w/concentration because of the rather high rate at which the body detoxifies. At 200 mg/m^3, the LCt_{50} = ~2,000 mg-min/m^3. At 150 mg/m^3, the LCt_{50} = ~4,500 mg-min/m^3.
6. *Medical Management of Chemical Casualties Handbook, July 1990,* USAMRIID.
7. Not normally encountered in a liquid state under field conditions.

A2.4.6.1.2. Certain chemical agents, such as hydrogen cyanide, chlorine, and phosgene, may be gases when encountered during the warm months of the year at sea level. Nerve agents and mustard are liquids under these conditions, but they are to a certain extent volatile. That is, they volatilize or evaporate, just as water or gasoline does, to form an often invisible vapor. A vapor is the gaseous form of a substance at a temperature lower than the boiling point of that substance at a given pressure. Liquid water, for example, becomes a gas when heated to its boiling point at a given pressure, but below that temperature, it slowly evaporates to form water vapor, which is invisible. Visible water clouds (steam) are composed not of water vapor, but rather suspensions of minute water droplets, that is, aerosols.

A2.4.6.1.3. The tendency of a chemical agent to evaporate depends not only on its chemical composition and on the temperature and air pressure, but also on such variables as wind velocity and the nature of the underlying surface with which the agent is in contact. Just as water evaporates less quickly than gasoline does, but more quickly than motor oil at a given temperature, pure mustard is less volatile than the nerve agent GB, but is more volatile than the nerve agent VX. However, all of these agents evaporate more readily when the temperature rises, when a strong wind is blowing, or when they are resting on glass rather than on, for example, porous fabric.

A2.4.6.1.4. Chemical vapors and small particles are carried by the wind and either evaporate or gradually settle to the ground. Large particles and liquid droplets fall out in a ballistic-like trajectory and are more quickly deposited on the ground. Smaller particles and droplets fall more slowly and settle farther downwind. Agents in liquid or solid form are primarily removed from the air by falling out and being absorbed into the ground or vegetation. For about the first 30 seconds following delivery, the agent dispersal characteristics are determined primarily by the efficiency of the delivery system. Afterwards, the movement and diffusion of the agent cloud are determined primarily by weather and terrain. Light winds and low turbulence allow

high, widespread concentrations of agents. High winds and strong turbulence reduce the concentration and decrease the area coverage carrying away and diffusing the agent cloud more quickly.

A2.4.6.2. Vapors. When a chemical agent is disseminated as a vapor from a bursting munition, the cloud initially expands, grows cooler and heavier, and tends to retain its form. If the vapor density of the released agent is less than the vapor density of air, the cloud rises, mixes with the surrounding air, and dilutes rapidly. If the agent forms a dense gas (the vapor density of the released agent is greater than the vapor density of air), the cloud flattens, sinks, and flows over the earth's surface. Generally, cloud growth during the first 30 seconds is more dependent upon the munition or delivery system than upon surrounding meteorological conditions. The agent concentration buildup is influenced by both the amount and speed of agent release and by existing meteorological conditions. Shortly after release, the agent cloud assumes the temperature of the surrounding air and moves in the direction and at the speed of the surrounding air. The chemical cloud is subjected to turbulence forces of the air, which tend to stretch it, tear it apart, and dilute it. The heavier the agent, the longer the cloud retains its integrity.

A2.4.6.3. Aerosols. Aerosols are finely divided liquid or solid substances suspended in the atmosphere. Several types of delivery systems can generate aerosol clouds. These include thermal munitions, aerosol or liquid spray devices, and bursting munitions. Airborne aerosols behave in much the same manner as vaporized agents, but are heavier and tend to retain their forms and settle back to earth. Because they are heavier than vapor clouds, they are influenced less by turbulence. As these clouds travel downwind, gravity causes the larger, heavier particles to fall to the ground near the release point while smaller, lighter particles travel and settle farther from the release point.

A2.4.6.4. Liquids. When a chemical agent is used for its liquid effect, evaporation also causes the agent to release chemical vapor. Depending upon volatility, vapor clouds are usually of low concentration, have about the same temperature as the surrounding air, and tend to flow toward and stay near the surface. Additionally, vapor density governs the extent that the vapor will mix with the air. Liquid agents with a very high vapor density, such as VX, evaporate very slowly. While the liquid droplets are airborne and for some period time after they reach the surface, the liquid continues to evaporate. Agent vapor pressure will govern the rate at which the liquid will evaporate. Initial concentrations are lower, but evolve over a long period (until the liquid source is gone). Liquid agents may also be absorbed (soak into a surface) and adsorbed (adhere to a surface). Once the liquid is no longer present on the surface, the desorption (chemical agent vapor returning back into the air) process begins. The vapor concentration over areas contaminated with a liquid agent tends to be less than with newly formed or weapon-generated vapor clouds. Downwind agent concentrations for agents with high vapor density are not nearly as great as with other types of agents.

A2.4.6.5. Powders. Some agents may be used in a powder or dusty form. Dusty agents are created by soaking very small particles of inert substances in liquid chemical agents. These solid particles will retain about half of the agent that is found in a liquid droplet of the same size. Dusty agents present detection challenges but also have operational drawbacks. The reduced amount of agent produces less vapor and the smaller particles (generally designed to be <10 microns in size) have a shorter hazard duration that a neat liquid agent droplet of the same size. The operational drawbacks are that these agents can enter the body through the skin or be inhaled. They may also present a contact hazard if allowed to remain on the skin for extended periods. Dusty agents can be

released in a variety of climatic conditions; however, agent effectiveness varies greatly. Refer to current intelligence sources for further information.

A2.4.7. Agents of Primary Concern to Airbases. Artillery shells, rockets, bombs, grenades, mines, or missiles are all viable chemical agent delivery systems. Chemical agents can also be sprayed from air, land, and water vehicles or covertly used to contaminate food and water supplies. The most likely methods for chemical agent delivery on airbases are from missile attack, aircraft bomb or spray attack, or from special operations forces. Other delivery means are possible but do not allow an adversary to place a militarily significant quantity of an agent on the airbase because of distance or agent properties.

NOTE: The agents discussed within this manual are all products of older technology and do not include classified information or address novel agents. Contact the supporting intelligence agency for the most current information on current and new agent threats and properties. The primary agents of concern to airbase operations are summarized in **Table A2.7.** and described below:

A2.4.7.1. V-Series Nerve Agents. The nerve agent VX and its V-series foreign variants represent the most significant hazard to airbases. V-series nerve agents are the most toxic (about 100 times more toxic than Sarin), and most persistent of the current generation of chemical warfare agents. VX-contaminated surfaces produce very little vapor, due to the agent's slow rate of evaporation, but are a deadly contact hazard. VX is the most suitable agent for delivery by missiles and generally represents the most significant chemical threat to airbases threatened by TBMs.

A2.4.7.2. G-Series Nerve Agents. The G-series nerve agents are a much lower contact hazard than the V-series agents but produce far more vapor. The low vapor density causes them to evaporate quickly and create a larger downwind hazard. G-series agents are most effective against unmasked people or when used within enclosed areas.

A2.4.7.3. Mustard Agents. Distilled Mustard (HD) and variants are the most likely blister agents to be used against air base operations. These agents are designed to incapacitate personnel rather than kill.

A2.4.8. Detection and Identification. **Table A2.8.** summarizes Air Force chemical detector and monitor capabilities. See AFMAN 32-4017 for detailed information on detector capabilities and employment techniques.

Table A2.8. Air Force Chemical Agent Detection and Monitoring Capabilities.

Detector Or Monitor	Chemical Agent			Primary Operators
	Detection	Identification	Response Time[2]	
ABC-M8 Chemical Agent Detector Paper	GA, GB, GD, HD, HL, HN1, HN2, HN3, HT, VX, L	Categorizes as V, G, H	Instantly	All Airmen
M9 Chemical Agent Detector Paper	G, V, H, L	None	<20 Sec	All Airmen
M256A1 Chemical Agent Detector Kit[1]	V and G series, H, HD, HN, CX, AC, CK, L	Categorizes as Nerve, Blood or Blister	10-20 Min	CE Readiness
M8A1Automatic Chemical Agent Alarm	GA, GB, GD, VX	None	<1 Min	CE Readiness
M90 Chemical Agent Detector	Nerve and Blister	Categorizes as Nerve or Blister	<10 Sec	CE Readiness
M22 Automatic Chemical Agent Alarm	GA, GB, GD, VX, H, L	GA, GB, GD, VX, H, L	30-120 Sec	CE Readiness
Chemical Agent Monitor	Responds to GA, GB, GD, VX, H	Classifies as Mustard or Nerve	<1 Min	CE Readiness, BEE
M272 Chemical Agent Water Test Kit	H, L, AC, CK, G, VX	Distinguishes Between Classes	<20 Min	CE Utilities; BEE
ABC-M18A2 Chemical Agent Detector Kit[1]	G, V, CK, H, HD, HN, CX, AC, CG, L, CD, MD	CK, CX, L, MD, H, HD, HN, HT, AC, ED, V, G	8-20 Min	EOD and Technical Escort Teams

NOTES:

1. These kits also contain one book of M8 paper.
2. Varies with agent, concentration, temperature, and droplet size. Times represent the best case under ideal conditions.

A2.4.9. **Chemical Warfare Agent Hazard Duration Estimation.**

A2.4.9.1. **Hazard Duration.** Hazard duration is the time that must pass after a chemical attack before airmen can safely unmask or reduce MOPP without being affected by a subsequent one-hour exposure to vapor or a two-hand surface touch.

A2.4.9.1.1. Knowing the hazard duration time is critical to helping commanders maintain operational tempo following a chemical attack. Previous chemical warfare defense training tied unmasking and MOPP posture to chemical agent detection devices, such as chemical agent monitors (CAM), the M-8, or the M-22s. However, the review of chemical agent hazards

has demonstrated that these devices may not always be sensitive enough to register the presence of an unsafe liquid contact or vapor hazard.

A2.4.9.1.2. An exhaustive review of scientific literature (and recent live agent testing from several technically sound sources) provides a framework for determining the probable hazard duration associated with chemical agents. Hazard duration times vary by type (liquid contact vs. vapor), agent, surface, temperature, etc.

A2.4.9.2. **Liquid Contact Hazard.** Knowledge of liquid hazard duration is critical to the commander's risk management decision process. Liquid hazard duration determines the time until it is safe for personnel to have limited bare-skin contact with a contaminated surface. Previously, these times were tied to M-8 paper response. However, current procedures no longer rely exclusively on M-8/M-9 results. The liquid hazard table extends mission oriented protective posture (MOPP) times beyond M-8/M-9 sensitivity.

A2.4.9.2.1. Times (shown in hours) represent liquid contact hazards causing severe effects for 16% of the personnel that come into contact with the contaminated surface; they start after completion of the droplet fall. Recent studies noted that droplet fall may last up to one hour after the attack (munition function) occurs. Contact is defined as briefly placing the bare palms of both hands on the contaminated surface.

A2.4.9.2.2. Contact hazard does not equate to pickup and transfer hazard (transferring the liquid and cross-contaminating another person/object); it only refers to the contamination of skin after touching the liquid. For porous surfaces, such as asphalt and concrete, there is no expected pickup and transfer risk. Although a relatively large percentage of agent can transfer from one surface to another, contact with a third surface (even if most impervious) will result in a very small fraction of agent transferred. So while there may be a contact hazard there is not an operationally significant pickup and transfer hazard (reference Defense Threat Reduction Agency, *Data Report for the Chemical Warfare Agent Contamination Transfer Test,* WDTC-DD-02-067, October 2002).

A2.4.9.2.3. **Table A2.8.**2 provides a general summary of expected liquid hazard durations. Always remember that Civil Engineering Readiness Technicians and Bioenvironmental Engineering Officers/Technicians have the necessary tools and training to provide more refined estimates of the actual liquid hazard duration following a chemical attack. Liquid hazard toxicology is based on the Department of Defense accepted toxicology values from AD A392 849, Institute for Defense Analyses, Report of the Workshop on Chemical Agent Toxicity for Acute Effects, June 2001,for severe incapacitating dose of liquid at the 16% population response level.

A2.4.9.2.4. Liquid Hazard Table guidelines.

A2.4.9.2.4.1. The liquid hazard table includes results from temperatures between –5° and 50°C.

A2.4.9.2.4.2. Times used in the table are represented in hours (e.g., 0.1 equals 6 minutes, 0.5 equals 30 minutes, 0.9 equals 54 minutes, etc.).

A2.4.9.2.4.3. The table includes data for sixteen surfaces, any of which could be present on an air base.

A2.4.9.2.4.4. Times are listed for Tabun (GA), Sarin (GB), Soman (GD), Cyclosarin (GF), Distilled Mustard (HD), Russian VX isomer (R-33), and VX.

A2.4.9.2.4.5. An entry of "0" in a cell means that the contamination density is below the toxicology standard of either 100% transfer from the surface (for those cases where no transfer data is available) or below the level reported to be transferred by the experimental literature.

A2.4.9.2.4.6. A variety of munition types were used when estimating the hazard duration. Those, as well as temperature and wind speed, are combined in single cells within the table. This simplifies data display; however, the importance of wind speed on some surfaces, specifically grass and aircraft topcoat, is hidden.

A2.4.9.2.4.7. Example. **Table A2.8.**1 provides an example of chemical liquid hazards on concrete for wind speeds between 4-18 kilometers (or 2-11 miles) per hour:

A2.4.9.2.4.7.1. GA: The value is 0. This means there is no liquid hazard that would cause severe effects for 16% of personnel who briefly touch the contaminated surface, regardless of delivery means, wind speed or temperature.

A2.4.9.2.4.7.2. GD: The value is 0 in most cases; however, in a few (particularly in areas of high concentrations consistent with bomb delivery and ground burst craters, and low winds), the value was 0.5 (30 minutes).

A2.4.9.2.4.7.3. The entry for VX is 0 – 0.1. In some cases, the hazard would not cause severe effects for 16% of personnel who come into brief bare hand contact with the contaminated surface. Other cases show the hazard lasting up to 6 minutes. These variances were caused by differences in wind speed, delivery system, temperature, and method used when calculating the hazard duration.

A2.4.9.3. Temperature, wind speed, and atmospheric stability are key factors when determining where the agent is deposited, its contamination density, and droplet size. Deposited liquid will spread across the surface it contaminates. On porous surfaces, the agent will tend to be sorbed from the surface. Concrete tends to sorb agent quickly. Bare metal, on the other hand, sorbs very little agent. An agent remains a liquid contact hazard until it has sorbed, evaporated, or been decontaminated.

A2.4.9.3.1. Because hazard duration times reflect the 95th percentile of the highest contamination density area of the footprint, it is possible that 5% of the areas will have higher liquid hazard durations than those depicted in the table above.

A2.4.9.3.2. For ground burst munitions, the crater is expected to be the most highly contaminated area. It should be considered a liquid hazard longer than the time indicated on the table above while the rest of the deposition footprint will most likely have a lower contamination density/shorter hazard time.

A2.4.9.4. The table augments M-8/M-9 paper as a tool when making MOPP related decisions. However, it is important to understand the limitations and uses of M-8.

A2.4.9.4.1. When pre-positioned, M-8 is fairly effective at indicating the presence of liquid agent. Equipment, facilities, and vehicles with M-8 paper depicting the presence of an agent will be marked to identify contamination.

A2.4.9.4.2. Swiping/Patting a surface with M-8 paper after an attack has occurred may not detect the presence of a liquid hazard on a contaminated surface. Therefore, it is imperative that M-8 paper be pre-positioned before an attack.

A2.4.9.5. The skin on the palm of a hand is considered less sensitive than the average skin surface on the body. As such, it will allow less agent to penetrate than many other skin surfaces. Current practices do not allow live agent testing on live human skin, thus skin simulants are used (e.g., silicon rubber). The actual relationship between agent transfer amounts onto simulated skin vs. live human skin is unclear.

A2.4.9.6. **Vapor Hazard.** Vapor hazard duration associated with any chemical agent depicts the time after the agent reaches the surface until it is safe to unmask.

A2.4.9.6.1. Vapor hazards result from three processes:

A2.4.9.6.1.1. Munition function (generates both a chemical vapor and liquid contact hazard).

A2.4.9.6.1.2. Evaporation of droplets as they fall to the ground.

A2.4.9.6.1.3. Evaporation of droplets after landing on a surface (secondary evaporation).

A2.4.9.6.2. Munition function and fall phase evaporation constitute the primary vapor carried downwind. After liquid droplets reach the ground, they evaporate at rates determined by the volatility of the agent, wind speed on the surface of the droplet, and surface area of the droplet.

A2.4.9.6.3. As a liquid droplet spreads, the agent moves into voids and sorbs into the surface. This reduces the rate of vapor generation. Liquid agent deposited on an airbase will spread across surfaces and will be sorbed at different rates. Some surfaces tend to sorb agent very quickly. The longer it takes an agent to sorb, the more vapor is generated.

A2.4.9.6.4. The Vapor Hazard Tables are available through the HQ Air Force Civil Engineer Agency Web Site at: **https://wwwmil.afcesa.af.mil/**. These tables were developed using VLSTRACK 3.1. They characterize vapor dosage levels from chemical agents delivered by various weapon types in a variety of weather conditions. Weather conditions are characterized by atmospheric stability, wind speed, and temperature. Atmospheric stability is represented as either NEUTRAL (Pasquill stability category (PSC) D) or STABLE (PSC F). PSC D was used to represent conservative daytime atmospheric conditions; PSC F, nighttime conditions. The tables depict the time after an attack (e.g., munitions function) that vapor generated at breathing height would be expected to cause either lethal or mild effects for 16% of the personnel exposed. The DoD accepted values for mild effects (e.g., miosis), as listed in AD A392 849.

A2.4.9.6.5. Calculations use the 95th percentile highest dosage level of the footprint.

A2.4.9.6.6. Vapor hazard times are directly influenced by surface type, temperature, wind speed and atmospheric stability. However, these were assumed constant when producing the vapor hazard duration tables. Since these conditions change regularly throughout the day, actual hazard times may be different from those depicted on the tables. Civil Engineering Readiness Technicians and Bioenvironmental Engineering Officers/Technicians have the necessary tools and training to provide more refined vapor hazard duration estimates.

A2.4.9.6.7. Vapor Hazard Tables. The chemical agent vapor hazard duration tables available through the HQ Air Force Civil Engineer Agency Web Site for GA, GB, GD, GF, HD, R33,

and VX. These tables include expected hazard times for the seven primary operating surfaces found on airbases that contribute to area vapor hazard (e.g., Asphalt, Bare Ground, Concrete, Grass, Sand, Sandy Loam, and Tar and Chip). Other surfaces, such as glass and bare metal, represent a very small percentage of surface area on a base and are not expected to impact the area vapor hazard; however, they could present a local hazard for personnel working directly with/in close proximity to them. In these cases, personnel should use the 10-foot rule (see **A2.4.9.7.** below).

A2.4.9.6.7.1. The tables list predicted times a chemical agent remains a vapor hazard at temperatures of –5, 10, 25, and 50 oC. If using a temperature between the listed values, use the higher temperature values to quickly determine the worst case. Release altitude is listed by either low (20m - 250 m above ground level (AGL)) or high (over 1000 meters AGL). Tables are listed by agent and primary operating surface and include four data sets:

A2.4.9.6.7.1.1. Time Vapor Hazard causes lethal effects in 16% of the population exposed (LCt 16).

A2.4.9.6.7.1.2. Time Vapor Hazard caused mild effects (e.g. miosis) in 16% of the population exposed (ECt 16).

A2.4.9.6.7.1.3. Times M-22 ACADAs detect the presence of a Vapor Hazard.

A2.4.9.6.7.1.4. Times CAMs detect the presence of a Vapor Hazard.

A2.4.9.6.7.2. Multiple delivery types and various meteorological conditions were examined for each agent and surface combination.

A2.4.9.6.7.3. Cases are color-coded to indicate the time range of the hazard, as follows:

A2.4.9.6.7.3.1. **Dark Green** : Hazard duration is less than 1 hour

A2.4.9.6.7.3.2. **Lighter Green** : Hazard duration is between 1 and 6 hours

A2.4.9.6.7.3.3. **Yellow** : Hazard duration is between 6 and 12 hours

A2.4.9.6.7.3.4. **Orange** : Hazard duration is between 12 and 24 hours

A2.4.9.6.7.3.5. **Red** : Hazard duration is between 24 and 72 hours

A2.4.9.6.7.4. **Table A2.8.**3. details times VX on concrete will cause mild effects in 16% of the exposed population. For a daytime TBM attack (high altitude) at 10oC with 2 knot winds, a vapor hazard is expected to be present for 9 hrs. The same attack with at night would not be expected to produce a significant vapor hazard. NOTE: A low altitude reflects optimal release for small droplets given a supersonic TBM, while a high altitude reflects optimal release for large droplets given a subsonic TBM.

A2.4.9.6.7.5. **Table A2.8.**4 summarizes the results as a percentage of cases examined. For example, at 10 oC on Concrete, the VX Vapor Hazard was less than 1-hr in 75% of the cases, 6-12 hours in 8% of the cases, and 12-24 hours in 17% of the cases. The impact of temperature on the duration of the vapor hazard is a function of the agent volatility. Therefore, the temperature range creating the longest vapor hazard will differ for each agent. Wind speed is also a very important factor. Lower wind speeds cause all agents to have longer vapor hazard durations.

A2.4.9.6.7.6. **Table A2.8.**5. shows the expected M-22 ACADA vapor detection response (in hours) for the same VX combination of weapon, temperature, wind speed and atmospheric stability on concrete. By comparing the times listed in **Table A2.8.**3 and **Table A2.5.**, one can see that vapor hazards are present in many cases when the ACADA would not alarm. The same is true of CAM Detector Response Duration tables on the HQ AFCESA Web Site. Therefore, it is important to work with Civil Engineering Readiness Technicians and Bioenvironmental Engineering Officers/Technicians to establish safe unmasking guidance based on these tables rather than relying solely on currently available vapor detectors when making unmask decisions.

A2.4.9.6.7.7. The vapor hazard tables hold temperature, wind speed, and atmospheric stability constant for the duration of the hazard measurement period. In reality, these environmental factors are constantly changing throughout the day. If the hazard time reported in the table is long (e.g., greater than 6 hrs), changes in temperature and wind speed would be expected to affect the real duration of the hazard. It is crucial that Civil Engineering Readiness Technicians and/or Bioenvironmental Engineering Officers/Technicians conduct base-specific assessments of the vapor hazard duration using actual temperatures and wind conditions. This helps refine hazard estimates and may allow the return to reduced MOPP postures quicker than the use of static tables would allow. In some cases, hazards may have appeared to pass only to appear at a later time as environmental changes occur.

A2.4.9.7. **10-Foot Rule.** The 10-foot rule was developed in order to provide guidance for protecting personnel that had to use and/or handle chemically-contaminated resources or work in locations with materials that might retain a residual chemical hazard longer than the major terrain surface area on which it is located. The 10-foot rule embodies a safety factor that goes beyond current OSD guidance (which allows removal of IPE whenever detectors no longer detect a chemical agent vapor hazard).

A2.4.9.7.1. The basic tenets of the 10-foot rule:

A2.4.9.7.1.1. The 10-foot rule provides guidelines in the form of probable time ranges that residual chemical hazards are likely to exist. The times are not absolute guarantees of safety. Personnel must be cognizant of the circumstances that significantly affect the time estimates and remain alert for evidence of chemically-induced symptoms in themselves or co-workers.

A2.4.9.7.1.2. The 10-foot rule addresses the potential presence of residual contamination originating from relatively non-porous equipment surfaces such as painted or bare metal and glass.

A2.4.9.7.2. There are two phases associated with the 10-foot rule.

A2.4.9.7.2.1. Initial Phase. During the initial phase, personnel will remain in MOPP 4 whenever they stay within 10 feet of the contaminated equipment for more than a few seconds. This MOPP level provides personnel the maximum protection from the chemical agent as it transitions from a contact and vapor hazard to a vapor hazard only.

A2.4.9.7.2.2. Follow-on Phase. In the follow-on phase, personnel will use gloves of any sort (i.e., leather, rubber, cloth, etc.) when operating on or handling the contaminated equipment. Although a contact hazard is unlikely, relatively small amounts of the agent

may still be present. The use of gloves will ensure that unnecessary bare skin contact with agent residue is avoided.

A2.4.9.7.3. **Table A2.8.**6. shows times associated with initial and follow-on phases of the 10-Foot Rule. To simplify response processes, commanders may choose to use the worst case scenario as the foundation for all 10-foot rule actions i.e., 24 hours for the initial phase and all periods of time greater than 24 hours for the follow-on phase.

A2.5. Toxic Industrial Materials (TIM):

A2.5.1. Introduction:

A2.5.1.1. TIM hazards, previously considered insignificant during wartime, increase greatly in significance when they are manufactured, stored, distributed, or transported in close proximity to airbases. Deliberate or inadvertent release during Military Operations Other Than War (MOOTW) significantly increases hazards to indigenous population and US forces. While wartime chemical agents are highly toxic and lethal in small amounts, the countries that produce them are generally known and are few in number when compared with the quantities and universal nature of TIM. TIM should be recognized for the single hazard they pose as well as the potential risks that may result from explosion or fire. Most present a vapor (inhalation) hazard. This vapor concentration may be very high at or near the point of release. It may also reduce the oxygen concentration below that required to support life. TIM are generally categorized as shown in **Table A2.9.**

A2.5.1.2. Forces will always operate in environments in which there are toxic materials and toxic industrial chemicals present. These materials or chemicals may be located on the airbase and under US or host-nation control, or located in a commercial or government controlled facility outside of the airbase perimeter. If an uncontrolled or deliberate release occurs, these have a significant impact on the full range of military operations. Most TIM are released as vapors. These vapors exhibit the same dissemination characteristics as chemical warfare agents. The vapors tend to remain concentrated downwind from the release point and in natural low-lying areas such as valleys, ravines, or manmade underground structures. High concentrations may remain in buildings, woods, or any area with low air circulation. Explosions may create and spread liquid hazards, and vapors may condense to liquids in cold air.

Table A2.9. Chemical Liquid Hazard Example.

	KPH	MPH	GA	GB	GD	GF	HD	R-33	VX
Concrete	4-18	2-11	**0**	**0**	**0-0.5**	**0***	**0**	**0-***	**0-0.1**

A2.5.2. Planning. Analyze potential TIM sources and assess the potential effect of a release from on- and off-base sources. Follow planning and response guidelines in AFI 10-2501, AFMAN 10-2502, and AFMAN 32-4002, *Hazardous Materials Emergency Response Planning*. Use the current version of the National Institute for Occupational Safety and Health, *Pocket Guide to Chemical Hazards*, and US Department of Transportation, *Emergency Response Guidebook*, to pre-plan actions, respond to incidents, and predict downwind hazard distances for day or nighttime release. See the HQ AFCESA publication, *Protective Actions for Hazardous Material Releases,* for protective actions and shelter-in-place planning guidelines for hazardous material releases.

A2.5.3. Protection. The most important action if a TIM is released is immediate evacuation of personnel outside the hazard area. The GCE and military standard collective protection filters are not

designed to provide protection from TIM. If evacuation is impractical, implement the wartime shelter-in-place procedures outlined in **Chapter 5**. Use the U.S. Department of Transportation, *North American Emergency Response Guidebook*, to identify individual protective equipment requirements for specific hazards. The greatest risk from a large-scale toxic chemical release occurs when personnel receive little or no warning, are unable to escape the immediate area, and are overcome by vapors.

A2.5.4. Detection and Identification. Fire protection forces and the bioenvironmental engineer can provide limited detection and identification of TIM. The most effective method is to identify potential threats prior to release and develop response plans tailored to counter these threats should a release occur.

A2.6. Conventional Weapons:

A2.6.1. Introduction. Three types of conventional weapons are considered threats to airbases. They are direct-fired weapons, indirect-fired weapons, and explosives. **Table A2.15.** shows some typical weapons and their effects. You must know the type of weapons you are defending against to determine the correct design and placement of protective shelters, revetments, and individual cover. Direct-fired weapons fire a projectile that is designed to strike a target and penetrate the exterior protection. Direct-fired weapons are normally highly accurate, low trajectory weapons (e.g., tanks, anti-tank guns, automatic cannons, and small arms). Indirect-fired weapons are mortars, artillery shells, rockets, missiles, and bombs; they rely on blast and fragmentation to affect the target. They have a higher trajectory and steeper angle of drop.

Table A2.10. Liquid Contact Chemical Hazard Estimates for Selected Airbase Surfaces.

Temperature -5 -50o Celsius ---- Wind Speed 4-18 KPH (2-11 MPH) ---- Severe effects for 16th Percentile Population Response	Liquid Chemical Agent Hazard (In Hours)1,2						
Surface	GA Tabun	GB Sarin	GD Soman	GF Cyclosarin	HD Distilled Mustard	R-33 (Russian VX Isomer)	VX
Concrete	0	0	0-0.5	0*	0	0-*	0-0.1
Asphalt	0	0	0*	0*	0*	0*	0-0.9
Grass	0	0	0*	0*	0-0.2	0*	0-33
Sand	0	0	0*	0*	0*	0*	0-0.5
Sandy Loam	0	0	0*	0*	0*	0*	0-1
Bare Ground	0	0	0*	0*	0-0.1	0*	0-1
Tar and Chip	0	0	0*	0*	0*	0*	0*
AC Topcoat	0	0	0*	0*	0-0.3	0*	0-14
CARC Paint	0	0	0*	0*	0	0*	0*
Alkyd	0	0	0*	0*	0	0*	0-1
Polyurethane	0	0	0*	0*	0	0*	0*
Glass	0	0	0-3	0*	0	0*	0*
Bare Metal	0	0	0-3	0*	0-0.8	0*	0*
Wood	0	0	0*	0*	0*	0*	0-1
Snow	0	0	0*	0*	0*	0*	0
Ice	0	0	0*	0*	0*	0*	0*

NOTES:

1. Based on 95th percentile highest deposition results from VLSTRACK 3.1 using a range of tactical ballistic missile and bomb attacks.

2. Assumes 420 cm2 hand as pick-up area for severe effects 16% response dose based on experimental pickup data adjusted by relative skin penetrability of palm vice whole body spatial average.

* The entries reflect the expected hazard duration (after the completion of liquid deposition; may take from 2-60 minutes), but in some cases, particularly involving high concentrations of large droplets associated with bomb delivery and/or ground burst craters, the contact hazard could extend for longer periods. However, there is currently not sufficient data to estimate what that hazard duration would be with 100% transfer. Hazards are possible but we cannot predict if/how long the risk exists.

A2.6.2. Explosive Effects. When an explosive is detonated, the primary effects are the result of blast overpressure and fragmentation. Fires may also result from the heat produced by the blast, incendiary components from the weapon, or from the ignition of flammable material near the detonation. Knowledge of explosive effects can enhance survival during attacks and aid in the selection and construction of protective shelters. Detailed information on blast effects, calculation of blast standoff distances, and planning factors are in AFH 10-222V4*, Guide To Civil Engineer Force Protection*, and AFP 32-1147(I*), Design Analysis of Hardened Structures to Conventional Weapons Effects*. Contact the Civil Engineer Explosive Ordnance Disposal Flight for further information.

A2.6.2.1. Blast Overpressure. Structural and material damage and personnel casualties resulting from the detonation of explosives are due primarily to the force of the blast. This force, measured in pounds per square inch (psi), is called blast overpressure. Blast overpressure normally radiates equally away from the point of detonation like a wave. Strength (in psi) decreases as the distance from the detonation point increases. A plot of specific psi values would result in a series of circles around the point of detonation. The sizes of these circles are in direct proportion to the amount of explosive detonated. The bigger the explosion, the farther away the blast wave will be felt. Likewise, the amount of damage and casualties per detonation is in direct relation to the amount of explosive and the separation distance of structures and personnel involved. The bigger the explosion and the closer you are to it, the greater the damage. As the distance from the explosion increases, there is a point where the blast overpressure, although still present, will not have a harmful affect on personnel. This point is called the safe-blast distance. Blast overpressure estimates are based upon the total amount of explosives involved. If two or more munitions are expected to detonate at the same time, their explosive weights are added together and all calculations are based on the combined explosive weight.

A2.6.2.2. Fragmentation. Secondary to blast damage is damage caused by fragmentation, or the projectiles created by the breakup of the munitions cases. Generally, there are two types of munitions cases: light and heavy. Light case munitions are those with thin, light cases of metal or other material, or no case at all. Damage results primarily from blast overpressure, since the case, if any, produces lower concentrations of lighter fragments around the point of detonation. Heavy case munitions are those having a thick, heavy wall case. Damage results primarily from fragmentation, since these munitions are designed to cause a higher concentration of heavier fragments to radiate out from the point of detonation. The distance fragments travel is based on a single munition. If two or more munitions are expected to detonate at the same time, only the explosive weight of the single item with the greatest explosive potential is used to calculate the fragmentation distance. Similar to overpressure, fragmentation usually radiates equally away from the point of detonation. The velocity of the fragments decreases as the distance from the detonation point increases. The point at which fragments are traveling too slowly to penetrate bare skin is called the safe-fragmentation distance.

A2.6.3. Protective Actions. Civil Engineer technicians can determine the most effective hardening methods and protection actions required to defeat explosive threats. They can also provide advice and training on construction methods using locally available materials. For most deployments, expedient hardening will be provided for base facilities and equipment during the initial beddown. When available, common materials should be used for protection of facilities and equipment. For existing structures, use expedient hardening to increase protection. However, the ideal situation is to incorporate hardening into the initial facility construction before hostilities begin and harden the structure to defeat the worst-case threats. **Chapter 5** and **Attachment 7** provide guidelines for hardening. See

AFH 10-222V14, *Guide to Fighting Positions*, for standard expedient shelter designs and construction methods.

Table A2.11. Vapor Hazard Duration Estimate for VX on Concrete (16% Mild Effects).

Vapor Hazard VX On Concrete ECt 16									
		Stability		PSC D	PSC F	PSC D	PSC F	PSC D	PSC F
		Wind Speed (knots)		2		6		10	
Agent	Release	Munition	Temp °C (°F)						
VX	Low Alt.	TBM	-5 (23)	0.21	0	0.0	0	0.03	0
VX	High Alt.	TBM	-5 (23)	0	0	0.0	0	0	0
VX	Low Alt.	TBM	10 (50)	24.0	16	0.49	0	0.3	0.1
VX	High Alt.	TBM	10 (50)	9	0	0	0	0.1	0.0
VX	Low Alt.	TBM	25 (77)	72	72	3.57	1.5	1.88	0.9
VX	High Alt.	TBM	25 (77)	72	20	4.6	0.43	0.6	0.22
VX	Low Alt.	TBM	50 (122)	72	72	56.19	72	45.19	22.19
VX	High Alt.	TBM	50 (122)	72	72	43.19	16	7.8	13.5

Table A2.12. VX Vapor Hazard Duration Estimate on Concrete (% of cases).

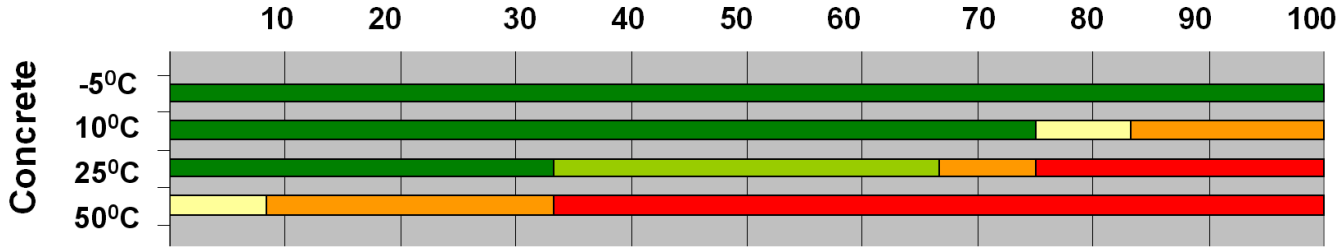


Table A2.13. VX on Concrete M-22 Detector Response Duration.

Vapor Hazard VX On Concrete ACADA Detector Times									
		Stability		PSC D	PSC F	PSC D	PSC F	PSC D	PSC F
		Wind Speed (knots)		2		6		10	
Agent	Release	Munition	Temp °C (°F)						
VX	Low Alt.	TBM	-5 (23)	0.01	0	0.0	0	0	0
VX	High Alt.	TBM	-5 (23)	0	0	0.0	0	0	0
VX	Low Alt.	TBM	10 (50)	0.0	0	0.01	0	0.0	0.0
VX	High Alt.	TBM	10 (50)	0	0	0	0	0.0	0.0
VX	Low Alt.	TBM	25 (77)	0	0	0.06	0.03	0.04	0.0
VX	High Alt.	TBM	25 (77)	0	0	0.0	0.01	0.01	0.01
VX	Low Alt.	TBM	50 (122)	4	3	0.66	0.39	0.35	0.27
VX	High Alt.	TBM	50 (122)	3	4	0	0	0.2	0.1

Table A2.14. Time Ranges Associated with the 10-Foot Rule.

"10-Foot Rule" Time Standards*		
Agent	**Initial Phase**	**Follow-on Phase**
HD	0-12 hrs	Greater than 12 hrs
GB	0-12 hrs	Greater than 12 hrs
GD, GF, GA	0-18 hrs	Greater than 18 hrs
VX, R33	0-24 hrs	Greater than 24 hrs
* Rule is based on expected contamination on an airbase following a chemical attack. Adjust times if agent concentration is higher than expected.		

Table A2.15. Typical Weapons and Effects.

Weapon Type	Typical Effects
Projectiles	
Small Arms and Aircraft Cannon	Projectile Penetration, Spalls
Direct and Indirect-Fired Weapons	Airblast, Fragment Penetration, Projectile Penetration, Spalls
Grenades	Projectile Penetration
Bombs	
Fire and Incendiary	Fire
Dispenser and Cluster	Fragment Penetration
High Explosive	Blast, Fragment Penetration, Ground Shock, Cratering, Ejecta
Rockets and Missiles	
Tactical Weapons	Projectile Penetration, Airblast
Battlefield Support	Blast, Fragment Penetration, Ground Shock, Cratering, Ejecta
Special Purpose Weapons	
Fuel-Air Munitions	Airblast
Incendiary	Intense Heat, Noxious Gas, Oxygen Depravation
Demolition Charges	In-Structure Shock, Blast, Cratering, Ground Shock

Attachment 3

PRE-CONFLICT, ATTACK RESPONSE, AND POST-CONFLICT OPERATIONS

Section A3A— Pre-Conflict Actions

A3.1. Introduction:

A3.1.1. In-place and deployed forces must be prepared to conduct combat operations as required by Air Force, theater, or MAJCOM directives. Pre-conflict actions prepare forces for operations in NBCC threat areas. These actions require a readiness strategy designed to train and equip forces to counter the expected threats. This strategy includes training and equipping personnel, identifying shortfalls and limiting factors, and developing or reviewing base and joint support plans. Use existing unit and airbase-level exercises to complement training requirements, emphasize airman common core skills, and focus on team and unit task integration. Include exercise objectives to evaluate leadership effectiveness and assess unit readiness.

A3.1.2. When a crisis or conflict arises, mobility operations and force deployments begin. In-place forces will begin their transition to wartime operations and prepare to accept and beddown the deploying forces. These wartime operations build upon deliberate planning assumptions and focus efforts on the current threat, situation, and mission. Pre-, trans-, and post-attack actions support transition to wartime operations, survival, recovery, and mission sustainment. Successful conflict termination is followed by an orderly transition of forces from combat to post-conflict operations.

A3.1.3. Effective wartime operations require coordinated and integrated actions at all levels. When appropriate, the actions within this chapter identify one or more responsibility levels for execution. At the highest level, the WOC and SRC direct airbase-level actions (AIRBASE) to maintain overall mission focus and operations tempo. At the intermediate level, the unit commander directs actions through their unit control center, subordinate work centers, and team leaders (UNIT). At the lowest level are actions that are the responsibility of each airman (AIRMAN). This separation by level allows for rapid identification of both tasks and responsibilities. It also supports and simplifies the development and integration of airbase and unit standard operating procedures and execution checklists.

A3.1.4. This chapter contains three sections that provide common actions and considerations for wartime operations. **Section A3A** covers pre-conflict actions and preparedness. **Section A3B** lists attack actions. It provides pre-attack and post-attack actions for alarm conditions Green and Yellow, trans-attack actions for Alarm Red, and post-attack actions to accomplish in Alarm Black. **Section A3C** provides post-conflict actions to support reconstitution after hostilities cease.

A3.2. Plans and Training:

A3.2.1. Identify and train deploying or in-place military, DoD civilian, contract, and host nation personnel who have not received NBCC Defense training within the previous 18 months. (AIRBASE)

A3.2.1.1. Train personnel, including those TDY and transient, to accomplish last-second contamination avoidance actions and seek overhead cover and physical protection prior to attacks. (AIRBASE, UNIT)

A3.2.2. Identify and train other non-combatants at overseas locations in accordance with theater or Department of State directives. (AIRBASE)

A3.2.3. Form the Airbase Threat Working Group. Assess the current NBCC and terrorist threat at both home station and the deployment location. Provide this assessment to the Installation Readiness Council. (AIRBASE)

A3.2.4. Review the airbase FSTR Plan 10-2 and the base or joint support plan for each potential deployed and transient location. Ensure plans include the procedures, manpower, and material to enable an airbase to accomplish the tasks in **Table 1.2.** Coordinate with the plan OPR and advise the reception base or transient location of unique support requirements. Where possible, conduct a site survey at each deployment location. See AFI 10-404, *Base Support Planning*, for expanded information and specific responsibilities. (AIRBASE, UNIT)

A3.2.5. Develop plans and standing operating procedures to protect sortie generation and strategic airlift throughput capability. Include procedures for cross-functional actions and support. See theater plans and the HQ AMC *Air Mobility Operations in a CB Environment (CB CONOPS)*. (AIRBASE)

A3.2.6. Identify NBC manpower and material support requirements beyond UTC requirements within host-nation agreements and interservice support agreements. Include support provided by the host-nation and support provided to the host-nation at both the installation and unit level. (AIRBASE)

A3.2.7. Identify and provide collective protection spaces for in-place and deployed Air Force personnel as required by theater or MAJCOM guidance. If theater or MAJCOM guidance is not provided, plan to provide rest and relief collective protection for at least 30 percent of the force and toxic free area rest and relief for at least 20 percent of the force per shift. Use any combination of Class I-IV transportable, fixed facility, or expedient collective protection systems. Include additional space, if required, to protect transient aircrew and passengers. For planning, assume collective protection shelters and toxic free areas used for rest and relief will operate two twelve-hour shifts and provide the capability to protect at least 50 percent (30 percent with collective protection, 20 percent with toxic free areas) of the airbase population per shift. See **Attachment 7** for all other collective protection requirements. Consider adding additional capability to account for system attritions. Plan to sustain this capability for up to 96 hours (continuous or 12-hour segments) within a 30-day period. (AIRBASE, UNIT)

A3.2.8. Identify and provide contamination control area (CCA) capability for in-place and deployed Air Force personnel as required by theater or MAJCOM guidance. If theater or MAJCOM guidance is not provided, plan to process at least 20 percent of the airbase population during a 24-hour period. Include additional capability, if required, for transient aircrew and passengers. Reduce the CCA processing requirements by the number of personnel that will use Class I through IV collective protection CCA. Where feasible, include procedures to rapidly process minimally injured (ambulatory) personnel through non-medical CCA. This speeds access to medical treatment and reduces the burden upon medical decontamination teams. For planning, assume the CCA will operate two twelve-hour shifts and provide the capability to process at least 10 percent of the airbase population per shift. Consider adding additional capability to account for system attritions and CCA surge processing capability. Plan to sustain this capability for up to 96 hours (continuous or 12-hour segments) within a 30-day period. See AFMAN 32-4005 for detailed CCA procedures. (AIRBASE, UNIT)

A3.2.9. Identify NBCC augmentation manpower needs for airbase and unit teams. Assign and train personnel. Requirements may include contamination control area, post-attack reconnaissance, shelter

management, and command and control teams. Deliberate planning guidelines for identifying specialist and augmentation support for NBCC defense are in AFI 10-404, *Base Support and Expeditionary Site Planning*; USAF WMP-1, Annex S*; NBCC Defense;* and AFI 10-217*, Resource Augmentation Duty (READY) Program.* (AIRBASE, UNIT)

A3.2.10. Evaluate the need for and the ability of the airbase to implement an effective airbase defense sector and NBCC zone plan. If warranted, develop a plan and identify zones or sectors on base maps. Train the base populace and command and control elements to execute these operations. (AIRBASE)

A3.2.11. Consolidate multiple planning requirements into existing plans or documents whenever possible. For example, include hardening, dispersal, and contamination avoidance cover planning in the FSTR Plan 10-2 and the base or joint support plan. (AIRBASE, UNIT)

A3.3. Material:

A3.3.1. Identify the minimum theater, MAJCOM, and local requirements for NBCC equipage. Develop plans and procedures to obtain the quantity of material needed to meet minimum requirements and sustain operations for up to 30 days. (AIRBASE, UNIT)

A3.3.2. Issue IPE and medical pre-treatment materials and nerve agent antidotes to and train DoD civilian, and contract personnel (in accordance with contract) deploying to or stationed in medium and high NBCC threat areas. Issue IPE to and train host nation personnel in medium and high NBCC threat areas as required by theater or MAJCOM guidance. Direct personnel to inspect their equipment to identify deficiencies and provide assistance to resolve discrepancies. Do not issue equipment to deploying personnel that will reach shelf-life limits within 180 days of the deployment date. Identify shortages and unresolved deficiencies to higher headquarters. (AIRBASE, UNIT, AIRMAN)

A3.3.3. Verify individuals have completed mask-fit training. (see AFMAN 32-4006, *NBC Mask Fit and Liquid Hazard Simulant Training*). (AIRBASE, UNIT, AIRMAN)

A3.3.4. Verify individuals have required eyeglasses and protective mask inserts. Correct deficiencies. (AIRBASE, UNIT, AIRMAN)

A3.3.5. Protect bulk stored or palletized IPE and NBC equipment from weather, contamination, abuse, and theft. Double-wrap with plastic tarps or contamination avoidance covers. Periodically check for damage. (AIRBASE, UNIT)

A3.3.6. Stockpile or plan to deploy materials that are essential for plan and mission execution. Contamination control items must be available at the in-place or deployment location. This includes items such as bulk plastic sheeting, contamination avoidance covers, materials to produce chlorine-based decontamination solutions, or other approved decontamination products or systems. Available options include pre-positioning, War Reserve Material, unique contamination-control UTCs, and established unit-level UTCs. Periodically review these requirements for the appropriate type, quantity, and procedures to ensure material serviceability. Stockpiles should be convenient to their point of use, configured for rapid dispersal to improve survivability, and secure from pilferage. (AIRBASE, UNIT)

A3.4. Medical:

A3.4.1. Verify individuals are medically qualified to deploy. (AIRBASE, UNIT)

A3.4.2. Ensure individuals have received all required immunizations. (AIRBASE, UNIT, AIRMAN)

A3.4.3. Review medical intelligence sources for NBC threats and treatment methods. (AIRBASE)

Section A3B—Attack Actions

A3.5. Overview . Pre-attack actions begin upon receipt of the mobility warning order or when the in-place forces are directed to transition to wartime operations. Pre-attack action executed during Alarm Green and Alarm Yellow prepares the airbase for attack. Trans-attack actions focus primarily upon individual and weapons system survival. Post-attack actions focus upon saving lives, detecting and mitigating hazards, mission restoration, and sustainment. Actions within any of the attack phases may be a continuation or refinement of actions initiated during earlier operations. If attacks have already occurred, priority restoration operations will continue when Alarm Green is declared. The airbase will also replenish, repair, or replace lower priority resources expended, damaged, or destroyed in previous attacks or operations. **Table A3.1.** provides commanders with a comparison of Civil Engineer and Medical NBCC tasks during the pre-attack phase. Detailed medical TTP are outlined in AFTTP 3-42.3, *Health Service Support in Nuclear, Biological and Chemical Environments* (Draft).

Table A3.1. Civil Engineer and Medical NBCC Tasks - Pre-Attack Phase

Pre-Attack Phase	
Civil Engineer UTCs*	**Medical UTCs****
Conduct NBC agent and conventional weapon hazard analysis. Provide detailed assessments to the Commander on NBC agent identification, characteristics, persistency, and hazards. Develop the airbase hardening and camouflage, concealment and deception plan . Coordinate NBCC defense measures with host-nation and joint service NBC forces. Identify materiel and utility requirements (increased water and fuel consumption rates) to support sustained operations in NBC environments. Identify training and equipage shortfalls; resolve deficiencies. Determine threat-based NBCC passive defense measures. Identify warning times for air, missile, and ground threats. Set up and operate the airbase NBC detection system. Establish the airbase element of the theater or Joint Forces NBC Warning and Reporting System (NBCWRS). Monitor NBC contamination status of recovery airfields. Determine NBC environmental sampling methods and handling procedures. Establish and operate the NBC Defense Cell and provide liaison to the host-nation or Joint Forces NBC Defense Cell. Conduct just-in-time training for military, civilian, family members, and contract personnel. Conduct mask-fit testing for personnel not fitted. Train the SRC and UCCs on attack actions and reporting. Evaluate the airbase attack warning system. Assist the SRC develop responses to likely threat and mission scenarios. Develop the airbase contamination avoidance plan and advise units on methods to implement actions. Assist Supply determine initial and sustainment (30 days) requirements for NBCC defense equipment and supplies. Develop the airbase shelter plan and manage operations.	Operate the MTF and assigned medical assets. Coordinate on casualty collection point and patient retrieval plans and mechanisms. Assist the WOC, SRC, and NBC Defense Cell with NBC pre-attack risk assessment and management. Provide NBC medical surveillance including the tracking and epidemiological assessment of disease incidence to aid in the recognition of covertly delivered biological or chemical agents, advice on health hazard control, and NBC detection at medical treatment facilities (***NOTE:*** Medical surveillance includes surveillance necessary to assess both short and long-term health threats, identify agents, and assess agent exposure). Conduct environmental baseline, food, water, disease, and industrial hazard vulnerability assessments (health related). Provide information on toxic industrial material, directed energy weapon effects, patient care and treatments, and heat and cold stress determinations. Conduct lab analysis of clinical and environmental samples for pathogens. Employ epidemiological and disease reporting systems, such as the Global Expeditionary Medical System (GEMS). Tailor medical assessments to meet the local tactical situation and current NBC intelligence and enemy threat assessments. Provide the commander with advice on medical and health-based NBC risk assessments, health threat and medical intelligence, disease surveillance and reporting, and casualty prevention through individual protection (immunizations, prophylaxis, and chemical countermeasures). Provide human health data on potential threat agents to commanders . Recommend and provide NBC immunizations and chemoprophylaxis. Establish detection system at the medical facility. Determine BW sample handling procedures. Initiate medical surveillance to support early BW identification. Conduct or arrange for presumptive identification and diagnosis of suspect biological warfare agents.

Pre-Attack Phase	
Civil Engineer UTCs*	**Medical UTCs****
Train shelter and collective protection teams to operate and maintain systems. Develop and construct expedient collective protection shelters. Erect and maintain collective protection systems. Develop the airbase CCA plan and manage CCA operations. Develop contaminated waste collection, storage, and disposal plan. Develop the airbase decontamination plan and manage decontamination operations. Train CCA and decontamination teams and develop standard team responses to likely threat and mission scenarios. Assist Supply develop IPE protection, dispersal, and distribution plans. Provide alarm condition and MOPP level recommendations based upon threat.	Check ventilation in shelters; provide advice on medical aspects of shelters. Establish patient decontamination capability at the MTF. Establish decontamination capability for medical equipment, vehicles, and shelters. Coordinate with medical facility commander, SMEs, and Casualty Collection Points, to establish contaminated patient flow patterns. Advise in support of reduced MOPP level recommendation (health/medical effects).
* Includes deployable Civil Engineer Prime BEEF, Explosive Ordnance Disposal, Full Spectrum Threat Response, and Fire Protection elements. Fixed facilities perform these missions with organic assets. ** Depending upon availability of in-place and/or deployable medical assets, the following deployable medical elements advise the commander and/or perform the listed medical missions: Bioenvironmental Engineer NBC Team, Medical Patient Decontamination Team; Prevention and Aerospace Medicine Team, and Biological Augmentation Team. Fixed facilities perform these missions with organic assets.	

A3.6. Alarm Green - Attack is Not Probable:

A3.6.1. Update the current NBCC threat intelligence information. Review current intelligence information every 12 hours (or as new information is available). Review attack reports from other theater locations to determine enemy behavior and tactics. (AIRBASE)

A3.6.2. TBM attacks will likely include chemical or biological agents; therefore, conduct accurate and timely threat assessments to determine the appropriate alarm condition, MOPP level, and "last second" contamination avoidance actions. (AIRBASE)

A3.6.2.1. Train personnel to remain within protected areas until otherwise directed by the chain of command (may be up to 60 minutes). Train personnel who are directed to perform outside operations within 60 minutes after a TBM attack exploit as much overhead cover as possible and maximize use of contamination avoidance measures (perform immediate decontamination; cover with ponchos and rain gear). (AIRBASE, UNIT, AIRMAN)

A3.6.3. Upon initial declaration, recall forces and activate the WOC, SRC, and unit control centers. Direct 24-hour operations for primary and alternate command and control functions. Review standard operating procedures and conduct action drills for likely threat and mission scenarios. Identify time-phased actions by threat, mission priority, and the availability of resources. Initial NBCC defense priorities should focus on attack detection and warning, protection, and mitigation of specific threats and threat weapon systems. Follow-on priorities include recovery, mission sustainment, defense enhancements, and maintenance of existing capabilities. (AIRBASE, UNIT)

A3.6.4. Contact the theater or joint force agency responsible for air, ground, and missile attack warning and defense. Verify the procedures and timelines for how the airbase receives theater missile, aircraft, and ground forces attack warning and how the airbase reports attacks. Identify each primary warning point and determine the time required to warn the airbase under each likely attack scenario. Identify secondary warning methods and plan for 24-hour coverage. Test both the primary and secondary warning methods and procedures. (AIRBASE)

A3.6.5. Review airbase warning signals and alarm conditions. Provide visual aids and current information to each unit control centers, the base population, and all assigned, attached, coalition, and host-nation forces. Develop multilingual visual aids and public address systems announcements. Include warning procedures for geographically separated units, non-combatants, and enemy prisoners of war. (AIRBASE)

A3.6.6. Develop command and control system procedures to rapidly receive notice of TBM launch, adjust mission focus, and disseminate warning to all base personnel. (AIRBASE)

A3.6.7. Verify the operation and coverage of the base warning system. Verify the actual times required to notify the airbase population under each warning method (base siren, public address system, radio net, and telephone). Verify the warning system is able to provide attack warning and notification to 100 percent of the airbase population within 10 minutes. (AIRBASE, UNIT)

A3.6.8. Implement MOPP operations based upon the current threat. Consult with Civil Engineer Readiness and Medical personnel to determine the projected MOPP, work-rest cycles, and hydration standards for the next 24-hour period. Notify the base populace and re-evaluate every 12 hours or when climatic conditions significantly change. Determine the need for MOPP options and direct when appropriate. Based upon threat, direct personnel to wear field gear and personal body armor (if issued) in addition to the current MOPP. On a case-by-case basis, delegate MOPP authority to subordinate commanders. Direct personnel who wear contact lenses to remove them and wear spectacles or spectacle inserts. (AIRBASE, UNIT, AIRMAN)

A3.6.9. Implement the airbase zones or sector plan to support the movement of contaminated assets (people and equipment) between zones or sectors. Identify critical post attack recovery teams (EOD, airfield damage assessment, building damage assessment, NBC reconnaissance, and firefighter) and sector or zone crossing procedures to facilitate quick movement in support of post attack recovery operations. UCCs must ensure that personnel moving from contaminated zones or sectors to uncontaminated zones or sectors do not inadvertently reduce MOPP when split-MOPP operations are executed. (AIRBASE, UNIT, AIRMAN)

A3.6.10. If the previous alarm condition was Alarm Red or Black, re-evaluate the status of protective actions. Replenish material expended during contamination control or decontamination operations. Redistribute material, such as IPE and nerve agent antidotes, to support priority missions or units with high usage rates. Take action to replace casualties. Review previously reported damage. Verify damage, contamination, and UXO reports were received and action is complete or underway to resolve the situation. Initiate action to collect and dispose of contaminated waste, unclaimed weapons and ammunition, and UXO that is declared safe for movement to holding areas. Prepare a written record that identifies the location of previously contaminated areas, unrecovered human remains, contaminated waste burial sites, missile and bomb craters, and unrecovered UXO. (AIRBASE, UNIT, AIRMAN)

A3.6.11. Review the probable NBCC attack threat scenarios and actions with Security Forces, Civil Engineer Readiness, and intelligence personnel at each shift change. Review the status of planned and in-progress medical pretreatments. (AIRBASE)

A3.6.12. Direct individuals to keep their canteens full at all times. Direct units to store potable water within unit work areas to support unit operations for a minimum of 24-hours without resupply. Direct commanders and supervisors to enforce hydration requirements. (AIRBASE, UNIT)

A3.6.13. Develop and implement an airbase Ground Sector and NBCC zone plan. Practice likely post-attack scenarios with command and control elements. Ensure unit control centers understand their responsibility to maintain control of their personnel when they enter or exit contaminated areas. Provide zone or sector information or maps to each unit control center and all assigned, attached, coalition, and host-nation command and control centers. (AIRBASE)

A3.6.14. Evaluate airbase medical treatment capabilities based on the current threat and brief the commander and staff. Establish procedures for casualty collection. Identify casualty collection points (CCP) and notify each unit control center, the base population, and all assigned, attached, coalition, and host-nation forces. Consider collocating the CCP with the CCA. (AIRBASE)

A3.6.15. Establish base mortuary procedures for processing contaminated and uncontaminated remains as outlined in Joint Publication 4-06, *Joint Tactics, Techniques, and Procedures for Mortuary Affairs in Joint Operations*. Identify and staff the mortuary collection point. Identify and prepare sites for temporary interment of human remains. Provide the information to the SRC, each UCC, the base population, and all assigned, attached, coalition, and host-nation forces. (AIRBASE)

Table A3.2. Contamination Control Area (CCA) Operations - General Actions.

Task or Action	Responsibility Level		
	Airbase	Unit	Airman
Identify CCA required for threat and airbase population.	X	X	
Designate CCA locations at or near sortie generation areas, collocate with casualty collection points.	X		
Identify CCA processing capability to support processing 20 percent of the airbase population with a 24-hour period.	X	X	
Assign CCA to units and assign CCA teams to operate.	X	X	
Train CCA teams on duties and conduct drills.	X	X	
Set up CCA in accordance with CCA plan.	X	X	
Establish post-attack reconnaissance plan.	X	X	
Establish CCA entry and exit routes and post signs.		X	
Establish airbase and CCA contaminated waste station.	X	X	
Establish mission critical equipment refurbishment area.		X	
Integrate base CCA plan with host nation/coalition forces plan.	X		
Stock CCA with supplies and available IPE.	X	X	
Provide support equipment for night operations.	X	X	
Activate CCA, notify unit control center and NBC defense cell.	X	X	
Know CCA location and processing procedures.			X
Report to CCA when directed by the UCC.			X

A3.6.16. Activate NBCC specialized teams. Assign personnel where needed to bring teams up to 100 percent of required manning for 24-hour operations. Direct responsible units to verify team material is serviceable and operators are proficient. Conduct team drills and training to meet local proficiency standards. (AIRBASE, UNIT)

A3.6.17. Maintain watch for covert attack indications. Periodically remind personnel to remain observant for signs of a covert or suspicious activity. Provide specific information on threats, if available. (AIRBASE, UNIT, AIRMAN)

A3.6.18. Increase protection for food and water supplies. Direct units to store a 24-hour supply of Meals, Ready to Eat (MRE) within their unit area. If NBC attacks have occurred previously, consider the need to use uncontaminated MRE or packaged foods and bottled water until food service supplies are determined to be uncontaminated. (AIRBASE, UNIT)

A3.6.19. Develop or implement the airbase CCA plan (**Table A3.2.**). Identify primary and alternate CCA on-base locations. The CCA (including Classes I through IV collective protection shelter capability) must be able to process the required percentage of the airbase population over a 24-hour period. (AIRBASE)

Table A3.3. NBCC Protective Shelter Operations - General Actions.

Task or Action	Responsibility Level		
	Airbase	Unit	Airman
Identify types of shelters required for threat.	X	X	
Designate shelter locations at/near sortie generation areas.	X		
Identify shelter space for in-place and deployed personnel.	X	X	
Assign shelters to units and unit personnel to shelters.	X	X	
Evaluate shelter management team needs for each shelter.	X		
Assign shelters to direct sortie generation personnel.	X	X	
Train SMT members on duties and conduct drills.	X	X	
Train occupants on entry and exit procedures.	X	X	
Set up shelter in accordance with shelter floor plan.		X	
Establish post-attack reconnaissance plan.	X	X	
Establish shelter entry and exit routes.		X	
Establish entry decontamination station.		X	
Post shelter signs.		X	
Integrate shelter plan with the host-nation/coalition forces plan.	X		
Shelter teams pickup assigned shelter management kit.		X	
Stock shelters with available supplies and equipment.	X	X	
Pickup and inspect detection and monitoring equipment.		X	
Activate the shelter, notify UCC and NBC defense cell.	X	X	
Receive, inventory, and secure supplies.		X	
Know shelter location and processing procedures.			X
Report to shelter in Alarm Yellow or when directed.			X

A3.6.20. Implement the airbase protective shelter plan (see AFMAN 32-4005). Implement actions, as appropriate, in **Table A3.3.** and **Table A3.4.**. Manage shelter operations through the SRC and NBC Defense Cell. Provide assistance to shelter management teams (SMT), especially those associated with collective protection facilities and transportable systems. (AIRBASE, UNIT)

A3.6.21. Implement the airbase protective hardening plan (**Table A3.5.**). Coordinate these plans to complement the airbase critical asset dispersal plan and contamination avoidance cover plan. (AIRBASE, UNIT)

A3.6.22. Implement a consolidated critical asset dispersal and NBC contamination control and cover actions (**Table A3.6.**). Use all available facility overhead cover, hardened facilities, revetments, and berms. Prioritize use of facility overhead cover for mission critical assets (aircraft, munitions, aerospace ground equipment, fire trucks, POL vehicles). Develop procedures to identify empty shelters or facilities with overhead cover for use as temporary protection when they are not in use to protect the

primary assets. Coordinate the plan to complement actions identified in the airbase hardening plan. (AIRBASE, UNIT)

Table A3.4. Collective Protection Shelter Operations (System Dependent).

Task or Action	Responsibility Level		
	Airbase	Unit	Airman
Direct units to activate collective protection shelters.	X	X	
Install serviceable filters (when directed by SRC) and store one set of spare filters at the shelter location.		X	
Inspect system according to technical data.		X	
Expediently seal buildings to enhance system capability.		X	X
Expedient Protection: Request CE evaluation of protection requirements. Check condition of existing bunkers and revetments. Improve protection with expedient hardening measures.		X	
Inspect shelter for unusual conditions or hazards.		X	X
Check alternate power for collective protective shelters. Test run generators before attack.		X	
Check and fuel generators before attacks. Develop fuel re-supply plans.		X	
Develop generator repair plan.			
Monitor fuel consumption and reorder fuel as required.		X	
Place shelter on standby until directed to activate.		X	
Know shelter location and processing procedures.		X	X

Table A3.5. Protective Hardening - General Actions.

Task or Action	Responsibility Level		
	Airbase	Unit	Airman
Identify hardening required for threat and executable with available resources.	X	X	
Select shelter, bunker, or defensive fighting position construction materials that minimize hazards from liquid chemical agents.	X	X	X
Request Civil Engineer assessment of hardening needs.	X	X	
Survey area to identify and reduce the potential for injury from secondary blast hazards.		X	X
Remove, cover or tape windows to reduce the potential for injury from broken glass/glass shards.		X	X
Prioritize hardening requirements and dedicate resources to accomplish actions.	X		
Request Civil Engineer training on hardening techniques.		X	
Assign unit teams to implement approved hardening actions.	X	X	
Integrate hardening plan with the host-nation/coalition forces plan.	X		
Know location of unit shelters and bunkers.			X
Report to unit shelter or bunker in Alarm Yellow, Alarm Black, or when directed.			X

A3.6.23. Implement the airbase NBC detection plan. Include detection assets from all Air Force, joint service, host-nation, and coalition forces. Annotate base and unit maps to show NBC Reconnaissance team routes. Each unit should additionally annotate their unit PAR team routes and areas of responsibility. Coordinate detector site security with Security Forces. Request Security Forces patrols verify detector site security during normal patrol operations. Operate the detector network consistent with the current threat and available resources. (AIRBASE, UNIT)

Table A3.6. Dispersal and NBC Contamination Control and Cover Actions.

Task or Action	Responsibility Level		
	Airbase	Unit	Airman
Identify dispersal and cover requirements based upon threat and executable with available resources.	X	X	
Request Civil Engineer assessment of cover and dispersal needs.	X	X	
Prioritize resources for dispersal and cover.	X	X	
Request Civil Engineer training on techniques.		X	
Assign unit teams to implement dispersal and cover actions.		X	
Integrate dispersal and cover plan with the host-nation/coalition forces plan.	X		
Maintain dispersal and cover plan discipline, return resource to dispersal location or re-cover after use.		X	X

A3.6.24. Disperse and protect bulk stored or palletized IPE and NBC equipment from weather, contamination, abuse, and theft. Include equipment stored inside facilities or under cover. Double-wrap with plastic tarps and check for damage or contamination following attacks. Stock unit shelters and CCA with IPE and assets as outlined in the airbase FSTR Plan 10-2. Develop and implement procedures to monitor and provide scheduled updates to the SRC on status of IPE stocks and anticipated shortages. (AIRBASE, UNIT)

A3.6.25. Contact the Joint Rear Area Coordinator to identify what security, medical, or NBCC defense assistance is available from or provided to other rear area units. (AIRBASE)

A3.6.26. Contact the coalition or host-nation forces NBC defense section and coordinate mutual support for contamination avoidance, protection, and decontamination. (AIRBASE)

A3.6.27. Direct the NBCC Cell to implement the Theater NBC Warning and Reporting System procedures. Identify NBC warning and reporting procedures and responsibilities for Air Force geographically separated units, joint service, coalition, and host-nation NBC defense units and forces. (AIRBASE)

A3.6.28. Implement standing operating procedures to protect tactical aircraft, large-framed aircraft, and passengers. Ensure procedures include methods to notify aircrew and passengers of airbase alarm conditions and MOPP level prior to aircraft arrival, during aircraft taxi, and during ground transfer to and from the aircraft. (UNIT, AIRMAN)

A3.6.29. Ensure post-attack reconnaissance teams (base and unit level) develop procedures to clearly report UXO, casualties, building damage, and contamination. Procedures should be detailed enough to allow UCC and SRC personnel to differentiate between UXO and contamination reports and avoid prolonged MOPP 4 wear due to inadequate reporting and procedures. (AIRBASE, UNIT, AIRMAN)

A3.6.30. Establish UXO holding areas for NBCC munitions. Use prevailing wind data, base utilities, and knowledge about unit operating locations to select a suitable site, which will not affect, or have the least effect, on base operations or personnel. Ensure holding areas meet contaminated waste guide-

lines, are protected from flooding, and located so that runoff will not affect water supplies or inhabited areas. (AIRBASE, UNIT, AIRMAN)

A3.7. Alarm Yellow - Attack is Probable In Less Than 30 Minutes. This condition indicates an attack against the airbase or identified location is expected in the near term. Ground actions should focus upon final protection and contamination avoidance measures to mitigated attack effects. Air operations should focus on the ability to continue missions and the consequences of delaying or canceling missions. ***NOTE:*** Alarm Yellow declaration does not automatically reduce MOPP level. Reduce MOPP level only when directed through the chain of command.

A3.7.1. Implement MOPP based upon the threat. Consult with Civil Engineer Readiness and Medical personnel to determine the appropriate MOPP, work-rest cycles, and hydration standards for the next 24-hour period. Notify the base populace. Determine the need for MOPP options and direct when appropriate. Based upon threat, direct personnel to wear the helmet and body armor in addition to the current MOPP. On a case-by-case basis, delegate MOPP authority to subordinate commanders. (AIRBASE, UNIT)

A3.7.2. If the current MOPP level is MOPP 0 or MOPP 1, then implement MOPP 2. If the current MOPP level is MOPP 3, MOPP 4, or the MASK ONLY option is in effect, remain in the current MOPP and remain masked unless directed otherwise. Ensure all personnel within the immediate area are in the correct MOPP level and know the current alarm condition. (AIRMAN)

A3.7.3. Consider the mission priorities, threat, and warning timeline and direct appropriate actions. Identify critical tasks and missions to either continue or terminate. Terminate routine or non-critical operations. Direct units to implement the appropriate pre-planned actions from their Alarm Yellow checklists. (AIRBASE, UNIT)

A3.8. Alarm Red - Attack by Air, Missile, or Ground Force is Imminent or In Progress:

A3.8.1. Introduction. **Table A3.7.** provides commanders with a comparison of Civil Engineer and Medical NBCC tasks during the trans-attack phase.

Table A3.7. Civil Engineer and Medical NBCC Tasks – Trans-Attack Phase.

Trans-Attack Phase	
Civil Engineer UTCs*	**Medical UTCs****
Provide alarm condition and MOPP level recommendations based upon threat. Assist commander determine what activities will continue, at increased risk to personnel, during Alarm Red. Provide warning to Civil Engineer and NBCC specialized teams. NBC Cell transmits and receives NBC reports.	Shelter medical personnel and equipment. Assist the WOC, SRC and NBC Defense Cell with NBC trans-attack risk assessment and management.
* Includes deployable Civil Engineer Prime BEEF, Explosive Ordnance Disposal, Full Spectrum Threat Response, and Fire Protection elements. Fixed facilities perform these missions with organic assets. ** Depending upon availability of in-place and/or deployable medical assets, the following deployable medical elements advise the commander and/or perform the listed medical missions: Bioenvironmental Engineer NBC Team, Medical Patient Decontamination Team; Prevention and Aerospace Medicine Team, and Biological Augmentation Team. Fixed facilities perform these missions with organic assets.	

A3.8.1.1. The specific actions to take for Alarm Red depend upon the threat and the location of the individual or weapon system. Whenever possible, the WOC or SRC should supplement attack warning signals with detailed attack information. If available, provide the attack type (aircraft, missile, or ground force), expected attack location (building, sector, or zone), and time remaining until the attack begins. Supplemental information enables individuals and units to execute the most effective protective actions and minimize mission degradation. It also enables the airbase to tailor actions and respond to simultaneous, multiple threats. The WOC or SRC should not delay attack warning solely to include supplemental information. Likewise, individuals and units should not delay protective actions to wait for supplemental information. React to Alarm Red warning immediately and based on the information available. If supplemental information is incomplete or unavailable, execute the most stringent Alarm Red protective actions, then contact the UCC or work center and request guidance. (AIRBASE, UNIT, AIRMAN)

A3.8.1.2. Report observed attacks or enemy personnel movement to the unit control center or work center as soon as they occur. Armed individuals should defend themselves under the current Rules of Engagement and coordinate actions with other personnel within their areas. (UNIT, AIRMAN)

A3.8.1.3. Use Buddy Checks to verify proper IPE wear and assist other personnel with donning. If the position where a person is located becomes too dangerous to maintain, move to a safer area. Assist injured personnel if possible. Otherwise, remain in the current position and under cover until provided further instructions. This may be through announcement of Alarm Black, direction from the unit control or work center, or instructions from security forces or emergency response personnel. (AIRMAN)

A3.8.1.4. Unless under direct attack or otherwise directed, WOC, SRC, and UCC personnel should complete their warning and notification actions before assuming protective actions or donning IPE. This enables rapid warning of the airbase population and takes advantage of the hardening protection provided to most command and control facilities. (AIRBASE, UNIT)

A3.8.1.5. The airbase Commander may direct mission essential activities to continue during Alarm Red. The importance of these missions should justify the increased risk to personnel and resources. Examples include mission continuation and sortie generation, aircraft launch or recovery, medical, EOD, fire fighting, or airbase defense operations. Essential activities may also include the safe termination of in-progress operations such as aircraft and bulk storage POL transfers, weapons loading, aeromedical evacuation, and air traffic control operations. Units should develop likely scenarios and standing operating procedures and provide them to the WOC or SRC during pre-attack planning. Command and control elements should train to quickly recognize these situations and use the available time to gain operational advantage or direct critical attack mitigation actions. (AIRBASE, UNIT)

A3.8.2. Actions for Personnel In Open Areas. When the attack warning sounds (or notification is received) individuals in open areas should seek the best available protection (building, bunker). Ideally, this protection should be within 200 feet and provide overhead cover. If such protection is unavailable, move to a ditch, depression, or structure that provides protection from blast, fragments, and small arms fire. If no warning is received and an attack begins, drop to the ground, don the protective mask, crawl to closest available protection, and don the remaining IPE. Use any available material to provide overhead cover (rain gear, poncho, tarps, or plastic). (AIRMAN)

A3.8.3. Vehicle and Equipment Operators and Passengers. When the attack warning sounds or notification is received, vehicle, equipment operators should drive to the best available protection (building, aircraft shelter, bunker, or hanger) while passengers don IPE. Ideally, protection should be within a one minute or less drive and provide overhead cover. Drive the vehicle, equipment into or under shelter if possible. Otherwise, stop (do not block roads or taxiways), leave keys in the ignition, and direct passengers to seek cover. All personnel don IPE. If such protection is unavailable, drive near a ditch, depression, or structure that provides protection from blast, fragments, and small arms fire. All personnel exit, take cover, and don IPE. For missile attacks only, all personnel remain inside the vehicle, equipment (window up and doors closed), and don IPE. If no warning is received and an attack begins, the operator should stop the vehicle, and direct the passengers to exit. All personnel should drop to the ground, don the protective mask, crawl to closest available protection, and don their remaining IPE. (AIRMAN)

A3.8.4. Aircrew Operating Aircraft and Aircraft Passengers. When the attack warning sounds or notification is received, taxi tactical aircraft into any available shelter. For large frame aircraft or if shelter is not available for smaller aircraft, notify passengers to don IPE, and request instructions from the ground control. (AIRMAN)

A3.8.5. Actions for Personnel Inside Structures, Shelters, and Tents. Hardened facilities include those facilities that are provided with hardened, semi-hardened, or splinter protection levels (refer to **Chapter 5** and **Attachment 7**). Personnel within splinter protected expeditionary or temporary shelters (i.e., tents, hard wall shelters, shipping container-type offices, portable buildings, and trailers) should accomplish the actions in paragraph **A3.8.5.4.** for personnel in unhardened structures without collective protection. Expeditionary and temporary shelters are prone to catastrophic structural failure from blast effects. There may be little or no warning prior to failure and, if a failure occurs, the shelter will

provide little or no overhead cover protection to occupants. Personnel within these shelters should seek protection in hardened, semi-hardened, or splinter protected facilities or bunkers, if available. The senior personnel within each shelter should ensure hardened or collectively protected shelter doors remain closed as much as possible to limit infiltration of contamination, and control personnel entering and exiting the shelter. If an NBC threat is present, anyone entering or leaving a shelter must assume that contamination is present outside until detection and observation prove otherwise. Stop shelter processing if continued operations will endanger shelter staff or occupants. (AIRMAN)

A3.8.5.1. Hardened Structures Equipped With Classes I through IV Collective Protection. Unless under attack by ground forces, personnel who are inside a hardened structure equipped with collective protection systems will assume the mask-only option until the attack is over, and the shelter team verifies the over pressurization system is functioning. They do not need to take cover or wear field gear. Should a breach occur within an area provided with collective protection, personnel should assume (or remain in) MOPP 4 and follow instructions from the shelter management team. Controlled entry and exit procedures are in effect until the outside protective level is MOPP 2 or lower. (AIRMAN)

A3.8.5.2. Hardened Structures Without Collective Protection. Personnel who are within a hardened structure without collective protection will assume the mask-only option unless otherwise directed. They do not need to take cover or wear field gear unless under attack by ground forces. Should a breach occur, personnel should assume (or remain in) MOPP 4. When the outside MOPP level is MOPP 2 or below, remove the protective mask only after completing the detection and ventilation procedures in paragraph **A3.9.12.** ***NOTE***: This action is only necessary if a confirmed chemical or biological attack occurred. (UNIT, AIRMAN)

A3.8.5.3. Unhardened Structures with Classes I through IV Collective Protection. Personnel will take cover to avoid conventional weapons effects and assume MOPP 4. When the attack is over and the shelter team verifies the overpressurization system is functioning, personnel within these facilities should assume MOPP 2, or as directed. Should a breach occur within an area provided with collective protection, personnel should assume (or remain in) MOPP 4 and follow instructions from the shelter management team. Controlled entry and exit procedures are in effect until the outside protective level is MOPP 2 or lower. (AIRMAN)

A3.8.5.4. Unhardened Structures Without Collective Protection. Personnel will take cover to avoid conventional weapons effects and don their IPE. Personnel will assume the same MOPP level as directed for personnel outside. When approved by the airbase senior commander, personnel within these facilities may be allowed to reduce to mask-only protection when the attack is over. Controlled entry and exit procedures are in effect until the outside protective level is MOPP 2 or lower. (AIRMAN)

A3.8.6. Common Actions:

A3.8.6.1. Keep Shelters Closed. Shelter teams or senior personnel in each shelter should ensure shelter doors remain closed as much as possible to limit infiltration of contamination, and control personnel entering and exiting the shelter. (AIRMAN)

A3.8.6.2. Maintain accountability of shelter occupants. (AIRMAN)

A3.8.6.3. Keep personnel away from the exterior walls of the shelter. Use desks and interior rooms to provide additional protection within unhardened facilities. (UNIT, AIRMAN)

A3.8.6.4. Perform self-aid and buddy care. Report casualties and observations or symptoms of chemical or biological attacks to the unit control centers or the shelter management team. (AIRMAN)

A3.9. Alarm Black - Attack is Over:

A3.9.1. **Table A3.8.** provides commanders with a comparison of Civil Engineer and Medical NBCC tasks during the post-attack phase.

A3.9.2. Continue to wear IPE according to MOPP declaration. Ensure all personnel are in the correct MOPP level and know the current alarm condition. Personnel within hardened and unhardened shelters should follow the actions approved by the airbase commander. The SRC should assess initial reports from Base Defense Operations Center, control tower, and PAR teams to determine the nature of attack and identify obvious damage to base. Use this information to determine when to direct unit PAR team to begin their surveys. (AIRBASE, UNIT, AIRMAN)

A3.9.3. Remain under cover and check yourself and other individuals for evidence of contamination. If contamination is found, complete immediate decontamination with the M291 and M295 decontamination kit. Perform self-aid and buddy care as needed. (AIRMAN)

A3.9.4. Conduct a physical check within your facility and a visual check of the outside areas for UXO, casualties, contamination, and facility or equipment damage. Report all positive findings to the UCC or work center. Stay in a protected position with overhead cover unless you are in personal danger or must perform rescue or assist casualties that cannot move themselves to your position. (UNIT, AIRMAN)

A3.9.5. Base Civil Engineer NBC Reconnaissance and Damage Assessment teams begin surveys and report contamination, UXO, damage, fire, casualties, and other incidents as found. (AIRBASE, UNIT)

A3.9.6. Identify contamination hazards and direct split MOPP levels based for zones or sectors. The UCC controls post attack movement between zones or sectors. Base decisions on the current hazards and mission requirements within these areas. Restrict movement to mission essential tasks and identify sector or zone entry and exit control points. (AIRBASE, UNIT)

A3.9.7. When movement is required, identify conditions and procedures to regulate movement of contaminated personnel and equipment between clean and contaminated areas. Implement procedures for receiving and handling contaminated equipment moved into clean areas. Examples include movement of contaminated munitions and POL vehicles into uncontaminated zones or sectors and the movement of uncontaminated material and transportation of people across contaminated zones or sectors. Contamination marking and clear communication of the zone or sector MOPP levels are critical to successful mission execution and effective contamination avoidance. (AIRBASE, UNIT)

A3.9.8. When directed by the WOC or other authority, begin unit PAR sweeps over pre-designated unit areas. Check pre-positioned M8 and M9 paper for signs of contamination and look for passive indicators such as dead or dying wildlife. Determine if sufficient uncontaminated assets remain to allow use of only these assets. If so, separate (and properly mark) contaminated assets from uncontaminated resources. (AIRBASE, UNIT)

Table A3.8. Civil Engineer and Medical NBCC Tasks – Post-Attack Phase.

Post-Attack Phase	
Civil Engineer UTCs*	**Medical UTCs****
Provide alarm condition and MOPP level recommendations based upon threat. Conduct firefighting, rescue, and emergency treatment of injured personnel. Conduct NBC reconnaissance to determine contamination footprint(s) and related operational protective measures. Conduct UXO reconnaissance to locate, identify, remove, and neutralize US and foreign NBCC ordnance and improvised devices. Conduct airfield and facility damage assessment. Collect and consolidate post-attack reports from NBCC teams, UCCs, and the SRC. Advise Installation Commander on tactics, techniques, and procedures to conduct sustained operations in a contaminated environment. Direct wartime damage recovery to include rapid repair/replacement of critical facilities or utilities, and managing repair/construction operations. Plot detailed airbase NBC footprint contamination. Plot and report NBC attacks for theater warning and reporting. Provide additive technical expertise, support, and manpower to NBCC defense. Manage CCA operations and advise on entry and exit control point procedures. Advise SRC commander on NBC operational aspects (persistency, contamination isolation and control). Provide MOPP level recommendation (operational) to include split-MOPP/reduced MOPP operations. Coordinate collection, storage, and disposal of contaminated waste.	Assist with NBC post-attack risk assessment and management. Detect NBC agents at the MTF, report to SRC and NBC Cell. Dispatch to identified NBC footprints for further identification and quantification of hazard concentrations and collection of samples (surveillance for health protection). Sample food and water for NBC contamination Conduct surveillance activities in reduced MOPP level sectors. Conduct environmental surveillance in support of human health hazard assessment. Conduct epidemiological surveillance. Perform lab analysis and identification for medical surveillance purposes, to include "silver standard" presumptive identification. Preserve, package and ship confirmatory BW agent samples. Report field surveillance data to NBC Cell and SRC. Report lab diagnostic information (including silver standard analysis) to SRC and NBC Defense Cell. Report epidemiological information obtained at the MTF to the SRC and NBC Defense Cell. Document individual exposure (PRD-5) requirements. Identify groups of personnel in hazard areas (e.g., squadrons in contaminated sectors) and track exposure to NBC agents (PRD-5 requirements). Advise the SRC commander on health effects and health risks of NBC agents. Advise on health/medical aspects in support of reduced MOPP level. Perform patient decontamination. Perform the appropriate level of decontamination for medical vehicles, shelters and equipment.
* Includes deployable Civil Engineer Prime BEEF, Explosive Ordnance Disposal, Full Spectrum Threat Response, and Fire Protection elements. Fixed facilities perform these missions with organic assets. ** Depending upon availability of in-place and/or deployable medical assets, the following deployable medical elements advise the commander and/or perform the listed medical missions: Bioenvironmental Engineer NBC Team, Medical Patient Decontamination Team; Prevention and Aerospace Medicine Team, and Biological Augmentation Team. Fixed facilities perform these missions with organic assets.	

A3.9.9. When directed to resume mission critical operations or tasks, continue to look for evidence of contamination and watch for hazard marking signs or indications. If contamination is found on vehi-

cles or equipment, decontaminate the areas that must be touched or used to continue the mission. Concentrate on such areas as door handles, seats, steering wheels, operating controls, and ladder steps. Place plastic sheet over contaminated areas (even if decontaminated) where people will sit. Begin immediate or operational decontamination within 1 hour of initial contamination of porous or permeable surfaces or do not decontaminate. Mark contaminated assets, notify personnel within your area, and notify your unit control or work center. (UNIT, AIRMAN)

A3.9.10. When directed by the SRC, UCC, replace contaminated M8 and M9 paper and contaminated protective covers (plastic over vehicles and equipment for example). Properly dispose of all contaminated waste. (UNIT, AIRMAN)

A3.9.11. The UCCs and SRC will collect PAR information, determine the effect on operations, prioritize actions and recommend courses of action to the WOC and commander. The NBC Defense Cell will plot any contamination that is found, identify the type of agent, and determine potential hazard duration. The SRC staff will conduct MOPP analysis and recommend base-wide or NBC zone, sector alarm conditions and MOPP. Commanders determine if mission needs justify the risk of split MOPP. The SRC must continually evaluate and adjust protective measures as hazards decrease or if the wind direction shifts. Consider the use of MOPP options to reduce thermal burden and maintain an appropriate level of protection. (AIRBASE, UNIT)

A3.9.12. Structure Ventilation Procedures. When the outside contamination level allows operations without the protective mask, ventilate all structures and tents not equipped with Classes I through IV collective protection systems. Do not remove the protective mask until this procedure is completed or agent detectors indicate the area is safe. Ventilation procedures clear the airborne contamination that may have infiltrated the structure. Include tents, fighting positions, bunkers, and aircraft shelters. Turn ventilation systems on (if equipped) and operate in the fresh air or exhaust mode. Open doors and windows to speed the removal of residual contamination. After 30 minutes, test with available detectors to determine if hazards remain. (AIRBASE, UNIT)

A3.9.13. If an airbase obtains positive indications of a NBC attack and the attack is the first verified use within the theater, the airbase commander will immediately transmit an NBC 1 report by FLASH precedence up the reporting chain. The NBC Defense Cell will issue NBC reports for subsequent attacks and provide more detailed information when required. Whenever possible, obtain samples of suspected NBC contamination for transfer to established laboratories for analysis and confirmation. (AIRBASE)

Section A3C—Post-Conflict Operations

A3.10. Post-Conflict Operations. Post-conflict threat levels dictate which protective actions remain in force or are no longer required. The airbase mission may require support from Joint Forces to conduct aircraft, material, and vehicle decontamination to meet acceptable peacetime safety levels. Base Civil Engineer and other specialized teams may be tasked to support battle damage assessment, environmental monitoring, and surveillance of previously contaminated areas. (AIRBASE, UNIT, AIRMAN)

Attachment 4

FUNCTIONAL AREA TACTICS, TECHNIQUES, AND PROCEDURES (TTP)

Section A4A—General Base Populace and Multifunctional TTP

A4.1. Introduction:

A4.1.1. The development of the tactics, techniques, and procedures (TTP) within this area used analysis of field operations, functional area publications, lessons learned, as well as feedback from functional area managers and subject matter experts. Some TTP are unique to a function or specialty while others, with slight modification, can apply to several areas.

A4.1.2. These TTP also incorporate best practices and solutions to mitigate the consequences of NBCC attacks and sustain operations in NBCC environments. The decision to use them depends upon the threat and conditions present at the airbase. Include NBCC defense TTP in unit or work center checklists and job guides. Functional Area Managers (FAM) should review field unit solutions and include common TTP into functional area publications and enlisted Career Field Education and Training Plans (CFETP). The Civil Engineer Readiness Flight can provide assistance on NBCC defense actions and help functional area experts develop TTP to support specific operations.

A4.1.3. The TTP in the following paragraphs do not supercede or replace requirements within equipment technical orders. Follow established procedures for safe operations. Identify conflicts or hazards through the Air Force Technical Order System or Safety System.

A4.2. Contamination Avoidance. Personnel assigned duty at base and unit entry control points or who perform facility and unit area entry identification and control duties are critical to the success of the base and unit contamination avoidance activities. These elements are the first line of defense for personnel and equipment that depart the unit areas and move throughout the base. They are also the last line of defense to evaluate personnel and material and prevent contamination from entering and possibly contaminating the unit area or facility. In addition to security measures, these posts should check all personnel, vehicles, and material that enter and depart the unit area or facility. They should ensure that detector paper is properly prepositioned and that personnel know the contamination status of the area and their destination. These posts are not responsible for placing the detector paper. Placement is an individual or operator responsibility. However, they are responsible for checking people, vehicles, and equipment when entering the unit area for positive paper indications.

A4.3. Contaminated Waste Control and Disposal. For additional information on standard decontamination methods and waste disposal procedures, refer to guidelines in Air Force Technical Order 11C15-1-3, AFH 10-222, *Volume 4, Environmental Guide for Contingency Operations,* and AFMAN 32-4017, *Civil Engineer Readiness Technician's Manual for Nuclear, Biological, and Chemical Defense*.

A4.3.1. Introduction. Chemical and biological attacks can generate significant quantities of contaminated waste. Contaminated items will include IPE and field gear, contaminated M8 and M9 paper, components of the M291 and M295 decontamination kits, contamination avoidance covers and bulk plastics, and personal equipment. The waste that accumulates at waste disposal points, contamination control areas, and at cargo transload sites must be collected and disposed of properly to limit hazards.

Depending on the type and quantity of contaminated material, waste accumulation areas themselves could increase local hazards and require increased protective measures within the areas. In addition, the airbase is responsible for limiting, to the greatest extent possible, post-conflict clean-up and restoration actions.

A4.3.2. Air Force Policy. Simple actions to identify, control, and mark waste will reduce problems with waste accumulation and disposal. During contingency situations with armed conflict or the threat of armed conflict, Airmen have a responsibility to make every effort to comply with environmental regulations and policies. Deployed forces in these situations are strongly encouraged to fight as trained - with appropriate consideration of environmental impacts and the mission. If the operations do not permit compliance, Airmen should use common sense and consult the Base Civil Engineer environmental function. This function may request an Executive Emergency Exemption.

A4.3.3. Unit Waste Disposal Points. Establish work center, facility, and base-wide contaminated waste disposal points during the pre-attack phase. Train personnel to collect and dispose of their non-reusable contaminated items in these designated areas. Use plastic bags, trashcans, barrels, and empty munitions cans, for contaminated waste storage. Trash barrels with multiple layers of plastic bags are easy to obtain and simplify waste removal. Mark the contaminated waste as outlined in **Attachment 6**. The disposal point should be at least 10 feet away and downwind from the rear or entrance to the facility, bunker, fighting position, or CCA. Clearly identify the disposal point and prepare contaminated marking signs in advance to mark containers after use. Be prepared to relocate the disposal point when the wind direction changes.

A4.3.4. Airbase Waste Disposal Area. The airbase must collect contaminated waste from unit waste disposal points and store it at one or more waste disposal areas. There are three primary ways of handling large amounts of contaminated waste: open storage, burying, or burning. Open storage is the method of choice followed by burning. Bury contaminated material only as a last resort. Consider the following procedures and select the best method or methods for the current situation, mission, and resources.

A4.3.4.1. Open Storage. Above ground, open area storage is the simplest and least costly option. No special equipment is necessary and simple marking signs will suffice to identify the area. Locate the storage site in an area that least affects the airbase operations and will not require movement before the end of hostilities. Depending upon the type of contamination, this area may present a long-term contact hazard. It may also generate a sizeable downwind vapor hazard that extends beyond the marking signs and airbase boundary. Bagging the waste will substantially reduce but not eliminate these hazards.

A4.3.4.2. Burning. Burning quickly reduces contaminated chemical and biological waste hazards and requires little space or manpower. Burn contaminated chemical and biological material in an open-pit, diesel-fueled fire. Burn contaminated chemical and biological material completely. Burning will most likely generate a low concentration vapor cloud and create a downwind hazard. Select a site in an area that least affects the airbase operations and minimizes fire or visibility hazards. Coordinate the burn site location and burn times with the airbase fire department, Base Civil Engineer, and base operations.

A4.3.4.3. Burying. Post-conflict environmental restoration difficulties and the possibility of ground water contamination are the primary reasons not to bury contaminated waste. Another reason to avoid burying waste is the need for heavy equipment or a significant amount of labor to pre-

pare the burial site. If this method is used, bag the waste to reduce handling and removal hazards. Locate the storage site in an area that least affects the airbase operations and post marking signs accordingly. Do not allow people or vehicles to drive over the area because the material may settle and create additional hazards. Do not bury contaminated waste without the approval of the airbase commander and knowledge of the Base Civil Engineer. If burial is approved, provide the Base Civil Engineer with a written report that includes the date burial started and ended, types and quantity of material buried, type of contamination, the location (Global Positioning System coordinates are preferred), and the size and depth of the excavation.

A4.4. NBC Decontamination. **Table A4.1.** provides a quick reference of standard decontamination materials available at most airbases. Refer to Technical Order 11C15-1-3, and AFMAN 32-4017, for additional information. Refer to the HQ Air Mobility Command, *Air Mobility Operations in a Chemical and Biological Environment*, for large-framed aircraft and cargo transload operations. Refer to AFTTP 3-42.3 and the concept of operations for the wartime medical decontamination team for medical decontamination

Table A4.1. Standard Decontamination Material Resources.

Material	Use For:			Decon Level			*NOTES*
	N	B	C	I	O	T	
M291 Skin Decontamination Kit			X	X		5	1
M295 Individual Equipment Decontamination Kit			X	X	X	5	1
M17A1, 2, 3 Lightweight Decontamination Apparatus	X	X	X		X	5	1
Supertropical Bleach (STB)		X	X	X	X	5	3,4
Calcium Hypochlorite (HTH)		X		X		5	3,4
Sodium Hypochlorite (5 or 0.5 Percent Solution)		X	X	X	X	5	3,4
Formalin		X		X	X	X	2,5
Sodium Carbonate			X		X	X	5
Sodium Hydroxide		X	X		X	X	5
Soap, Detergent	X	X	X	X	X	X	1,5
N - Nuclear, B - Biological, C - Chemical I - Immediate, O - Operational, T - Thorough							

NOTES:

Consult technical data for proper use, contact time and collateral hazards.

1. Primary use is to remove surface contamination (M295 not authorized for skin decontamination).
2. Primary use is for medical decontamination.
3. Desired solution is 5 percent for equipment; 0.5 percent for personnel (skin contact) decontamination. Consider using commercial chlorine bleach test kits to verify concentration.
4. Requires minimum contact time for maximum effectiveness; varies by agent
5. Refer to the *North American Emergency Response Guide* for TIM decontamination.

A4.4.1. Weapons.

A4.4.1.1. Weapons Decontamination. Many weapons are extremely hard to completely decontaminate because of the existence of lubricants that trap agents and rifle perforated barrel guards that allow small chemical droplets to get into hard to reach places. Contaminated weapons should be operationally decontaminated within minutes after exposure if possible using the M291 or M295 decontamination kit. Use water-soaked rags to remove the decontamination kit's powder residue. When feasible, thoroughly decontaminate the weapon by disassembly and rinsing in a 5 percent chlorine solution. If possible, expose previously contaminated weapons to moving air. Always wear gloves when cleaning previously contaminated weapons. Decontaminate the weapons cleaning tools (cleaning rod and brush) with a 5 percent chlorine solution. Dispose of the used weapons cleaning materials as contaminated waste.

A4.4.1.2. Contaminated Weapon Handling in Armories or Closed Spaces. Previously contaminated weapons may become inhalation hazards to unmasked personnel within closed or unventi-

lated areas. Whenever a previously contaminated weapon is not required for immediate use, it should be double wrapped in plastic bags to contain the residual hazard and prevent exposures to low level chemical vapors.

A4.4.2. Medical Litters.

A4.4.2.1. Canvas Litter. Disassemble the litter and decontaminate the components. Decontaminate litter canvas by immersion in boiling water for 1 hour. If available, add 4 pounds of sodium carbonate (washing soda) to each 10 gallons of water. After boiling with washing soda, rinse with clear water. Decontaminate the wood by applying a 30 percent aqueous slurry of bleach and let it react for 12 to 24 hours. Repeat applications if necessary. Then swab the wood dry and let it aerate at elevated temperatures, if possible. If the litter cannot be taken apart, decontaminate it with bleach slurry or by flushing it with hot soapy water. Then aerate the litter outdoors.

A4.4.2.2. Decontaminable Litter. Apply a 5 percent chlorine bleach solution to the entire surface of the litter, handles, and poles. If the chlorine bleach solution is not available, use the M295 decontamination kit.

A4.5. Vehicle and Equipment Decontamination.

A4.5.1. General Guidelines:

A4.5.1.1. Contaminated vehicles and equipment are not unserviceable. Do not abandon or stop protecting items contaminated from previous attacks. Personnel that use the proper IPE and protective measures can use contaminated vehicles and equipment. Vehicle operators and passengers should place plastic sheeting or other barrier materials on seats if the seat area or the individual are (or were previously) contaminated. Body heat and pressure (from sitting) increases the potential for liquid chemical agents to penetrate the ensemble. Consider using barrier material to cover the steering wheels. This is especially important for vehicles that have open cabs or driver's compartments.

A4.5.1.2. Focus decontamination efforts on surface areas of the vehicle or equipment that will be continuously touched. Operationally decontaminate porous and non-porous surfaces contaminated with liquid chemical agent within 1 hour of the time of contamination. Decontaminate the non-porous surface areas to reduce the contact and transfer hazard from agent that does not evaporate or does not sorb into the surface. Regardless of the decontamination technique used, it will be easy to remove agents from smooth panels. However, chemical agents tend to remain at low levels in crevices, rivet heads, and joints. See paragraph **A4.5.2.** for special considerations for Chemical Agent Resistant Coating (CARC) and polyurethane painted surfaces.

A4.5.1.3. Non-porous surfaces, such as glass and unpainted metal, do not allow liquid chemical agents to rapidly penetrate their surface. These locations represent the most dangerous areas on a contaminated surface. Use the M295 decontamination kits or a 5 percent chlorine bleach solution to reduce or eliminate contamination from vehicle surfaces. ***NOTE*:** When using a 5 percent chlorine bleach solution on vertical surfaces, the solution is not likely to remain in contact with the surface long enough to be fully effective.

A4.5.1.4. Plastic and rubber components are porous materials that sorb liquid chemical agents. Once the agent sorbs, it remains embedded in the material and some level of vapor hazard will remain for extended periods.

A4.5.1.5. Chemical or biological agents in solid or particulate form do not penetrate or adhere to most surfaces and are easily removed or neutralized with liquid decontamination solutions.

A4.5.1.6. If canvas storage covers, seatbelts, webbing, carpet, and other textile materials are contaminated with liquid chemical agents, there are no effective, operationally feasible methods to decontaminate. Should these items become contaminated, place barrier material over the items or replace them.

A4.5.2. Chemical Agent Resistant Coating (CARC):

A4.5.2.1. CARC is the name for a type of paint applied to vehicles and equipment to enhance the ability of operators to decontaminate the item after a chemical attack. Most non-CARC painted surfaces readily absorb liquid chemical agents. However, it may take up to 6 hours for chemical agents to sorb into those few vehicle or equipment items that have been painted within the previous two years. CARC paint older than 2 years readily sorbs chemical agents. Due to the slower rate of sorption with CARC paint, the contact and transfer hazard remains viable as long as the agent is on the surface. Additionally, the resulting vapor concentrations are at their maximum limit. If it is necessary to use CARC painted vehicles or equipment within 6 hours of contamination, decontaminate the entire exterior in addition to those areas that will be continuously touched.

A4.5.2.2. Personnel can identify CARC paint from its rough texture, but the most accurate means of identification is to look for the "CARC" stencil near the vehicle data plate. Most CARC vehicles and equipment are assigned to security forces, mobile communications, tactical air control, and civil engineer units. Units with CARC painted vehicles and equipment must train the vehicle operators or those responsible for CARC painted material to take additional precautions and limit contamination spread.

A4.5.2.3. The most important measure is to pre-position M8 and to provide overhead cover for CARC painted material during chemical attacks. Consider providing additional M295 decontamination kits for storage on or with this equipment. If overhead cover cannot be provided, use protective covers (such as plastic sheeting) to cover each CARC painted vehicle or equipment item. Place CARC painted items under overhead cover or install protective covers during pre-attack operations or when the items are not in use. CARC painted HUMVEEs and M113s should have protective covers made to fit mounted weapons and to cover windshields, open cargo beds, and hatches.

A4.5.2.4. When attack warning occurs, vehicle operators should drive the vehicle to their designated shelter site or seek shelter under the best available overhead cover. Vehicle operators should turn off the engine, close hatches and doors, and install protective covers. Equipment operators should shut down equipment, close access doors and panels, and install protective covers. Following the attack, operators will check pre-positioned M8 paper. Decontaminate the contaminated surfaces of the vehicles or equipment using the M295 decontamination kits if the item will be used within 6 hours of contamination (before the agent sorbs into the paint). A 5 percent chlorine bleach solution can augment the decontamination process. When possible, conduct CARC vehicle and equipment decontamination within contaminated areas.

A4.5.3. Polyurethane Paint. The majority of vehicles and equipment on Air Force installations are painted with polyurethane compounds. Chemical agents readily sorb into this type of paint. Thus, decontamination operations will not have a significant effect unless decontamination activities take place very shortly after the time of contamination (within minutes). When the liquid agent sorbs into

the paint, it reduces the residual contact hazard and may present a vapor off-gassing hazard for long periods. Also see paragraph **A2.4.3.** and **A2.4.5.**

A4.5.4. Contaminated Vehicle Identification and Marking: Each vehicle and equipment operator is responsible for placing M8 paper on their vehicle or equipment prior to attacks. They are also responsible for identifying and marking contamination found after attacks. When post-attack movement is directed by the WOC or UCC, check pre-positioned M8 paper as soon as possible and mark contamination as outlined in **Attachment 6**. Vehicle and equipment operators must conspicuously identify contaminated items to enable maintenance personnel to identify these items and take the necessary protective actions and precautions when performing maintenance. The operator must also notify their UCC of the contamination items status. When the item is contaminated, mark with the appropriate symbol as outlined in paragraph **A6.6.2.** For vehicles, place the marker in lower center portion of the windshield. Each vehicle operator will annotate the AF Form 1800-series operator's form when the marker is place. Equipment operators should use the appropriate inspection form outlined in the equipment technical data. Include the date and time of the contamination, the agent type, and the location of the contamination on the vehicle. If the inspection form is not available or becomes contaminated, provide the same information, along with the vehicle or equipment registration or identification number, to the unit UCC. The UCC consolidates unit information and passes this information to the SRC. The SRC reports the information to the Vehicles or other UCC as appropriate. For vehicles, the UCCs will also notify the vehicle operations control center and include the point-of-contact information, vehicle location, contamination type, damaged or unserviceable status, and vehicle registration number.

Section A4B—Functional Areas Tactics, Techniques, and Procedures

A4.6. Aircrew and Aircraft Operations:

A4.6.1. The protection of aircrew members and aircraft is of the utmost importance during attack situations. The adversary's use of chemical warfare (CW) agents has the potential to seriously degrade aircrew and aircraft operations. In order to prevent degradation, ensure to train aircrew and maintenance members on how to operate in an NBCC environment, implement effective contamination avoidance measures, and develop proactive attack response procedures to protect both personnel and equipment. Procedures for aircrew and aircraft operations involve six areas: mission preparation, stepping to fly, ground procedures prior to takeoff, airborne procedures, ground procedures after landing, and large frame aircraft (LFA) procedures.

A4.6.2. Mission Preparation:

A4.6.2.1. In addition to the normal mission preparation, aircrew members must be aware of the status of the CW environment, both locally and throughout the area of responsibility. Place particular emphasis on current, home base MOPP status, and how to best avoid any existing contamination. In addition, update CW conditions throughout the area of responsibility to evaluate the availability of potential divert locations.

A4.6.2.2. Don appropriate aircrew chemical defense equipment (ACDE) to match the appropriate MOPP level and carry individual protective equipment (IPE). This may require transition from IPE to ACDE. If possible, protect vehicles used to transport aircrew members to and from aircraft from contamination. Options include permanent facility with overhead cover and coverage by barrier materials.

A4.6.3. Stepping to Fly (STEP):

A4.6.3.1. Stepping to fly identifies precautions to protect aircrew members from injury and or contamination while in transit from the squadron facility to the aircraft. When stepping to fly, wear the appropriate ACDE, and transport aircrew members in a vehicle that provides overhead cover (enclosed vehicle). Aircrew members should not walk to the aircraft parking location and should avoid open space on the ramp, unless there is no other choice.

A4.6.3.2. If Alarm Red occurs during the STEP process, personnel inside the vehicle should attain proper MOPP posture and seek appropriate protection. This may require use of the ground crew mask. If available, a hardened aircraft shelter (HAS) provides optimum protection. Use caution if entering a HAS that contains aircraft and/or equipment. Close doors after entry. If a HAS (or other overhead cover is not immediately available), seek best protection for the type of attack.

A4.6.4. Ground Procedures Prior to Takeoff. Take advantage of HAS protection if available, and keep ground (taxi) time to an absolute minimum. Aircraft are most vulnerable to contamination during the taxi time from shelter to takeoff.

A4.6.4.1. Aircraft Preflight. Extra aircrew members in GCE may accomplish aircraft preflight. If the aircraft is contaminated, the aircrew should follow proper decontamination procedures in order to prevent cross contamination. Perform operational decontamination (M295 decontamination kit or 5 percent chlorine solution) on those surfaces that will be continually touched during the aircraft preflight. Logical areas include the canopy, aircraft ladder, aircraft entrances, aircraft ramps, aircraft servicing areas, munitions racks, engine access panels, and other common use areas. If personal contamination is expected, conduct immediate (personal) decontamination procedures.

A4.6.4.2. After engine start (in HAS). If Alarm Red occurs after engine start, the normal procedure is to shut down. Ensure ground personnel are aware of the alarm warning. Engine noise may preclude normal alert notification procedures from being effective. Hand signals are common. Ground personnel should assume proper MOPP posture and should close HAS doors. If the aircraft do not have protection from the attack, procedures may include launch-for-survival.

A4.6.4.3. Aircraft Launch-To-Survive. Develop local procedures and conditions to address this option. In general, aircraft may launch-to-survive any time after engine start if they have sufficient fuel and unrestricted, safe access to the runway. In practice, this option may only be practical for aircraft that have just landed or aircraft at or near the end of runway (EOR) station. Coordinate movement with Air Traffic Control (ATC) to allow rapid takeoff and follow local EOR station procedures. Transient aircrew should contact the WOC or ATC for local procedures.

A4.6.4.4. Prior to Taxi. Accomplish aircraft arming and EOR procedures in accordance with local procedures; typically in the HAS just prior to taxi. This affords protection from the HAS and limits time of exposure for both aircraft and personnel.

A4.6.4.5. If Alarm Red occurs after taxi, follow local procedures. Typically, the procedures depend on whether additional protection is available along the taxi route. If empty HAS are available, procedures will have the aircraft taxi into the HAS for protection. Normal engine shutdown procedures will follow (requires ground crew assistance) and close HAS doors. Local procedures should address protection options.

A4.6.4.6. If protection is not available, aircraft will continue taxi for takeoff, if possible. In either case, aircrew members should maintain contact with command and control entities (WOC, Main-

tenance Operations Center (MOC), supervisor of flying, squadron ops.) to relay the aircraft's status and position, and to identify and deconflict taxi routes.

A4.6.5. Airborne Procedures:

A4.6.5.1. Flying provides the most effective method of decontaminating the exterior surfaces of aircraft. The aircraft should be airborne for 60 minutes or more and flights at lower altitudes are more effective than higher altitudes. All sub-sonic speeds have approximately the same effectiveness. Test results indicate these flight operations will reduce contamination levels to below the eye effects level on the smooth portions of the aircraft exterior. Small pockets of higher levels of contamination may exist in cracks or around rivets or screws. Once airborne, aircraft are generally unaffected by any effects from a CW environment. The threat of contamination is remote. However, ensure to consider the environment at intended landing locations to determine whether to land, delay, or divert.

A4.6.5.2. Aircrew members should remain aware of the current operational and CW status of primary and alternate landing locations. Do not attempt to land during Alarm Red situations unless conditions prevent any other option. Follow supervisor of flying or WOC instructions and either hold or divert.

A4.6.5.3. Avoid landing at an airfield that is in Alarm Black. Pay particular attention to determining the threat to aircraft contamination from liquid deposition. The liquid deposition phase following a CW airburst attack can extend up to 1 hour (reference **Chapter 2**, **Figure 2.3.**). If landing during Alarm Black, aircrew members should expect a contaminated environment and MOPP 4 conditions. Ensure to confirm the MOPP status with the WOC.

A4.6.6. Ground Procedures After Landing:

A4.6.6.1. Take advantage of any protection available, and keep ground (taxi) time to an absolute minimum. Aircrews should contact WOC or squadron operations prior to taxiing back to the shelter area to check on possible altered routes due to damage, presence of UXO. Accomplish aircraft dearm and EOR procedures in accordance with local procedures; typically at the HAS just prior to shutdown.

A4.6.6.2. Taxi Back. If Alarm Red occurs during taxi back, follow local procedures. These procedures depend on whether additional protection is available along the taxi route. If empty HAS are available, procedures will have the aircraft taxi into the available HAS for protection. Follow normal engine shutdown procedures (requires ground crew assistance) and close HAS doors. If enroute protection is not available, aircraft will continue taxi to home shelter. Local procedures may include a launch-for-survival option. In either case, aircrew members should maintain contact with command and control entities (WOC, supervisor of flying, squadron operations) to relay the aircraft's status and position, and to identify and deconflict taxi routes.

A4.6.6.3. Post Engine Shutdown (at HAS). If Alarm Red occurs after engine shutdown, aircrew members should close the aircraft canopy and don directed MOPP posture. Maintenance personnel will pushback or tug aircraft into the shelter area and will secure shelter doors as appropriate. If the aircraft is in a HAS (doors closed) and is not contaminated, aircrew may exit the aircraft (closing the canopy behind them). If there is any suspicion of personnel contamination, aircrew members should process through an aircrew contamination control area (ACCA). Accomplish post flight aircraft inspections and maintenance debriefings as expeditiously as possible and under cover as available.

A4.6.6.4. When transporting aircrew members back to the squadron facility, follow the same precautions used in stepping to fly. Wear the appropriate ACDE and transport aircrew members in a vehicle that provides overhead cover (enclosed vehicle).

A4.6.7. Large Frame Aircraft (LFA):

A4.6.7.1. Forward operating locations (FOL) are not typically the home base for airlift, tankers, bombers, reconnaissance, since they are usually at locations that are beyond the CW threat range. However, there are times, when LFA must operate in a CW environment. Air Mobility Command (AMC), United States Transportation Command (TRANSCOM), and the theater air component commander will use strategic and tactical airlift to continue the time-phased force deployment data (TPFDD) delivery flow, regardless of the chemical environment. Therefore, every LFA landing or operating within range of projected CW threat weapon systems, should have the capability to conduct at least minimal aircraft service, load, off-load, and decontamination operations.

A4.6.7.2. The revised understanding of the threat environment includes comprehending mission realities, agent characteristics, personnel actions in the air and on the ground, contamination avoidance, and decontamination procedures.

A4.6.7.3. Mission Realities. Strategic aircraft will be operating out of multiple airfields at once. This limits the number of potentially exposed aircraft at any single location. The aircraft will not remain on the ground for extended periods. Mission profiles call for rapid unloading/loading and take off. This, again, limits the potential for exposure to contamination. However, LFA will normally operate from an open ramp without cover while on the ground.

A4.6.7.4. Agent Characteristics. Chemical agents will usually sorb into concrete and asphalt within 10 minutes. The presence of water (rainfall) has no effect on the absorption of agent into concrete or asphalt. Chemical agents will remain in bodies of standing water, and although diluted, present a transfer hazard. Try to avoid contact if possible. If unavoidable, the tires, wheel walls, and perhaps the extreme underbelly of the aircraft may contain low levels of contamination. It is highly unlikely contamination will sling all over the aircraft exterior.

A4.6.7.5. Personnel Actions. There are a significant number of ways LFA personnel can minimize contamination and help sustain operations. The following basic facts concerning LFA vulnerability in a CW environment can help personnel understand which actions (contamination avoidance and or decontamination) will be necessary.

A4.6.7.5.1. While in flight, there is virtually no chance of contaminating the aircraft. LFA vulnerability to CW contamination on the ground will result predominantly from being outside and unprotected at the time of a chemical attack. Contamination can also transfer from contaminated people and or cargo allowed onto the aircraft. Rudimentary contamination avoidance techniques, such as closure of doors, hatches, and ramps, will prevent operationally significant amounts of contamination from entering the airframe. However, if the aircraft is open at the time of attack, or during the hour after attack, a large and troublesome internal contamination hazard is likely to arise. Therefore, the best plan is for aircraft to avoid being on the ground during a chemical attack or during the liquid deposition phase following an attack.

A4.6.7.5.2. If possible, remain airborne. If this is possible, remain aware of the current operational and CW status of primary and alternate landing locations and recognize holding or diverting to a “clean” location as the primary options. Keep command and control entities

aware of intentions. If remaining airborne is not an option and the aircraft must land, expect contamination and a MOPP 4 environment.

A4.6.7.6. Contamination Avoidance. The following pre-, trans-, and post-attack procedures minimize operational degradation for aircrew personnel.

A4.6.7.6.1. During the pre-attack phase, if facilities exist, keep aircraft in a hangar and keep the aircraft closed (windows, doors, ramps, hatches, ports) to the maximum extent possible. Establish shuffle boxes and hand decontamination troughs for aircraft entrances, and use engine running on and offload procedures as much as possible. Keep ground time to a minimum and depart the airfield as soon as possible.

A4.6.7.6.2. In the trans-attack phase, if time permits, depart airfield. If this is possible, ensure to don appropriate MOPP and close all aircraft doors, hatches, ports, and ramps. Once airborne, determine airfield conditions before landing. If unable to depart, do not run engines and avoid running environmental control systems (ECS). This limits the spread of contamination. If available, personnel should use collective filter systems and maintain positive internal pressure.

A4.6.7.6.3. In the post-attack phase, accomplish self and buddy checks as appropriate. When directed, determine the extent and type of contamination. Remember that liquid deposition can last for up to 1 hour. Record and report contamination and determine the aircraft status (contaminated versus clean) and position in a “flow plan”. Ensure to mark and segregate contaminated equipment and materials. Perform decontamination as appropriate and be aware of the potential for cross contamination (personnel, cargo, fuel, munitions). In addition, fulfill contamination control area (CCA) and ACCA requirements.

A4.6.8. Decontamination Procedures:

A4.6.8.1. Due to decontamination limitations, key leadership and installation personnel must realize there are limitations associated with decontamination efforts and form realistic decontamination effectiveness expectations.

A4.6.8.2. For aircraft decontamination efforts to be beneficial, personnel must complete decontamination activities within 1 hour of the time of contamination of porous or permeable surfaces. Non-porous surfaces, such as unpainted metal and glass, do not allow agent penetration and the liquid stays on the surface. These locations represent the most dangerous areas for a liquid contact and transfer hazard, but they are the most susceptible to decontamination, and are the best source for detection with M8 paper. Porous surfaces like painted metal and rubber will sorb chemical agents within tens of minutes. The quick sorption time minimizes the liquid contact and transfer hazard, but a vapor hazard remains once the agent is sorbed. Decontamination efforts will not remove the agent and M8 paper will not detect it once it has sorbed into the surface.

A4.6.8.3. Because of timing restrictions and limitations of decontamination capabilities, the creation of formal aircraft decontamination teams is neither warranted, nor a prudent resource expenditure for wartime operations. Operational decontamination, however, is appropriate and can provide sufficient protection to minimize risk to personnel while continuing the sortie generation process. Perform operational decontamination (M295 decontamination kit or 5 percent chlorine solution) on those surfaces that will be continually touched.

A4.6.8.4. When aircraft exterior decontamination efforts are appropriate, operations and maintenance personnel should consider the following factors. The use of the M295 decontamination kit will be effective for decontamination operations involving "routine use" areas. Smooth surfaces will be relatively easy to decontaminate, but chemical agents will tend to migrate into crevices, rivet heads, joints. The use of 5 percent chlorine solutions is an effective decontamination technique and may be the best choice for greasy areas, rivet heads, cracks, and crevices. It will be difficult to get the 5 percent chlorine solution to adhere to vertical surfaces long enough to optimize decontamination results.

A4.6.8.5. Flying provides the most effective method of decontaminating the exterior surfaces of aircraft. The aircraft should be airborne for 60 minutes or more and flights at lower altitudes are more effective than higher altitudes. All sub-sonic speeds have approximately the same effectiveness. Test results indicate these flight operations will reduce contamination levels to below the eye effects level on the smooth portions of the aircraft exterior. However, small pockets of higher levels of contamination may exist in cracks or around rivets or screws. Weathering alone can significantly reduce the residual CB hazard. Temperatures of 25° Celsius or above for relatively short periods (2-3 hours) can be effective.

A4.6.8.6. Forced Hot Air Decontamination. The use of forced hot air for purposes of decontamination may be a viable option for some agents. Studies recommend the use of the AM 32A-60A Start Cart since it is readily available at most installations. Tests involving blister agents (HD and THD) and nerve agents (GD and TGD) showed the best results. The effective air streams focused from two to three feet away for periods of five to fifteen minutes. The agent broke up into smaller drops before evaporating. However, forced hot air decontamination was not effective against the nerve agent VX. Due to this agent's construction, it tends to blow away from the high-velocity airflow. Maintenance personnel must recognize that forced hot air decontamination will not always result in a contamination-free aircraft.

A4.6.8.7. Aircraft Interior Contamination. Although remote, it is possible for CW agents to infiltrate the aircraft interior through the aircraft ECS and to contaminate (albeit lower levels) the cockpit area and avionics bays. The principal agent challenge to avionics components will be vapor, regardless of the type of agent.

A4.6.8.7.1. The highest and most reliable test indications of chemical vapor contamination were next to wire bundles and ECS insulation. The highest readings in the cockpit were near the floor next to the rudder pedals. The sensitivity of electrical equipment to chlorine or other water-based solutions limits their feasibility for decontamination. The simplest and most effective decontamination technique for interior aircraft decontamination is to fly the aircraft and continue using it.

A4.6.8.7.2. Cockpit Decontamination Procedures. Use the M291 or M295 decontamination kit and a 5 percent chlorine solution to effectively reduce or eliminate the operational contact and transfer hazard. There are no effective, operationally feasible methods for decontaminating leather items, canvas storage covers, webbing, and other textile materials contaminated with liquid chemical agents. Place barrier materials over the item(s) or replace them. Decontaminate contaminated tools using the M291 or M295 decontamination kit and/or a 5 percent chlorine solution and mark as contaminated.

A4.7. Aerospace Equipment Maintenance:

A4.7.1. Overview. The protection of aerospace equipment and personnel is of utmost importance during attack situations. The enemy's use of chemical warfare (CW) agents has the potential to seriously degrade sortie generation and other maintenance operations unless maintenance personnel are well trained, effectively implement contamination avoidance measures, and proactively apply installation attack response procedures to protect both personnel and equipment. If contamination is present, decontamination options and procedures must be understood and practiced. This section provides general tactics, techniques, and procedures (TTPs) to support and protect maintenance personnel and equipment during attack response actions in a CW environment. The ultimate goal is to minimize sortie generation degradation by limiting (1) the number of people and amount of equipment exposed to contamination, and (2) the time spent in MOPP 4.

A4.7.2. Operating Location Vulnerability Assessment. Conduct a vulnerability assessment to determine where and how sortie generation and other maintenance processes would be accomplished and how they would be vulnerable to degradation in a CW environment.

A4.7.3. Commanders will develop local TTPs to minimize degradation. These TTP will address the following areas as a minimum:

A4.7.3.1. Facility Options. The key to contamination prevention is the availability and use of all available overhead cover to protect critical assets. Hardened and protective aircraft shelters provide optimum cover, flow throughs and revetments provide some cover, and open ramps provide little or no cover. Develop local procedures to optimize protection using all the facilities available, and when feasible, making modifications to existing facilities.

A4.7.3.2. Equipment Prioritization. Commanders will identify the types and amounts of critical equipment required for sortie generation and maintenance operations. This equipment will be prioritized in an overall coverage plan.

A4.7.3.3. Coverage Plan. Develop a coverage plan to document procedures to cover critical equipment. If permanent overhead cover is not available, plan to use barrier material. The plan will include local checklists that prioritize coverage of mission critical equipment. Place special emphasis on securing aircraft points of ingress and egress by closing or covering cockpits, doors, and ramps.

A4.7.3.4. Plan to process through contamination control areas (CCAs). This process will require additional time be added to the beginning and end of each shift and may require the use of staggered shifts to accommodate the CCA capacity.

A4.7.3.5. Sortie Generation and Maintenance Procedures. As a minimum, the following procedures will be addressed: parking, inspections, maintenance, servicing, munitions/pod/tank load/download, arming/dearming, washing, and equipment servicing.

A4.7.3.5.1. Include appropriate attack warning and response procedures. Pay particular attention to procedures during the liquid deposition phase following a missile attack (Alarm Black). It is critical to avoid contamination during this phase.

A4.7.3.5.2. Focus post attack procedures on detection, reporting, marking, and segregation of contaminated equipment. If no contamination is present, plan for MOPP 2 and normal procedures; however, do not reduce MOPP until authorization is received from the WOC/SRC/UCC. If contamination is present, protect critical assets, mark and segregate contaminated

equipment, and remove and replace contaminated coverings. Do not use contaminated equipment unless absolutely necessary. If contaminated equipment must be used, plan for extended MOPP 4 and performance degradation.

A4.7.3.5.3. Include procedures addressing the receipt and processing of contaminated equipment/products from outside the maintenance areas. Examples include support equipment, munitions, fuel, spare parts, etc.

A4.7.3.5.4. To the greatest extent possible, accomplish before takeoff and after landing checks and procedures inside hardened aircraft shelters (HAS).

A4.7.3.5.5. If Alarm Red is declared after taxi begins and there is protection available, direct the aircraft to pull into a (HAS) and shutdown. If no protection is available, direct the aircraft to taxi to takeoff or taxi to shutdown park position.

A4.7.3.6. Engine Running Ground Procedures. Aircraft are most vulnerable while they are on the ground and not protected by overhead cover. For this reason, taxi time should be minimized and every effort made to take advantage of available cover as soon as possible. Develop communication and coordination procedures between aircrew and maintenance personnel to minimize aircraft parking and shutdown time.

A4.7.3.7. Procedures to Avoid or Handle Aircraft Contamination. Once airborne, there is little or no threat of contamination. Before landing, however, aircraft will be directed not to land in Alarm Red/Blue conditions unless there is no other option. Aircraft will also be directed to avoid landing under Alarm Black, particularly during the droplet fall phase. Aircraft will be directed to hold/divert rather than to land. Take the following actions as applicable to the CW environment.

A4.7.3.7.1. Take every effort to detect contamination. Use detection methods, including detectors (if available), and M8 paper. Report results in common areas and provide for personnel information.

A4.7.3.7.2. If aircraft land during Alarm Black, plan for contamination and MOPP 4 conditions. Maintain contact with the aircrew to remain informed of aircrew intentions so as to recover the aircraft utilizing the best TTP available.

A4.7.3.7.3. Identify and develop procedures to perform servicing, work around/in, or avoid aircraft that were on the ground and unprotected during the liquid droplet phase of a CW attack.

A4.7.3.7.4. Once contamination is detected on the aircraft exterior, complete decontamination efforts as quickly as possible. To be effective, decontamination activities must be completed before the agent adsorps into the surface. That is typically within minutes from the time of agent contact with the surface.

A4.7.3.7.5. In coordination with the base Bioenvironmental Engineer, develop procedures to clean impervious surfaces like unpainted metal/glass that do not allow agent penetration, and where the liquid stays on the surface. Although these surfaces are the most receptive to decontamination, they also represent the most dangerous areas for both liquid transfer and vapor hazard.

A4.7.3.7.6. Take special precautions to avoid exposing personnel to porous surfaces like painted metal/rubber will sorb chemical agents within tens of minutes. Although sorption min-

imizes the liquid transfer hazard, the vapor hazard remains, cannot be removed through decontamination efforts, and cannot be detected with M8 paper.

A4.7.3.8. Operational decontamination is appropriate and can provide sufficient protection to minimize risk to personnel while continuing sortie generation and maintenance processes. Direct the use of operational decontamination procedures (M295 kit or 5% chlorine solution) on those surfaces that will be continually touched during the sortie generation or maintenance processes (unless prohibited by technical order or weapons system program office). Logical areas include: canopy, aircraft ladder, aircraft servicing panels, munitions racks, engine access panels, equipment access panels, etc.

A4.7.3.9. Ensure TTPs consider that flying provides the most effective method of decontaminating the exterior surfaces of aircraft.

A4.7.3.10. Although remote, it is possible for CW agents to infiltrate the aircraft interior through the aircraft environmental control systems (ECS) and contaminate (albeit lower levels) the cockpit area and avionics bays. Develop procedures to address detection and decontamination of these areas.

A4.7.3.11. Task Qualification Training (TQT). TQT is conducted by first-line supervisors and builds upon individual skills initially taught by the Civil Engineer Readiness Flight.

A4.7.3.11.1. As a minimum, all personnel assigned to the Maintenance Group will receive initial training on local TTPs, including a practical exercise of performing maintenance tasks in full MOPP gear. Work center supervisors will select the appropriate tasks for training and are responsible for ensuring proper work-rest cycles are observed.

A4.7.3.11.2. Refresher training will be accomplished as outlined in AFI 10-2501.

A4.7.3.11.3. Completion of initial and refresher training will be documented and tracked using the appropriate automated maintenance information system (Core Automated Maintenance System or G081).

A4.8. Aircrew Life Support:

A4.8.1. The primary focus of Aircrew Life Support (ALS) is to generate aircrews to conduct operations in an NBCC environment. ALS procedures include recognizing vulnerabilities and opportunities to protect personnel, working safely and effectively in a contaminated environment, and understanding and operating an aircrew contamination control area (ACCA).

A4.8.2. Accomplish preparatory and planning actions to mitigate the impact of a CW environment on the ALS function. Identify preparatory actions by performing an operating location vulnerability analysis. This analysis should consider the types and effectiveness of available shelters, possible time required in shelters, and necessary equipment needs.

A4.8.3. Aircrew Chemical Defense Equipment. The aircrew chemical defense equipment (ACDE) provides limited protection against liquid agent. Use the aircrew ensemble for “flight related” duties and do not use it to perform “ground” duties in a known chemical environment. Aircrew personnel should wear the ground crew ensemble (GCE) during non-flying operations. Crewmembers should be aware of decontamination and processing procedures for both the ACDE and GCE.

A4.8.4. Protective Sheltering. Aircrew members generally spend all of their ground time (excluding aircraft taxi) in some type of protective sheltering. The sheltering of crewmembers in squadron facilities generally falls into two distinct categories: collective protective (CP) sheltering and non-protective sheltering. CP sheltering offers the best protection for personnel since it protects from blasts, the liquid deposition phase, and vapor contaminants. Non-CP shelters provide a degree of protection from blasts, natural elements, and the liquid deposition phase, but it does not provide protection against agents in vapor or aerosol form.

A4.8.5. Aircrew Transportation. Minimize vulnerability for aircrew members in transit to and from operations facilities to aircraft. Expect and avoid the liquid deposition phase following a CW attack and don the appropriate aircrew protective equipment. Since the overcape and booties are hot and cumbersome, ensure to consider aircrew fatigue. Transport aircrew personnel in a covered vehicle and aircrew members should not walk to aircraft.

A4.8.6. Coverage Plan. Normally, the majority of ALS equipment remains inside. Whether CP or non-CP shelters, there is little exposure to liquid contamination. Consequently, there may be little need for an expanded coverage plan. If there is no protection for equipment, place as much equipment as possible inside and under permanent cover. If unable to use permanent cover, protect all equipment as much as possible using sheltering materials and plastic covers. Cover mobility bins and dispersed equipment to the maximum extent possible.

A4.8.7. Attack Responses:

A4.8.7.1. Alarm Yellow. Continue ongoing preparations by aircrew members and don ACDE as required. Protect uncovered equipment with either barrier materials or place under overhead cover.

A4.8.7.2. Alarm Red. Immediately don MOPP 4 and cease all maintenance tasks, unless aircraft are launching for survival. Seek immediate cover and close shelter doors if applicable. At this point, little to no opportunities will exist for additional coverage actions. ***NOTE:*** The airbase Commander may direct mission essential activities to continue during Alarm Red.

A4.8.7.3. Personnel in Transit. Personnel in the vehicles should don appropriate MOPP and seek protection. If available, a HAS provides the optimum protection. Exercise caution if entering a HAS that contains aircraft or equipment. Close doors after entry. If no overhead cover is available, search for the best protection alternatives.

A4.8.7.4. Alarm Black. Aircrew members may be required to launch mission essential sorties in these conditions. During the liquid deposition phase, aircrews will remain in shelters or covered areas until conditions permit transportation. If this is not possible, aircrews should wear the plastic overcape and overboots while transiting. Do not remove the plastic overboots and overcapes until the aircrew member is ready to enter the aircraft or ACCA. The unique entry and exit procedures for each aircraft will determine when to remove items. The use of the overcape for an extended period may contribute to heat stress, increased carbon dioxide or static buildup, and may lead to decreased aircrew performance.

A4.8.7.5. Contamination Detection and Reporting. The WOC controls the timing for the release of the survey teams. Conduct unit PAR surveys when released by the WOC. Report the results to the UCC and the UCC will forward to the WOC.

A4.8.7.6. Aircrew members may need to use contaminated assets. If using contaminated assets, realize there is a contact hazard threat and decontamination operations will be necessary before touching the assets. Use caution in a contaminated environment when dealing with the transportation vehicle, aircraft, the boarding ladder, entrances, and preflight areas (munitions). Expect some level of personal contamination and extended periods in MOPP 4 as long as contaminated assets represent a vapor hazard. Consequently, ensure to consider work/rest cycles. In addition, ground personnel will require CCA and aircrew members will require ACCA.

A4.8.8. Detection Procedures. ALS personnel should use all available detection methods to detect contamination of personnel, vehicles, aircraft, and equipment. Examples include chemical agent monitor (CAM), locally positioned vapor sensors, M8 and M9 paper, and WOC/UCC reporting results from common locations. ALS personnel will require detection instrument availability, which they can acquire through Civil Engineer Readiness. Ensure to fully train ALS personnel to operate and interpret the instruments. Contact Civil Engineer Readiness for guidance if problems develop or if there is trouble interpreting the CAM readings.

A4.8.9. Decontamination Procedures:

A4.8.9.1. Personal Decontamination Procedures. Personal decontamination is vital. Accomplish personal decontamination as soon as contamination is present or suspected. Take appropriate response actions, to include accomplishing self and buddy checks for individual protective equipment contamination and decontaminating using M291 or M295 decontamination kits.

A4.8.9.2. Once contamination is present, accomplish personal decontamination procedures, report the presence of contamination to the UCC or SRC, and plan to process through an ACCA when appropriate.

A4.8.9.3. Perform operational decontamination (M295 decontamination kit or 5 percent chlorine solution) on those surfaces continually touched by aircrew members. Logical areas include the transportation vehicle (doors, seats, steering wheel), and munitions (anything touched during preflight inspections). Additional areas include any part of the aircraft touched during preflight and boarding (canopy, aircraft ladder, entrances, aircraft servicing areas, engine access panels, and other common use areas).

A4.8.9.4. Decontamination Equipment in the Field. AFI 11-303, Volume 3, *Aircrew Life Support (ALS) Combat Operations* lists the appropriate items and decontamination equipment and materials ALS personnel will need to have in the field. For example, these items include M8 paper, 5 percent chlorine solution, M295 and M291 kits, blower fans, hand troughs, and buckets.

A4.8.10. ACCA Operations:

A4.8.10.1. The purpose of the ACCA process is to provide detection, decontamination, and processing provisions for aircrew members. The ultimate responsibility for meeting the operational requirements of an ACCA clearly falls on the ALS personnel. The ACCA is a location to segregate, confine, contain, and remove toxic agents, with specific areas of operation and containment. These areas remain consistent regardless of their size or location. Systematic processing procedures for over pressurized systems (collective protection) and for an open-air environment remain the same. Open-air processing occurs in open fields, parking lots, taxiways, rooftops, or areas located away from toxic hazards. Contaminated personnel, vehicles, and equipment will bring contaminants into the open-air ACCA.

A4.8.10.2. Contact Hazard Area (CHA). The CHA is a defined room, space, or area within the boundary of the ACCA to identify and possibly contain contact hazards. Use absorbent materials to contain the hazard and use chlorine solutions to neutralize the chemical agents. Accomplish separation by the removal of contaminated items during the doffing process.

A4.8.10.3. Vapor Hazard Area (VHA). The VHA is where only the possibility of a vapor or inhalation hazard exists. The purpose of a VHA is to separate all airborne hazards before they process into a TFA. Over-pressurized systems use vapor locks to prevent off-gassing hazards from getting any further into the shelter. In open-air processing, the VHA is a large open space. This assists in reducing vapors. The further a crewmember travels and the larger the volume of air flow in the VHA, the greater the contamination diminishing effect.

A4.8.10.4. Toxic Free Area (TFA). This area should not contain a hazard. While operating in this area, there is no need for respirators or protective clothing. In open-air processing, however, locate the TFA main personnel rest area outside the defined boundary of the ACCA and at least 200 yards away. Shifting wind direction or the accumulation of contaminated materials (potential hazard effects from off-gassing or agent resuspension), or the noise associated with general ACCA operations, necessitates the need for locating the TFA away from the ACCA in an open-air environment. With over pressurized systems, the entire structure past the point of the airlock is the TFA.

A4.8.10.5. Entry and Exit Control Points (ECP). ECP may be separate or all-inclusive. In open-air ACCA, the ECP are different. One is located at the start of the processing area where personnel enter, and the other is located at the opposite end where personnel exit. This ensures the one-way flow of processing. Hardened shelters and other over-pressurized shelter systems use air lock entryways to prevent any outside contaminants from getting into the TFA. In most cases, the ECP will be the same. Establish ECP to monitor the flow of individuals in and out of the ACCA or shelter. Keep documentation on processing at the ECP. This documentation helps record the attendance, exposure, and historical aspects of ACCA operations.

A4.8.10.6. Some deploying units may find themselves operating from pre-existing facilities, such as hardened, semi-hardened, or other collective protection type structures. Having collective protection available will be the exception rather than the norm. Therefore, it is incumbent upon deploying ALS personnel to deploy with the expectation that no decontamination structure or shelter will be available.

A4.8.11. Open-Air ACCA:

A4.8.11.1. Accomplish open-air processing in conjunction with non-CP shelters or as a stand-alone entity. It is the fastest and most likely method to process aircrew personnel. However, ensure to accomplish open-air processing in a contaminant free area.

A4.8.11.2. Planning. Accomplish the establishment of an open-air ACCA through multi-agency interaction. The SRC will coordinate efforts to ascertain as much information as possible. It is important to begin the planning and establishment of an open-air ACCA well before the threat arises. As a part of the planning, prepare ALS personnel for rapid repositioning and to operate from multiple locations.

A4.8.11.3. Site Selection. Deployed ALS personnel must develop decontamination teams to deploy to the ACCA set-up area when selected. Develop specific procedures for notification of the team leader and subsequent team members at base level. Accomplish ACCA site selection with

the assistance of Civil Engineer Readiness. The selection process involves numerous factors, to include areas that are up wind and a safe distance from contamination; areas accessible by ground transportation; and areas offering as much privacy and concealment as possible. Selecting locations that are out in the open may invite secondary attacks and the unwanted curiosity of others. Additional considerations include areas where localized weather conditions and wind patterns remain consistent; areas away from valley and ridgelines; areas offering the most inherent necessities; and areas within walking distance of the personnel-sheltering portion of the TFA. It will do no good to decontaminate crewmembers if they cannot get to a clean area to rest and debrief. If the shelter is not in the immediate area, arrange transportation. The locations must also offer the best possible options of disposing or removing contaminated waste. Always coordinate disposal of hazardous waste with Civil Engineer Readiness personnel.

A4.8.11.4. Multiple Sites. Choose multiple site locations to ensure coverage of threat contingencies. Multiple ACCA locations allow re-establishment of the ACCA if primary site compromise occurs.

Choosing a site near the ground personnel processing line will facilitate re-supply and will provide better security. However, a potential secondary hazard exists with this technique, since ground crew personnel are more likely to encounter contamination. Moreover, the aircrew ensemble, by design, does not provide protection from liquid contamination. It should not process through the ground crew CCA.

A4.8.11.5. ACCA Mobility. It will be very unlikely that your ALS organization will be the only one operating from the site; therefore, integrate and centralize ACCA site requirements, if possible. The mobile ACCA must be ready for assembly in a short amount of time. Bundle together the components for each station and double wrap with plastic to protect the assets from contamination and to aid attendants in the rapid set-up of the station. As a further protective measure, store the mobile ACCA in covered vehicles or inside when not in use to prevent contamination of barrier materials during attacks. This precaution will minimize the danger of ALS personnel and eliminate contaminated waste disposal requirements.

A4.8.11.6. Necessary Equipment. Procedures for the establishment of an open-air ACCA and the equipment used to accomplish the decontamination process center around the Contaminant Air Processing System™ (CAPS™). CAPS™ is the foundation for standardization and continuity throughout the ALS community. While some ALS shops may not presently have CAPS™, units may substitute their present shelters and other pieces of equipment in the place of CAPS™ until available.

A4.8.11.7. Activation. Establish procedures at deployed locations to notify the ACCA team and to activate the ACCA site after an attack. The senior ALS representative is responsible for coordinating activities within the SRC, notifying the ACCA manager after an attack, and directing the appropriate team(s) to the selected location for the ACCA.

A4.8.11.8. Work Rest Cycles. Shortened workloads and increased rest cycles are necessary for sustained operations in a contaminated environment. Some conditions may reduce the work time in the ACDE or GCE to less than 1 hour. Frequent rest periods may include time for ALS personnel to decontaminate themselves. ACCA managers must remember that the protective thresholds of the GCE are greater than those established for ACDE.

A4.8.12. Assume Contamination. Due to detection limitations and because the agents themselves are so dangerous, it is imperative that everyone who arrives at the ACCA assume contamination until it can be determined otherwise. Transported individuals that arrive at the ACCA in the same vehicle or who have been in close proximity to one another, may have cross-contaminated each other.

A4.8.13. Personal Processing of Aircrew in ACDE. Competencies with processing the GCE are necessary because ALS personnel must decontaminate themselves and aircrew personnel who may arrive at the ACCA in their GCE.

A4.8.14. The ACCA has four stations based on an overall processing ideology that follows four essential phases of processing. These include the entry control and initial processing phase; hood, helmet, mask, and glove wash phase; protective overgarment removal phase; and the mask removal phase.

A4.8.14.1. Station 1:

A4.8.14.1.1. Station 1 is the entry control and initial processing phase, which is the drop off point for all personnel transported to the ACCA. This station requires two attendants. At this station, brief crewmembers on the rules of the ACCA, accomplish initial decontamination procedures, and relieve them of weapons, classified material, and any other hand-carried items they possess. If aircrew members arrive at this station wearing an overcape, remove it as soon as possible to prevent overheating and carbon dioxide buildup.

A4.8.14.1.2. The attendant will perform contaminated clothing spot checks, using a CAM or chemical detection paper to determine exposure. When dealing with liquid or dusty agents, the crewmember should “dust” or decontaminate the area. Dusting materials does not neutralize the agent; it only contains them. Use towelettes moistened with a bleach solution or other decontaminating agents to neutralize the agents.

A4.8.14.1.3. Designate this station as the point for all medical pick-ups and extractions. No person showing signs or symptoms of exposure should proceed beyond this point. It may be necessary for the attendant to secure classified material if there is no one else available. Classified material should not be stored in the weapons safe. For safety reasons, it is recommended the ALS attendant handle, clear, and secure all aircrew weapons. To prevent unnecessary delays, conduct all questions and information gathering simultaneously with contaminant detection, classified document surrendering, or any other station procedure. Collected data, such as flight history, flight line occurrences, medical information, and eyewitness accounts all serve as important information and provide a traceable history for incident review. However, if gathering this information causes unnecessary delays in processing the crewmember, defer it to Station 4.

A4.8.14.1.4. Remove the flight gloves. Decontaminate plastic overboots in the washtubs while the crewmember stands in the boot wash tray. Remove all items worn over the flight suit or coverall. Separate individual items to prevent cross-contaminating other gear at the individual level as well as the unit level. Ensure that personnel store known contaminated items separately. For example, one dirty vest in a container of clean vests may cross-contaminate others.

A4.8.14.1.5. Deciding whether to perform decontamination procedures or to dispose of the equipment may be difficult. When in doubt, the safest and easiest of the two choices may be to dispose of it. Disposal also requires planning, training, resources, and attention to safety.

When deciding about the disposition of clothing and equipment, the two single most important factors are human safety and mission requirements.

A4.8.14.1.6. Arriving crewmembers should begin processing as soon as possible. Equally as important, direct crewmembers with masks having hydration capability to consume water before starting their processing. Not only will this hydrate the body, but it will also increase the cooling of the body.

A4.8.14.2. Station 2. Station 2 involves the hood, helmet, mask, filter and glove wash phase. One attendant will serve this phase. This station tries to contain all contact contaminants that might remain on the aircrew ensemble after processing through Station 1. Wash and wipe the external surface of the helmet, hood, mask, and blowers or filter packs (if applicable). Upon completion, decontaminate gloves in bleach and water rinse tubs.

A4.8.14.3. Station 3. Station 3 is the protective garment removal phase. Two attendants work this phase. This station removes the aircrew protective garments to include boots, aircrew ensemble, and helmet. Use separate racks to safely accomplish the ensemble removal and stowage. These procedures provide the safe transition from the CHA, through the VHA, and into the TFA. Ensure crewmembers doff these items one at a time. Separate individual items to prevent cross-contaminating other gear at the individual level, as well as the unit level. A “runner” should immediately separate contaminated equipment for either disposal or decontamination.

A4.8.14.4. Station 4:

A4.8.14.4.1. Station 4 is the mask removal phase. This is the final phase of ACCA processing and will transition aircrew members to the TFA. Two attendants serve this phase. Before mask removal, monitor aircrew members for detectable levels of contaminants using all detection methods available. When clear, remove masks (and filter pack or blowers). Spare ground crew masks should be available for problematic issues surrounding the mask removal process. Spare medical supplies, such as the atropine injectors and 2-PAM chloride injectors, should be available for personnel showing symptoms of contamination during mask removal. Do not mistake an aircrew member’s excitement as a sign of exposure.

A4.8.14.4.2. No hazard should remain when personnel enter this phase. The only items remaining on the crewmember that could possibly have a contact contamination hazard is the mask and hood assembly and rubbers gloves. After mask removal, there is minimal risk of continuing contact or vapor hazards. This station can present the greatest danger to the crewmembers as they remove their respiratory protection for the first time. The purpose of removing the mask at this point is to eliminate the possibility of carrying chemical into the TFA. It is crucial that the crewmember fully understand the procedures at this station before the attendant allows the crewmember to remove their mask. ***NOTE:*** If mission resources (replacement masks) are so low that no other respiratory protection is available, a potential risk from a decontaminated mask is far better than no protection at all.

A4.8.14.4.3. If the exterior of the mask was exposed to contamination, it is possible to thoroughly clean and to replace the mask filters for re-use. Although contaminants over time may permeate the mask’s butyl rubber, a decontaminated mask provides more protection than no mask at all. Any off gassing of the mask's outside surface would process through the mask filters during inhalation. If the interior of the mask were exposed to contamination, the re-issue

of the mask would not be possible, no matter how many times it was cleaned or decontaminated.

A4.8.14.4.4. Individually secure, properly handle, and immediately decontaminate masks and other equipment that have the potential for re-use. Moreover, disposable clothing or other readily available clothing must be available at this station. Consider the requirement and plan accordingly. In most cases, the only items the crewmember will need to re-don will be items provided by ALS. Paper painter suits, or other one-size-fits-all clothing, are ideal for this requirement. When the crewmember arrives at this station, the only items of clothing he/she should be wearing is cotton underwear or underclothing. The crewmember will don the disposable clothing and proceed to the TFA.

A4.8.14.5. Station 4A. This station is the exit control point and is a vital element in documenting and controlling movement within the ACCA. All crewmembers must provide any information to help ACCA attendants understand and document their experience. Log all crewmembers out of the ACCA from the exit control point for transport to the portion of the TFA.

A4.8.15. ACCA Manager. The ACCA manager is responsible for monitoring all line activities from Station 1 through Station 4. The manager may travel the complete CHA area, but will not enter the VHA. The ALS ACCA manager is typically the highest-ranking ALS individual on that shift, regardless of assigned unit. ACCA manager duties include line staffing, monitoring work and rest cycles, site location, maintaining equipment requirements, coordinating waste disposal with Civil Engineer Readiness, and ensuring medical aid for personnel.

A4.9. Vehicles:

A4.9.1. General Actions. Vehicles personnel must effectively employ pre- and post-attack actions to protect personnel and assets. Pre-attack actions include planning a vehicle covering strategy, protecting the vehicle fleet, and pre-positioning M8 paper on all vehicle assets. Post-attack actions include prioritizing vehicle use after an attack, conducting vehicle decontamination, and performing vehicle maintenance procedures in a contaminated environment. Additional post-attack activities include providing long-term identification of contaminated vehicles and supporting open-air CCA operations. Vehicle personnel should also review procedures in paragraph **A4.5.**

A4.9.2. Pre-Attack Operations. The vehicle fleet protection of mission essential vehicles is critical to the airbase mission during NBCC attack scenarios. Pre-attack actions, such as providing overhead cover, dispersing vehicles, and conducting expedient hardening, are the most cost-effective protective measures. When dealing with a parked vehicle, all operators must close vehicle doors, windows, and hatches and turn off the engine when Alarm Yellow or Red (if time permits) occurs. Every vehicle, including those under cover, must have M8 paper pre-positioned prior to an attack. These actions will save time and reduce the resources needed to implement post-attack recovery and sustainment actions. They will also limit the need for operational decontamination and increase personal safety by reducing the potential for personnel to come into contact with contaminated areas. The most critical vehicle assets or one-of-a-kind vehicles should receive top priority for protective actions.

A4.9.2.1. Heating, Ventilation, and Air Conditioning (HVAC) Operations. During pre-attack actions, shut down breathing air compressors and HVAC operations. Suspend all operations requiring respirator usage. These actions will prevent the potential spread of contamination and exposure to personnel and building interiors.

A4.9.2.2. Overhead Cover:

A4.9.2.2.1. Overhead cover is the most effective contamination avoidance measure. Provide vehicles with overhead cover by parking them within vacant facilities or areas (i.e., weather shelters) with overhead cover. If limited overhead cover is available, develop a vehicle priority list and place the highest priority vehicles within these areas. Use barrier materials on all other vehicles to prevent contact with NBC contamination. Personnel should place additional barrier materials inside each vehicle if possible, even if assigned to hardened facilities. Mission support requirements may result in the vehicle being isolated from hardened facilities. Ensure vehicle operators/using organizations place M8 paper on the outer layer of the barrier material. This will simplify post-attack reconnaissance. Try to use overhead cover given by fixed facilities. Use all installation facilities to search for overhead cover for vehicles; e.g., warehouses, hangars.

A4.9.2.2.2. Identify facility spaces, assign vehicles locations, and then determine the amount of barrier material and M8 paper needed to protect all vehicles. Identify, for example, how many linear feet of plastic sheeting, needed for each type of vehicle (based on double wraps). Decide how many times the unit expects to replace at least the outer layer (five times for instance). If a shortage of barrier materials exists, consider using barrier materials designated as replacement stocks to provide initial protection for high use assets.

A4.9.2.3. Dispersal and Expedient Hardening:

A4.9.2.3.1. Vehicle dispersal is a valuable asset protection technique. The probability is high that effective dispersal will protect some vehicle assets from contamination or damage from conventional weapons effects. However, use dispersal actions with expedient hardening and overhead cover whenever possible. Additionally, Vehicles personnel must guard against the tendency to park a large number of vehicles at any one location due to the ease of access.

A4.9.2.3.2. When identifying or constructing dispersal sites, choose a combination of features that provide the best available expedient or natural protection and support mission needs.

A4.9.2.3.3. Locate the dispersal site in an area that is not within the effective range of adversary ground force weapons. If possible, locate the site on a concrete or asphalt surface and ensure there are at least two entry and exit routes. One of the routes should be a concrete or asphalt surface. Enhance protection by locating the dispersal site in an area that is under the direct observation or control of a security forces defensive fighting position or an owner-user security checkpoint. To simplify retrieval and post attack reconnaissance tasks, place the site near a unit work area.

A4.9.2.3.4. Consider using dispersed vehicles as storage locations for alternate mission supporting materials, such as tools and equipment.

A4.9.3. Post-Attack Operations:

A4.9.3.1. To identify contamination after an attack, check prepositioned M8 paper as soon as possible after the WOC directs the general release of the base populace. If a vehicle did not have M8 paper prepositioned on it, check the vehicle non-porous surfaces, such as glass, where M8 paper will be able to detect the liquid chemical agent before it sorbs into the surface. Vehicles personnel using wreckers and busses and mobile maintenance personnel should carry a supply of M8 paper with them to test non-porous surfaces prior to contact. If a liquid chemical agent contaminates the

porous vehicle surfaces (paint, canvas, plastics), the agent will sorb into the surface, and the vehicle will remain hazardous to unprotected personnel for an extended period. Post-attack operations depend upon the vehicle operator or post-attack reconnaissance team to identify and conspicuously mark contaminated vehicles (see **Attachment 6**). This allows Vehicles supervisors to separate contaminated from uncontaminated vehicles and then develop plans to restore operations and minimize contaminated vehicle use.

A4.9.3.2. Use contaminated vehicles only when uncontaminated vehicles of the same type are unavailable. If possible, coordinate with the requesting unit to delay non-critical operations until the uncontaminated vehicle is available. This strategy requires close cooperation between the Vehicles UCC and the unit UCCs that use the airbase U-Drive-It vehicles. The Vehicles UCC consolidates reports on the unserviceable and contaminated vehicles and then provides them to the Vehicles representative in the SRC. The SRC Vehicles representative will work with vehicle operations section and airbase UCCs to develop a vehicle priority list to support critical wing activities with operational, uncontaminated vehicles.

A4.9.3.3. Contaminated Vehicle Identification and Decontamination (Also see paragraph **A4.5.4.** for vehicle operator responsibilities):

A4.9.3.3.1. Contaminated Vehicle Identification. The vehicle operator and unit personnel are responsible for clearly marking and reporting information to their UCC. They are also responsible for annotating the AF Form 1800-series form with key information. When notified by the SRC or UCC, the Vehicles UCC notifies vehicle operations dispatch and vehicle maintenance control and analysis (MC&A). MC&A consolidates and files the information in the vehicle historical files and reports contaminated vehicles to MAJCOM Transportation Division. The MAJCOM Transportation Division forwards this information to Air Staff and Warner-Robins Air Logistics Center for the item manager's records. Vehicle maintenance will enter the information into the On-Line Vehicle Interactive Management System (OLVIMS), where it will become part of the vehicle master record. ***NOTE***: OLVIMS, in its current form, does not include these fields. It is undergoing refinement to be able to input the contamination information. Once modified, OLVIMS will provide visibility of the vehicle’s maintenance record and contamination status to the installation, the Major Command, and the Air Staff. Until modification is complete, vehicle maintenance MC&A will keep a master log of contaminated vehicles and record the contamination status in the vehicle's historical file. MC&A will also track and report contamination information to MAJCOM, Air Staff, and Warner-Robins Air Logistics Center.

A4.9.3.3.2. Vehicle Decontamination: There is no machine, kit, team, technique, or procedure presently capable of fulfilling all decontamination requirements. Depending on the vehicle surface, the agent may sorb into the surface in times ranging from less than one minute up to approximately an hour. Vehicle decontamination operations will not have a significant effect once the agent has absorbed into the surface. Thus, there is no need for extensive vehicle decontamination and there is no need to establish a formal vehicle decontamination team. Refer to paragraph **A4.5.** for vehicle decontamination TTP and considerations for CARC and polyurethane painted vehicles.

A4.9.3.4. Open-Air CCA Support:

A4.9.3.4.1. Vehicles support is essential for open-air CCA operations. Initial survival and sustained operations require contaminated and uncontaminated personnel to move to and from their unit work areas and rest and relief areas. Some units, especially those with little or no vehicle capability, may not be able to provide transportation for their personnel. Vehicles and Civil Engineer Readiness must coordinate CCA planning and support for pre-attack setup and post-attack operations. These operations will likely focus on a mobile CCA strategy, since the installation will not know the locations of base contamination until after post-attack reconnaissance is complete.

A4.9.3.4.2. Following an attack, establish the CCA location within an uncontaminated area. Vehicles personnel may need to move CCA equipment and support personnel from their staging location to the CCA area. Once the CCA is operational, move contaminated personnel from their work or billeting areas to the CCA, and then to the uncontaminated areas identified for rest and relief. Once the CCA is operating, transportation needs will increase rapidly. In addition to personnel transportation, requirements will likely include movement of supplies and equipment to support sustained CCA operations. This may also include the movement of IPE from storage areas, transportation of contaminated waste, and resupply of food and water for CCA support. These operations, especially the rapid removal of contaminated waste, are critical to sustainment of CCA operations. Units must consider the transportation requirements for open-air CCA operations when preparing listings for inclusion in the Wing Minimum Essential Level (MEL) and Priority Recall Plans.

A4.9.4. General Maintenance Actions:

A4.9.4.1. After an attack, maintenance personnel should use the following guidelines.

A4.9.4.2. Check the vehicle for contamination marking signs, or positive M8 paper, or contamination annotations on the AF Form 1800.

A4.9.4.2.1. If there is any doubt about the contamination status of the vehicle, question the vehicle operators about the vehicle's location during the last 24 hours. Contact vehicle maintenance and ask them to query OLVIMS or check the vehicle historical file for contamination information on the vehicle. Additionally, perform a detailed examination of the non-porous vehicle surfaces for any sign of contamination. If the vehicle is contaminated, adopt MOPP 4, identify and mark the vehicle as contaminated, and report the findings to the transportation UCC. Annotate AF Form 1800 to show the contamination status.

A4.9.4.2.2. Report the contamination status to vehicle maintenance. Vehicle maintenance will enter the contamination information into OLVIMS (once modified) and will record the contamination information in the vehicle historical file.

A4.9.4.3. If petroleum, oil, and lubricant (POL) products come into contact with the OG, replace it. POL products will damage the OG even if contamination is not present. Maintenance personnel should wear rain suits or impenetrable coveralls if there is a risk of exposure to POL products. It is important to note that rain suits will intensify the heat stress potential.

A4.9.4.4. Whenever possible, ensure personnel perform maintenance activities in an open area with a large airflow. If the vehicle is in an enclosed area, raise the warehouse or garage doors, unless security cautions prevent these actions.

A4.9.4.5. As a safety precaution, always wear work gloves when working with or around previously contaminated vehicles if a chemical or biological attack occurred on the installation. For specific procedures on handling contaminated or previously contaminated vehicles, refer to **Attachment 2**.

A4.9.4.6. Place barrier materials over vehicle surfaces if more than cursory contact is necessary, i.e., leaning into the hood compartment or kneeling in the truck bed. Decontaminate items or surfaces that need to be touched to perform maintenance.

A4.9.4.7. Decontaminate the metal tools, jacks, and other items exposed to previously contaminated surfaces in a 5 percent chlorine solution. Immerse the tool for 10 to 20 minutes, then rinse with clean water, dry, and lubricate, if appropriate. Mark the tools as contaminated.

A4.9.4.8. Dispose of contaminated waste within a closed and marked container or in a marked plastic disposal bag at the unit contaminated waste disposal point, or in the nearest work center contaminated waste disposal point. If transporting contaminated waste from the work site to another location, place the contaminated waste inside marked plastic bags or closed containers before loading into the vehicle.

A4.9.4.9. Contaminated busses should move contaminated passengers and uncontaminated busses should move uncontaminated passengers. However, there will be times when insufficient uncontaminated or contaminated resources are available for use or mission dictates the prompt movement of personnel. During these times, use caution and place plastic barrier materials on the seats to prevent cross contamination.

A4.9.5. Vehicle Maintenance Operations:

A4.9.5.1. Vehicle maintenance personnel will determine the contamination status of vehicles in need of maintenance before acceptance. Vehicle maintenance personnel must be aware of the dangers and take appropriate precautions when handling contaminated vehicles.

A4.9.5.2. Develop vehicle maintenance procedures with the understanding that contaminated vehicles will not readily transfer contamination from their tires to the floor. It is not necessary to decontaminate the maintenance floor area after each vehicle service. As a safety precaution, if possible, decontaminate the maintenance floor with a 5 percent chlorine solution once per shift. However, decontaminate the area with a 5 percent chlorine solution as deemed necessary after an attack. If possible, do not paint the shop floor. Depending on the type of paint used, an extended residual hazard will exist if the paint used on the floor is non-porous.

A4.9.5.3. Vehicle maintenance may designate certain maintenance bays for contaminated vehicles to avoid potential cross contamination.

A4.9.5.4. Do not apply high heat, such as from a welder or cutting torch, to a previously contaminated vehicle unless the maintenance personnel within the immediate vicinity are wearing the appropriate protective equipment (MOPP 4 most likely). The high heat facilitates the release of the chemical agent vapors from painted metal and other surfaces. These vapor concentrations will probably be higher than the concentrations that existed at the time of attack.

A4.9.6. Mobile Maintenance Operations:

A4.9.6.1. Mobile maintenance personnel must be able to recognize and react to the signs of NBC contamination on vehicle surfaces and be very familiar with the early warning signs of agent exposure.

A4.9.6.2. Mobile maintenance vehicles should carry at least one case of M295 decontamination kits, 5 percent chlorine solution in a sealed 5-gallon container, and plastic disposal bags. These items support the increased need for operational decontamination associated with maintenance activities and safe storage and handling of contaminated waste.

A4.9.6.3. Replace the OG if it comes into contact with petroleum, oil, and lubricants (POL) products. Mobile Maintenance personnel should carry a rain suit and an extra OG and protective foot covers in the truck in the event their OG becomes oil soaked.

A4.10. Supply and Fuels:

A4.10.1. Pre-Attack Operations:

A4.10.1.1. Supply and fuels personnel must make every effort to protect their vehicles, assets, and property in order to provide mission essential assets during a CW attack. Effective covering, dispersal, expedient hardening are the most effective contamination avoidance measures.

A4.10.1.2. The search for structures capable of providing overhead cover should encompass the entire installation. Other options include modifying vehicle pavilions by enclosing open sides with barrier materials and moving unserviceable equipment out of cover and moving serviceable equipment under cover. Ensure to cover unserviceable equipment with barrier materials if using this option. Refer to the vehicle section for additional information, paragraphs **A4.5.** and **A4.9.**

A4.10.1.3. When developing a covering strategy, identify the most critical vehicle and equipment assets and ensure they receive top priority for covering. This should include items for critical missions or items in short supply, but high demand; e.g., R-11, C-300.

A4.10.1.4. Personnel should park vehicles and assets in facilities if possible and use barrier materials to prevent chemical droplets from coming in direct contact with the vehicle or asset's surface or interior. Do not cover refueling vehicles or liquid oxygen and liquid nitrogen equipment with plastic barrier materials. The plastic sheets can accumulate static electricity, which can discharge as sparks at any time, particularly during the removal process. Canvas covers are permissible and general-purpose vehicles or privately owned vehicles can use plastic sheets.

A4.10.1.5. Ensure property storage areas receive overhead cover and ensure to cover uncovered property with barrier materials. Each pallet or individually loaded items will need to be triple wrapped in plastic barrier materials. Plastic is the best ready-made protection available, but contamination can seep through the plastic in 2-3 hours. Place one layer under the pallet net and two layers over the pallet net. Remove and replace the top layer if it becomes contaminated.

A4.10.1.6. Guard against the tendency to park the majority of vehicles (to include hose carts) in the refueling operations yard due to the ease of access. Fuels personnel will need to provide protection for pump houses, fill stands and pit lids, and military service stations.

A4.10.1.7. Create shuffle boxes and glove decontamination troughs for entrances to doors and loading ramps. Cover the boot shuffle boxes and glove decontamination troughs with protective

materials and ensure they contain a 5 percent chlorine solution. Change the solution every 48 hours or after 400 people use them.

A4.10.1.8. Ensure personnel know the location of the contaminated waste disposal site (see paragraph **A4.3.**). This will prevent undue contamination in the receiving areas and the haphazard disposal of decontamination materials or unusable dirty items.

A4.10.1.9. Preposition M8 paper on all facilities, vehicles, and equipment, especially uncovered assets. Do not place the M8 paper under facility eaves or underneath pavilion roofs. Ensure to preposition it in multiple locations, on flat surfaces, and at locations that are easily accessible by post-attack reconnaissance personnel. Fuel handlers and supervisors out on runs should carry a supply of M8 paper.

A4.10.2. Post Attack Operations:

A4.10.2.1. The vehicle TTP for post attack operations also apply to supply and fuels. Refer to paragraphs **A4.2.**, **A4.3.**, **A4.4.**, and **A4.5.** for additional information.

A4.10.2.2. Use M8 paper to detect contamination on handles or doorknobs, windowsills, drainpipe exits, exposed gauges, levers, piping, or anything usually handled in a routine check. Personnel should also check facilities, vehicles, and equipment that did not have M8 paper prepositioned. Focus on the non-porous surfaces where evidence of contamination is most likely. The probability of detecting an agent on a porous surface with M8 paper is remote. Personnel must realize that a negative M8 paper reading does not equate to a hazard free asset.

A4.10.3. Communication Between UCC and the WOC. Establish a mechanism to contact the Supply Readiness Control Center (SRCC) and relay the working condition and contamination status of the U-Drive-It vehicles and other vehicles assigned to the unit. They consolidate the reports and forward to the vehicle UCC. The supply representative in the WOC will work with the vehicle representative to determine number of vehicles available to support critical Wing activities and vehicle maintenance MC&A will document the contamination status of the vehicle(s) as outlined in paragraph **A4.9.3.3.1.**

A4.10.4. Identifying and Marking:

A4.10.4.1. Conspicuously identify the contaminated assets and use it when uncontaminated assets of the same type are unavailable. This strategy extends beyond the supply flight and applies to U-Drive-It vehicles that units received. Refer to paragraphs **A4.3.**, **A4.9.** and **Attachment 6** for additional procedures for contamination identification and marking. Notify SRCC of contamination status and work in conjunction with the SRC and vehicle UCC to ensure to appropriately annotate all assets.

A4.10.4.2. Contact the SRC to determine the agents detected. This will allow property movement or decontamination personnel to gain insight into required activities. When dealing with a contaminated item, and time is not critical, weathering is the cheapest, safest, and most practical method of decontamination. Isolate all contaminated items and ensure to cover uncontaminated materials in close proximity and continue to use uncontaminated items if available. Depending on the agent and temperature, personnel may be able to work in reduced MOPP conditions if using uncontaminated assets.

A4.10.5. Pallet Considerations:

A4.10.5.1. Do not conduct the following activities until after the liquid deposition phase is complete. Determine, report, and annotate the contamination status of each pallet. If a single sheet of barrier material protected the contaminated assets, remove and replace the covering. Accomplish this within 6 hours (the faster the better). Carefully roll the material so the contaminated side rolls to the inside and then dispose of the material as contaminated waste. If a double or triple sheet of plastic or canvas protected contaminated assets, remove the outer layer and replace it as time permits. Dispose of the barrier material as contaminated waste in the appropriate pre-determined location (see paragraph **A4.3.**). If a barrier material did not protect the contaminated property, identify the item as contaminated. Mark the item in accordance with Air Force and installation procedures. If more than one type of agent contaminated the property, attach both signs to the property.

A4.10.5.2. Pay special attention to pallet netting. If netting was contaminated, it will most likely be impossible to decontaminate over time. Weathering will greatly reduce contamination. Ensure contaminated wrapping materials are disposed in a temporary waste disposal area. Routinely transfer the contaminated waste to the installation contaminated waste disposal site.

A4.10.5.3. Accomplish the required decontamination activities in order to complete mission requirements. This includes repackaging the pallets as necessary, to include the installation of protective covers.

A4.10.6. Vehicle Contamination:

A4.10.6.1. Personnel should never treat contaminated vehicles and assets as if destroyed. Care and personnel protection is all that is required to use the contaminated resource. Consider placing and, or replacing easily attainable “steering wheel protectors” on previously contaminated vehicles. Personnel should place plastic or some other barrier material on the seat if the area or OG had exposure to contamination. Chemicals will penetrate the ensemble more readily when applying heat and pressure directly to the contact point.

A4.10.6.2. There are no effective, operationally feasible methods for decontaminating canvas storage covers, webbing, seat belts, carpet, and other textile materials. Placing barrier materials over the item(s) and, or replacement are the best mitigation techniques.

A4.10.6.3. Supply may designate certain bays for contaminated vehicles. Whenever possible, accomplish the loading and unloading activities in an open area with a large airflow. Raise the warehouse or garage door if the vehicle is in an enclosed area. Follow the procedures in paragraph **A4.5.** and report the contamination information to the UCC and SRCC.

A4.10.7. Vehicle and Asset Decontamination.

A4.10.7.1. Vehicle and equipment operators must expediently decontaminate the parts that will continuously be touched within 1 hour of contamination. There is no need to create formal vehicle decontamination teams. However, ensure to clearly identify dirty vehicles as containing a residual chemical hazard. The operator’s or work center’s accomplishment of expedient decontamination using M295 decontamination kits will suffice to continue operations. Use M295 decontamination kits to decontaminate appropriate asset surfaces if more than cursory contact is necessary, i.e. leaning on hood compartment, kneeling in truck bed. Vehicle decontamination operations will not produce significant results once the agent has sorbed into the paint or other absorbent surfaces;

e.g., rubber, textiles, plastic. Refer to paragraph **A4.5.** for additional information on vehicle decontamination and dealing with vehicles painted with polyurethane compounds.

A4.10.7.2. Annotate the specific agent(s), date and time of marking, and temperature on the contaminated property. If using DOD sampling kits (biological agent samplers), annotate the rear of the sign, whether the hand-held assay tests were positive or negative, and report the contamination status of each pallet or property to the supply UCC. Keep detailed logs concerning the composition, location, and hazard category status of each piece of property. Determine if it is possible to deliver the property and use the priority of the request to determine if it is mission critical. **Table A4.2.** is an example of a tool to use to determine the degree of property contamination.

Table A4.2. Determining Degree of Property Contamination (Example).

Mission Criticality Level	Definition
Critical	Property is sufficiently important that it must be transported within 4 hours, regardless of existence of contamination.
Priority	Property is sufficiently important that it must be transported within 12 hours, regardless of existence of contamination.
Accelerated	Property is sufficiently important that it must be transported within 24 hours, regardless of existence of contamination.
Routine	Mission can be delayed until contamination levels are such that MOPP 4 is not required, regardless of how long it takes the contamination to dissipate.
Negligible	Mission can be delayed until there is no measurable indication of contamination; property should not normally be accepted inside property movement area and save room for higher priority property.

A4.10.8. Receiving and Delivery Area:

A4.10.8.1. The location of the receiving and delivery area, in relation to other parts of the property movement area, should be downwind from loading and unloading area and crosswind from decontamination area.

A4.10.8.2. Size and access requirements include routes to and from the remainder of the installation (for delivery of assets to entrance and holding area), routes to and from the decontamination area, and routes to and from the payload area.

A4.10.8.3. Assess the chemical hazard associated with the property and determine the degree of IPE required for reception activities. Mask and gloves with BDU should suffice for all situations involving vehicle exteriors only exposed to vapors (unless directed to be in different MOPP).

A4.10.8.4. Supply support personnel should meet the vehicle in MOPP 4, if undue mission degradation will not occur due to timing and, or heat stress. Assess the capability of the property movement area to receive and, or isolate property.

A4.10.8.5. Ensure all personnel are wearing the appropriate MOPP. Once property unloading is complete, determine the type, location, and degree of contamination remaining on the vehicle and ensure to transport personnel to the CCA as required. The WOC will make the final decision as to

the MOPP level ground support personnel must wear when working with the property and, or aircraft.

A4.10.8.6. Refer to paragraph **A4.5.** and **A4.9.** for decontamination and marking procedures for contaminated tools.

A4.11. Cargo Movement:

A4.11.1. Airbase contamination can significantly disrupt air and ground cargo movements if the UCC and cargo handlers do not plan and execute pre- and post-attack actions. The UCC must coordinate and identify task priorities and obtain airbase support when needed. Cargo handlers must effectively employ pre- and post-attack measures to minimize mission degradation and enable sustained operations. This includes the coordinated use of a system that balances the mission criticality level (importance) of the cargo with the hazard category (residual danger) associated with the materials to determine the appropriate action. Cargo handlers will require assistance from their unit post-attack reconnaissance team and Civil Engineer Readiness to determine the degree of contamination that may be present on the cargo or in the cargo storage and movement areas.

A4.11.2. The UCC controlling cargo movement will use **Table A4.3.** to identify the mission criticality of the material. Conspicuously mark this code on the cargo.

Table A4.3. Cargo Movement Mission Criticality Level.

Mission Criticality Level	Definition
C - Critical	Cargo is sufficiently important that it must be transported within 4 hours if possible, regardless of the existence of contamination.
P - Priority	Cargo is sufficiently important that it must be transported within 12 hours if possible, regardless of the existence of contamination.
A - Accelerated	Cargo is sufficiently important that it must be transported within 24 hours if possible, regardless of the existence of contamination.
R - Routine	Mission can be delayed until contamination levels are such that MOPP 4 is not required, regardless of how long it takes the contamination to dissipate.
N - Negligible	Mission can be delayed until there is no measurable indication of contamination. This type of cargo should not normally be accepted inside the cargo movement area. Room must be saved for higher priority cargo.

A4.11.3. Use **Table A4.4.** to determine the hazard category associated with the cargo.

A4.11.4. To support cargo movement activities in a contaminated environment, cargo handlers must possess 20 books of M8 paper and 1 NBC marking kit (with two chemical sign refills).

A4.11.5. Contamination avoidance is the key to success with cargo movement operations. Because of time constraints required by Time Phased Force Deployment Data (TPFDD) operations or other mission requirements and our technological inability to decontaminate several substances, contamination avoidance is the single most effective protective measure. As with all other operations, the proper implementation of contamination avoidance and contamination control measures will directly influ-

ence the amount and extent of decontamination operations required in a post-attack environment. These measures also directly influence when an individual or work center has to assume MOPP 4 in an otherwise clean area because contaminated cargo entered the site. Accomplish the following pre-attack contamination avoidance measures.

A4.11.5.1. To the maximum extent possible, place cargo underneath overhead cover. This can be provided through storage space inside facilities or the use of barrier materials. If using barrier materials, triple wrap each pallet. Place one layer under the pallet net and two layers over the pallet net. Remove the top layer and replace if it becomes contaminated. Place M8 paper on the outermost horizontal layer of the barrier material. When a contaminated layer of material is removed, place M8 paper on the next horizontal layer.

Table A4.4. Cargo Movement Hazard Category.

Hazard Category	Definition
1	Actual or suspected surface deposition of biological pathogens.
2	HD, L, or GB vapor present without contact hazard.
3	VX, L contact hazard present without measurable vapor hazard.
4	HD, GB contact hazard combined with medium level of danger associated with vapor concentrations (four to five CAM bars with HD and up to six CAM bars with GB).
5	HD, L, GB, VX contact hazard combined with high level of danger associated with vapor concentrations (six or more CAM bars with HD, Positive M256A1 tab for L, seven or more CAM bars with GB, or 6 or more CAM bars with VX). ***NOTE***: In the case of GB, high-vapor hazard alone can drive this category designation.

A4.11.5.2. Develop a Chemical Agent Monitor (CAM) footprint of the cargo storage and movement areas. By annotating what CAM readings exist in a known clean environment (false positive), personnel will not misidentify the hazard associated with a pallet of cargo and they will not waste time and energy attempting to decontaminate something that is clean. Refer to T.O. T.O. 11H2-20-1, *Operator's Manual for the Chemical Agent Monitor (CAM,)* for CAM operating and maintenance procedures.

A4.11.5.3. Place M8 paper in multiple locations throughout the area. As a minimum, position it on every pallet and on flat surfaces in open areas. Do not place it under facility eaves or pavilion roofs.

A4.11.6. In addition to the required post-attack reconnaissance and self-aid, buddy care activities, accomplish the following actions. ***NOTE:*** The timing of post-attack reconnaissance and self-aid, buddy care activities depend on the situation and direction from the airbase and unit chain of command. Unless otherwise directed, do not accomplish the following activities until after the liquid deposition phase has ended (about 60 minutes).

A4.11.6.1. Determine the contamination status of each individual cargo pallet. Annotate and report the result.

A4.11.6.2. If a single sheet of plastic protected contaminated assets, remove and replace the covering within six hours (the faster the better). If a double or triple sheet of plastic or canvas pro-

tected contaminated assets, carefully remove the outer layer and replace it as time permits. Carefully roll the material so the contaminated side is rolled to the inside and dispose of the material as contaminated waste.

A4.11.6.3. If barrier materials of any type did not protect the contaminated cargo, mark the item as contaminated in accordance with Air Force and unit marking procedures, (NBC Marking Kit, signs on all sides, see **Attachment 6**). If contaminated with more than one type of agent (chemical and biological for instance), attach both types of signs to the cargo.

A4.11.6.3.1. Further, for prioritizing cargo movement, cargo handlers should annotate the front of the appropriate NBC Marking Kit sign with the mission criticality (see **Table A4.3.**) and hazard category (see **Table A4.4.**) designator. The code for the mission criticality designator will be the first letter of the appropriate word i.e., "C" represents critical, and "N" represents negligible. The code for the hazard category is the number designator itself (i.e., "3" represents a VX, L contact hazard without a measurable vapor hazard).

A4.11.6.3.2. Annotate the specific agent or agents, date, time of marking, and the temperature (either Fahrenheit or Celsius) at the time of the marking operation on the rear of the marking sign or signs. If using DoD Sampling Kits (biological agent samplers), annotate the rear of the sign whether the hand-held assay tests are positive or negative. Report the contamination status of each pallet to the UCC.

A4.11.7. Cargo handlers should use **Table A4.5.** through **Table A4.9.** to determine what decontamination actions, if any, are necessary based on the contaminated cargo's mission criticality level and its hazard category.

Table A4.5. Cargo Decontamination Actions.

Mission Criticality Level	Hazard Category	Recommended Action
Critical	1	Spray cargo with water if action will not damage contents. Triple wrap, mark as "C1."
Critical	2	Aerate for 30 minutes if surrounding environment is clean. Triple wrap, mark as "C2."
Critical	3	Decontaminate with M295 decontamination kit. Triple wrap, mark as "C3."
Critical	4	Decontaminate with M295 decontamination kit. Aerate for 30 minutes if GB is the agent and the surrounding area is clean. Triple wrap, mark as "C4."
Critical	5	Decontaminate with M295 decontamination kit. Aerate for 30 minutes if GB is the agent. Triple wrap, mark as "C5."

Table A4.6. Cargo Decontamination Actions.

Mission Criticality Level	Hazard Category	Recommended Action
Priority	1	Same as "Critical 1," except wipe down cargo with dust remover, retest cargo with hand-held assay, triple wrap, and mark as "P1."
Priority	2	Aerate for 6 hours if surrounding environment is "clean," triple wrap, and mark "P2."
Priority	3	Decontaminate with M295 decontamination kit, recheck with M8 paper and use M295 again if necessary, triple wrap, mark as "P3."
Priority	4	Aerate for 6 hours if surrounding environment is "clean," decontaminate with M295 decontamination kit, triple wrap, mark as "P4."
Priority	5	Aerate for 6 hours if surrounding environment is "clean," decontaminate with M295 decontamination kit, triple wrap, mark as "P5."

Table A4.7. Cargo Decontamination Actions.

Mission Criticality Level	Hazard Category	Recommended Action
Accelerated	1	Same as "Priority 1," except expose cargo to sunlight for 4 hours and then attempt wash down, conduct wipe down procedures again if second hand-held assay test was positive. Triple wrap, mark as “A1.”
Accelerated	2	Aerate for 12 hours if surrounding environment is "clean," triple wrap, mark as “A2.”
Accelerated	3	Same as "Priority 3," except aerate for 12 hours before the decontamination process, recheck with M8 paper, and repeat the use of M295 as often as necessary or until time no longer permits. Triple wrap, mark as “A3.”
Accelerated	4	Same as "Priority 4," except aeration time should be extended to 12 hours. Further, recheck with M8 paper following initial M295 decontamination action; reaccomplish M295 operation if contact hazard still exists. Triple wrap, mark as “A4.”
Accelerated	5	Same as "Priority 5," except aeration time should be extended to 12 hours. Further, recheck with M8 paper following initial M295 decontamination action; reaccomplish M295 operation if contact hazard still exists. Triple wrap, mark as “A5.”

Table A4.8. Cargo Decontamination Actions.

Mission Criticality Level	Hazard Category	Recommended Action
Routine	1	Same as "Accelerated 1," except continue weathering and wash down and/or wipe down process until hand-held assay tests are negative. Triple wrap, mark as “R1.”
Routine	2	Same as "Accelerated 2." Triple wrap, mark as “R2.”
Routine	3	Same as "Accelerated 3," except aerate for 24 hours before starting the decontamination process. Triple wrap, mark as “R3.”
Routine	4	Same as "Accelerated 4," except cargo should not be loaded until the contact hazard has completely dissipated. Triple wrap, mark as “R4.”
Routine	5	Same as "Accelerated 5," except cargo should not be loaded until the contact hazard has completely dissipated. Triple wrap, mark as “R5.”

A4.11.8. Movement of Contaminated Cargo. Use the following guidelines when loading and transporting contaminated cargo.

A4.11.8.1. Determine the contamination status of the material handling equipment (K-loaders or forklifts) and the transport vehicle or vehicles. Determine if the items have measurable amounts of contamination. Attempt to locate the pockets of contamination if possible. This may entail the use of a CAM to pinpoint pockets of dirt and grease that may house agents in liquid or dusty form that M8 paper does not readily identify.

Table A4.9. Cargo Decontamination Actions.

Mission Criticality Level	Hazard Category	Recommended Action
Negligible	1	Same as "Routine 1." Triple wrap, mark as “N1.”
Negligible	2	Do not process unless contamination dissipates or mission criticality level is upgraded. Triple wrap, mark as “N2.”
Negligible	3	Do not process unless contamination dissipates or mission criticality level is upgraded. Triple wrap, mark as “N3.”
Negligible	4	Do not process unless contamination dissipates or mission criticality level is upgraded. Triple wrap, mark as “N4.”
Negligible	5	Do not process unless contamination dissipates or mission criticality level is upgraded. Triple wrap, mark as “N5.”

A4.11.8.2. If the transport vehicle is uncontaminated, take the following precautions to keep it clean during the cargo movement process.

A4.11.8.2.1. Expediently decontaminate the portions of the material handling equipment exposed to either the cargo pallet or the transport vehicle (forklift tines and rollers on the K-Loader). Use M295 decontamination kit or 5 percent chlorine bleach solution to decontaminate.

A4.11.8.2.2. Personnel should ensure to place plastic or another barrier material in the bed of the transport vehicle over the area that the cargo pallet(s) will sit on.

A4.11.8.2.3. Replace the outer layer of barrier material on the cargo pallet(s) if necessary.

A4.11.8.2.4. The transport vehicle operator should be the only person in the transport vehicle and must wear the appropriate level of IPE.

A4.11.8.2.5. Local cargo handlers should perform the actual cargo loading. Cargo handlers should not touch or stand on or inside the vehicle unless absolutely necessary. If they must touch or stand on or inside the vehicle, they should use decontamination troughs containing 5 percent chlorine solutions to decontaminate their gloves and boots before they make contact.

A4.11.8.2.6. Check the clean transport vehicle for evidence of cross-contamination and decontaminate with the M295 decontamination kit if contaminated.

A4.11.8.2.7. Seal vehicle chocks or other transport vehicle accessories that may have come in contact with contaminated surfaces inside a plastic bag prior to loading.

A4.11.8.3. Appropriately mark the vehicle and the cargo to clearly identify the hazard associated with the contaminated cargo.

A4.11.9. Use the following guidelines when loading and transporting clean cargo after attacks with chemical or biological agents.

A4.11.9.1. Determine the contamination status of the material handling equipment (forklifts and K-loaders) and the transport vehicle or vehicles.

A4.11.9.2. If the material handling equipment and/or transport vehicle is contaminated, take the following precautions to prevent them from cross-contaminating the 463L cargo pallet during the cargo movement process.

A4.11.9.2.1. Expediently decontaminate the portions of the material handling equipment that will come in contact with the cargo pallet.

A4.11.9.2.2. Place at least two sheets of plastic or another layer of barrier material in the bed of the transport vehicle over the area that the cargo pallet or pallets will sit on.

A4.11.9.2.3. Ensure that the pallet has at least a double wrap of barrier material.

A4.11.9.2.4. The transport vehicle operator should be the only person in the transport vehicle and must be wear the appropriate level of IPE.

A4.11.9.2.5. Local cargo handlers should perform the actual cargo loading. Cargo handlers should not touch or stand on or inside the vehicle or vehicles unless absolutely necessary. If they must touch or stand on or inside the vehicle or vehicles, they should use decontamination troughs containing 5 percent chlorine solutions to decontaminate their gloves and boots after they make contact.

A4.11.9.2.6. Check the pallet or pallets for evidence of cross-contamination and decontaminate with the M295 decontamination kit if contamination is present.

A4.11.9.3. Appropriately mark the vehicle to clearly identify the associated hazard.

A4.11.10. Cargo movement personnel should accomplish the following actions when they discover they will be receiving contaminated cargo from another location.

A4.11.10.1. Acquire all available information concerning the cargo. To include the following information:

A4.11.10.1.1. A description of what the specific cargo is (spare parts for special purpose vehicles for example) and to whom on the airbase it belongs.

A4.11.10.1.2. A description of what type of suspected contamination is present on the cargo.

A4.11.10.1.3. The physical condition of the cargo (i.e., triple wrapped with barrier material, unconstrained rolling stock).

A4.11.10.1.4. The time of cargo contamination in relation to the anticipated reception time at the installation.

A4.11.10.1.5. The status of the vehicle operator or operators (i.e., are there any casualties and will anyone require the use of a CCA).

A4.11.10.2. Contact Civil Engineer Readiness and the unit expecting delivery. Request assistance with an assessment of the contamination hazard and mission criticality associated with the cargo. Use this assessment to determine the degree of required IPE for reception activities. Also, use this assessment to change the specific cargo delivery location on the installation if necessary.

A4.11.10.3. If the cargo does not have a high mission priority (as stated by the receiving unit), assess the ability of the unit and/or cargo handlers to isolate the cargo upon reception. If choosing the isolation option, clearly cordon off the area surrounding the pallet or pallets with the NBC Marking Kit. Use a cordon radius of 25 feet or as directed by Civil Engineer Readiness personnel.

A4.11.10.4. If personnel must expediently use contaminated cargo to facilitate mission operations, the receiving unit and/or cargo handlers should take the following actions:

A4.11.10.4.1. Ensure reception personnel are in the appropriate MOPP (normally MOPP 4).

A4.11.10.4.2. Remove the layers of barrier material (if present), cargo nets, and/or pallet banding and dispose of these items as contaminated waste.

A4.11.10.4.3. Verify the type and level of contamination (for example, VX in liquid form on metal boxes with no measurable vapor hazard).

A4.11.10.4.4. If feasible, remove the specific cargo from its packaging configuration (wooden boxes for instance) and dispose of the packing material as contaminated waste.

A4.11.10.4.5. Accomplish appropriate decontamination activities based on the extent of contamination, agent or agents present, cargo surface, and time available. Contact Civil Engineer Readiness to determine the most effective method.

A4.11.10.4.6. If the cargo items themselves are contaminated, mark them appropriately so that work center personnel will immediately recognize the potential residual hazard.

A4.11.10.4.7. Each individual should accomplish immediate decontamination and process through the airbase CCA when directed by the UCC.

A4.12. Munitions:

A4.12.1. Overview. This section includes contamination avoidance procedures to employ throughout the munitions build and weapons load process, integrating contamination avoidance considerations into the use of munitions assets and personnel, long term identification of contaminated munitions assets, decontamination of munitions assets, and the handling of contaminated waste.

A4.12.2. Contamination Avoidance Measures. Munitions activities are directly linked to sortie generation. They involve multiple resources such as weapons, trailers, bobtails, and bomb loaders. The use or non-use of contamination avoidance measures within the munitions area has a tremendous ripple effect on other areas of the flight line, with a corresponding influence on sortie production capabilities. For example, if a load of bomb bodies becomes contaminated, this will require personnel to either take the time to decontaminate it or be in MOPP 4 for the entire process. The contaminated weapons would have a degrading effect on the bomb build area, the weapons storage area, the weapons load point, the radar warning receiver (RWR) pits, and the end of runway (EOR) station (if EOR activities were not performed within aircraft shelters). Thus, it is imperative that munitions personnel use effective contamination avoidance techniques throughout the entire process; from pulling the bomb bodies out of the storage igloos, through the bomb build process, and to the point the weapons load crews upload the aircraft and arm the munitions.

A4.12.3. Geographically Separated Munitions Storage Sites:

A4.12.3.1. In many cases, airbase munitions operations use geographically separated munitions storage sites that are not located in an area within the main perimeter of the airbase. These sites generally contain a critical stock of bomb building materials (bodies and components) that provide the installation with at least an initial weapons capability. It is critical that these remote sites and the personnel working there consciously participate in airbase active and passive defense hierarchy. The units should accomplish the following items to ensure these sites and personnel have sufficient protection from the effects of chemical and biological weapons. Transfer the weapons materials and supporting resources into the main installation at the earliest time possible, within the constraints of space and net explosive weight (NEW) restrictions. The units should ensure to tie the site into the airbase attack warning and reporting systems with as many redundant methods as feasible, including the installation siren and giant voice system, the commander's TV channel, radio (both military and radio station), and telephone line to the main munitions UCC.

A4.12.3.2. Depending on the distance from the airbase, the installation and munitions key leadership, in conjunction with Civil Engineer Readiness, must establish rules of engagement for remote site personnel. The remote site should have fixed or expedient shelters and bunkers for people, munitions, and the transport vehicles. Overhead cover and at least expedient hardening should be a key component of this protective scheme. The provision of overhead cover is important in that the entire munitions build and delivery process may need to be in a MOPP 4 configuration if the weapons components are contaminated prior to delivery to the bomb build stations.

A4.12.3.3. Installation security forces and munitions personnel must ensure to protect the remote site and munitions delivery process in terms of security considerations and should include protecting the weapons transport vehicles along the delivery route. Civil Engineer Readiness personnel

must ensure to set up a detection system at the geographically separated site to include the normal use of pre-positioned M8 paper and the employment of automated detectors. Civil Engineer Readiness and the installation munitions leadership must ensure to include the remote site in installation post-attack reconnaissance considerations, both in terms of on-site procedures and through aggressive monitoring by the NBC Defense Cell. This should also include the provision of specialized post-attack reconnaissance team support as necessary.

A4.12.3.4. Remote site personnel must possess an immediate decontamination capability for themselves (M291 and M295 decontamination kits, glove and boot decontamination troughs with 5 percent chlorine solutions) and operational decontamination capability for their munitions assets and vehicles (M295 decontamination kits). The rapid sorption characteristics of chemical agents guarantee that, for decontamination operations to be beneficial, site personnel will have to initiate the activity shortly after the onset of contamination since there will not be time for off-site personnel to arrive and conduct decontamination operations.

A4.12.4. Protecting Critical Resources from Contamination throughout the Munitions Process:

A4.12.4.1. The different stages and resources in the "life of a bomb" require various, integrated contamination avoidance techniques in order for the effort to be successful. Provide the munitions trailers (MHU-110 and MHU-141 for instance) in the process with overhead cover whenever possible. Use fixed facilities or the provision of barrier materials to protect the main cargo surface and trailer tongue. If choosing between protecting the trailer's cargo surface and protecting the tongue, protect the cargo surface. This action is wise because a contaminated cargo surface may transfer contamination to munitions in the first minutes after chemical agent deposition and it is difficult to decontaminate the trailer's cargo surface due to uneven metal grating, cracks, and crevices. Conversely, the trailer tongue is relatively easy to decontaminate with an M295 decontamination kit and it does not represent an operationally significant contamination transfer hazard. If using barrier materials, cover the sides of the munitions trailers as well, so that the undercarriage is protected.

A4.12.4.2. Forklifts should retrieve the bomb bodies out of the storage igloos or areas. These storage igloos or areas should provide overhead cover if possible because weapons contamination at this point negatively affects the entire process. Contamination avoidance measures must also extend to the protection of the forklift and the closing of igloo doors during attack situations. Drive forklifts into igloos, if space exists, and turn them off.

A4.12.4.3. If feasible, set up two or more bomb build stations and separate them by several hundred yards when space permits. This allows concurrent use to expedite bomb build-up and provides redundancy in case a station becomes unusable. Provide overhead cover for each station, or optimally, enclose them entirely. Chemical agent sorption and hazard durations on various surfaces will impact site operations. Bomb build station floors should remain unpainted because chemical agents rapidly sorb into bare concrete--that will quickly lower the contact hazard. However, if the floors must be coated, use latex based paint. When AM-2 matting or another impervious floor material is used, extended residual hazards will persist if liquid contamination occurs.

A4.12.4.4. Munitions personnel should not take the bomb components out of the storage igloos or areas until just before assembly. Effective scheduling of this activity can maximize the amount of time the weapons components have direct overhead cover. Depending on the time it takes to transport weapons components from the storage area to the bomb build stations, it may not be cost

effective from a manpower point of view to cover the trailers during this time. However, cover the trailers and their load of bomb components if they routinely spend more than 1 hour outside an enclosed bomb build station.

A4.12.4.5. After weapons assembly and placement onto the munitions trailer, they must have overhead cover as quickly as possible. If the flight line weapons storage area (slips) employs a continuous method of overhead cover (facility or large, single tarp that covers several trailers for example), it may not be cost effective to cover the loaded weapons trailers during the transport period from the bomb build station to the flight line storage area. If trailers did not have existing overhead cover at the flight line weapons storage area, ensure to cover them before they go to the slips. Depending on the flight schedule, bombs can easily spend 24 hours or more in this location before weapons load crews take them to the aircraft. It is crucial to protect the weapons and trailers during this extended time or their contamination at this point will undo many of the positive effects of previous contamination avoidance measures.

A4.12.4.6. If the weapons are contaminated while in the storage area, accomplish the integrated combat turns (ICT) in MOPP 4, even if the aircraft parking area and other resources (fuel trucks and bomb loaders) are uncontaminated. If dealing with contaminated individually wrapped trailers in the flight line weapons storage area, the weapons load crew should remove the barrier material, and dispose of it as contaminated waste before transporting the load to the aircraft parking area. However, if positioning the weapons without overhead cover for more than 1 hour at or in the immediate vicinity of the aircraft parking area, the weapons load crew should replace the barrier material before leaving for the site.

A4.12.4.7. If the trailers had overhead cover through a method other than individual wrapping, the weapons load crew should not remove the loaded trailer from the flight line weapons storage area until just before loading the aircraft. If positioning the weapons without overhead cover for more than 1 hour at or in the immediate vicinity of the aircraft parking area, the weapons load crew should protect the loaded weapons trailer through the use of barrier material prior to leaving for the site. Once removing the weapons from the trailer at the aircraft parking area, provide the trailer with overhead cover as soon as possible. This action will increase personal safety for the recipients of the trailer when returning it to the munitions area and will ensure the uncontaminated weapons build and delivery cycle can begin again.

A4.12.5. Integrating Contamination Avoidance Considerations into the Use of Assets and Personnel. Munitions personnel should protect all assets (overhead cover, dispersal, and expedient hardening) and only use those that are necessary at any given time. This concept of operations applies to both pre- and post-attack scenarios. In addition to decreasing the likelihood of resource contamination, with the subsequent possibility of cross contamination, using a lesser amount of resources and limiting operations when possible also has positive ripple effect for personnel protection.

A4.12.5.1. Munitions UCC personnel and supervisors should aggressively schedule assets such as trailers for full use to the maximum extent possible as opposed to half loads. Unless mission essential activities absolutely require it, resist using multiple assets in place of effective scheduling. The temptation and tendency to use multiple assets is especially strong in the early stages of deployment or employment at a location that has pre-positioned equipment. In these situations, the initial availability of assets generally exceeds requirements until full TPFDD force arrival takes place.

A4.12.5.2. Use larger trailers whenever possible or when simultaneous weapons delivery at multiple locations is not a requirement. This technique to limit the number of assets exposed to a potential or actual threat environment can have a significant effect on sustainment operations where the intent is to only use uncontaminated resources. For example, numerous MHU 141 trailers could remain protected using the larger MHU-110 trailers to accomplish the same weapons delivery missions.

A4.12.5.3. Due to the hazard imbedded in contaminated munitions equipment and weapons, munitions personnel must conspicuously identify the contaminated assets (see **Attachment 6**), use them only when uncontaminated assets of the same type are not available, and keep them separated from uncontaminated resources whenever possible. Contaminated munitions generally remain hazardous to unprotected personnel for extended periods. Since this can have a ripple effect on sortie production activities in otherwise clean areas, UCC personnel should locate and use uncontaminated weapons as much as possible. This action is feasible given the fact that personnel build munitions 24 or more hours in advance of their required use.

A4.12.5.4. The UCC should exert positive control of the personnel in relation to completion of critical mission activities and movement within and between contamination zones or sectors. The UCC should ensure they are aware of the contamination status of each area associated with munitions operations, including remote sites, different functions within the main munitions area, the flight line weapons storage area (slips), and the aircraft parking area. Then, UCC personnel should determine what critical mission operations must take place and limit movement to personnel doing those activities. The UCC must provide detailed instructions and status updates to personnel who must transit multiple contamination zones or sectors.

A4.12.5.5. If the munitions area is contaminated and the weapons build process did not have overhead cover, UCC personnel should determine the need for additional weapons during this period. If the munitions operation built enough weapons to be 24 hours or more in advance, it may not be necessary to continue building bombs in the first few hours after an attack. The application of this technique will limit unnecessary personnel exposure to the contaminated environment, reduce the number of munitions that become contaminated during the build process, and eliminate the negative ripple effect that contaminated weapons will have on the sortie production process.

A4.12.5.6. Supervisors and munitions work crews must ensure the personnel working at the flight line weapons storage area and the UCC are aware of the contamination status of the munitions assets as they transition between the munitions area and the flight line, since effective coordination and heightened personal awareness will enhance personnel safety. Bomb build personnel must ensure personnel at the slips are aware of the hazard associated with the assembled weapons they deliver. Slip personnel must ensure both bomb build and weapons load crew personnel are aware of the contamination status of resources within the flight line storage area and the weapons load crews must ensure slip and, or bomb build personnel are aware of the contamination status of the empty trailers returning for restocking (after weapons upload). Whenever possible, accomplish the munitions portion of end-of-runway (EOR) activities inside hardened aircraft shelters or shelter areas with revetments versus at typical EOR locations.

A4.12.6. Long Term Identification of Contaminated Munitions Assets. The long-term identification of contaminated munitions assets is difficult since they consider some assets (bobtails and forklifts) to be Air Force vehicles, and consider other assets to be (bomb loaders and munitions trailers) pieces of organizational equipment. Not every piece of contaminated ordnance needs to be individually

marked. If an MHU-141 trailer load of AIM-9 missiles is contaminated, it is sufficient to mark the overall trailer as contaminated rather than individually marking each missile and the trailer itself.

A4.12.6.1. Each person has the responsibility to conspicuously mark contaminated munitions assets. However, due to the temporary nature of these markings, there is no guarantee that personnel will be able to identify previously contaminated resources in the long term. This potential oversight may cause personal injury unless personnel ensure to take proper precautions in future maintenance operations. Each vehicle operator should also annotate the interior portion of the AF Form 1800; at the same time they apply the conspicuous external markings on the vehicle. The operator should include the date and time of contamination, the agent type, and the locations of contamination.

A4.12.6.2. Munitions personnel must relay the contamination status of equipment items to the UCC. Personnel will do this by referencing the specific equipment item's registration or serial number. UCC personnel will update Section V of the equipment's individual AFTO Form 244, *Industrial, Support Equipment Record,* with the same information listed above for vehicle entries. Since this system is not a centralized computer tracking system that has visibility of every piece of munitions support equipment in the Air Force, munitions personnel must ensure to accurately transcribe the information regarding past NBC contamination whenever updating or re-accomplishing the AFTO Form 244. As soon as practical, vehicle operators should notify the UCC of the contamination status of their vehicle and the UCC will forward the information concerning contaminated vehicles to the Vehicle UCC.

A4.12.7. Decontamination of Munitions Assets:

A4.12.7.1. Historically, munitions personnel had the task of providing installations with a munitions decontamination capability, including the decontamination of bomb build and weapons load crew assets. Due to limitations in decontamination technologies, installation personnel and key leadership must realize that, for decontamination operations to be beneficial, individual vehicle and equipment operators must operationally decontaminate the parts that will continuously be touched within 1 hour of the time of contamination. Units may organize and equip contamination control teams to support sustained operations. Use the team (normally two members) to assist unit personnel to develop and execute contamination avoidance and operational decontamination measures, to resupply the unit with decontaminants, and to collect and dispose of contaminated waste (see paragraph **A4.3.**).

A4.12.7.2. There is no need for extensive decontamination of each contaminated piece of ordnance, vehicle (bobtail, forklift), or equipment (trailer, bomb loader), as long as personnel clearly identify contaminated assets as containing a residual chemical hazard. The operator's or work center's accomplishment of operational decontamination using M295 decontamination kits will suffice to continue mission operations. Decontamination operations will not produce significant results once the agent has sorbed into the paint or other absorbent surfaces. Depending on the surface, this sorption takes place in periods ranging from less than one minute up to approximately an hour. Regardless of the decontamination technique used, it will be relatively easy to remove agents from the smooth panels before they absorb into the surface, but the chemical agents will tend to remain at low levels in crevices, rivet heads, and joints.

A4.12.7.3. Consider the following when developing specific munitions decontamination operational procedures at the unit or individual level. Chemical or biological agents in dusty (small

solid particle) form will not penetrate or adhere to surfaces in the same manner as agents in liquid form. While these agents will be relatively easy to remove with liquid solutions (5 percent chlorine bleach, soap and water), the threat from dusty agents is extremely limited and vehicle operators will probably not be able to detect the presence of these agents. There is no single machine, kit, team, technique, or procedure presently capable of fulfilling all decontamination requirements. The best chance of mitigating the effects of NBC contamination within the munitions area rests with the ability to accurately evaluate the situation, decide on an overall course of action, and direct individuals to accomplish a variety of tasks based on their individual circumstances.

A4.12.7.4. The majority of munitions assets on Air Force installations use paint with polyurethane compounds. Chemical agents readily sorb into this type of paint. Thus, decontamination operations will not have a significant effect unless they take place within minutes after the time of contamination. Time itself equates to an effective decontamination technique to reduce the residual contact hazard. Impermeable surfaces like arming wires and other unpainted metal components do not allow agent penetration; therefore, these locations represent the most dangerous areas on contaminated assets.

A4.12.7.5. Plastic and rubber components are porous materials and agents easily soak into these components. While the use of M295 decontamination kit or a 5 percent chlorine solution will effectively reduce or eliminate the operational contact hazard, the agent will remain imbedded in the material and varying degrees of vapor hazard will remain. There are no effective, operationally feasible methods for completely decontaminating canvas storage covers, webbing, and other textile materials contaminated with liquid chemical agents. Placing barrier materials over the item or item replacement are the best mitigation techniques.

A4.12.8. Handling of Contaminated Waste:

A4.12.8.1. The effective handling and disposal of contaminated waste will require a major effort by munitions personnel, especially in the bomb build area. The act of unpacking munitions components will create large amounts of waste. Periodically, remove this waste from the unpacking area to a temporary or permanent waste disposal area in order for the munitions build process to continue. Munitions personnel must use forklifts, trailers, or other vehicles to transport these unwieldy, heavy assets. This compilation of multiple materials becomes a potential danger site for munitions personnel. Since there is no effective method of decontaminating many of the materials and absolutely no operational need to decontaminate, the agents sorb with the waste materials and remain a hazard until weathering effectively mitigates the danger.

A4.12.8.2. The contamination hazard will probably exist within and around the collection of contaminated waste for a longer period than the surrounding terrain and will require munitions personnel to be acutely aware of the residual hazards. When establishing their portion of the airbase contaminated waste disposal program, munitions personnel should determine where their temporary waste disposal sites will be located. They must also determine the location of the permanent contaminated waste disposal site, the time or stock level for placing materials in the temporary waste disposal site, and the mechanism to transport the assets from the temporary to the permanent contaminated waste disposal site. The temporary waste disposal site should be at least 50 feet from occupied facilities or work positions if possible, and the permanent contaminated waste disposal site is normally a centralized function for the installation and its location is obtainable from the Civil Engineer Readiness representative in the SRC. Also see paragraph **A4.3.**

A4.12.8.3. Use the NBC Marking Kit to cordon off or clearly identify any waste disposal sites contained within the munitions area and pre-position M8 paper around the temporary waste disposal sites. Assume contamination if the pre-positioned M8 paper displays positive results. Ensure each work center within the munitions area has contaminated waste disposal bins for small items such as contaminated M8 paper and used M295 decontamination kits, and develop the mechanism and procedures for delivering the contaminated waste from these locations to the installation's contaminated waste disposal site. In addition, determine the contamination status of the forklift and the transport vehicles that will be moving the weapons packing materials to the installation contaminated waste disposal site.

A4.12.8.4. In addition to ascertaining if the items have measurable amounts of contamination on their surface, also locate the pockets of contamination if possible. This may entail the use of a CAM to pinpoint agents in liquid or dusty form housed in pockets of dirt and grease that M8 paper does not readily identify. If the transport vehicles are uncontaminated, place plastic or another barrier material over the bed of the transport vehicle and dispose of the barrier material at the same time as the contaminated waste. At the end of each delivery cycle, check the vehicle for evidence of cross-contamination and take appropriate decontamination steps (normally the M295 decontamination kit). Mark the vehicle and the cargo to clearly identify the hazard associated with the contaminated cargo to personnel along the transportation route.

A4.13. Security Forces:

A4.13.1. Military Working Dog (MWD) Protection:

A4.13.1.1. Collective Protection. Specialized protective equipment is not available for military working dogs (MWDs); however, measures are available to protect MWDs from NBC contamination under some conditions. These measures include a combination of collective protection and contamination avoidance TTP. Assign each MWD and handler to a space within a facility equipped with a Classes I through IV collective protection system. MWD teams on patrol should go to the closest available collective protection during Alarm Yellow and Alarm Red. If collective protection is unavailable, the handler and MWD should move into a facility or area with overhead cover. If the kennel does not have Classes I through IV collective protection, configure the kennel for Class V protection or, as a last resort, provide overhead cover. Move MWDs in kennels into the closest Classes I through IV collective protection during Alarm Yellow. Keep the MWDs in the Class V protected area during Alarm Red. All handlers and MWDs should remain in a protected area until the WOC declares MOPP 0, 1, or 2 or directed otherwise.

A4.13.1.2. Contamination Avoidance. Ensure personnel place M9 paper at several locations on the MWD collar. Attach it to provide about 1-2 inches of exposure on each side of the collar. If collective protection is unavailable when Alarm Red occurs, the handler should locate the best overhead cover in the immediate area. For missile attacks, put the MWD inside of a vehicle, cargo aircraft, or any other area that provides protection from agent fallout. If overhead cover is not available, assume the directed MOPP, take cover in a location that provides the best degree of splinter protection, and cover the MWD with any available protective material. Protective covers include plastics sheeting, rain gear, cargo covers, or any other non-porous material. Following the attack, use the M291 decontamination kit to decontaminate exposed areas of the potentially contaminated animal. Perform this procedure even if there is no evidence of contamination on the

MWD. Unless critical mission operations direct otherwise, do not allow MWDs to move until personnel know the contamination status of the area where the MWDs will operate.

A4.13.1.3. Operating in Previously Contaminated Areas. Transport MWD in vehicles when crossing previously contaminated areas. Do not allow the MWD to sit or lie down while in the area. If the MWD will operate within the area, the handler should provide protection of the MWD feet before moving into the area. Use butyl rubber dog boots, such as those to protect from cold weather, as foot covers when MWDs operate in these areas. Construct expedient foot covers from the MCU-2 series protective mask hood or the M-17A2 protective mask M6A2 hood material. Cut the hood to provide enough material to cover the foot. Wrap the material around the lower portion of the leg to prevent contact with the ground while the MWD is walking, and use duct or masking tape to hold the material in place. One hood makes two or three expedient foot covers.

A4.13.2. Operations Outside the Airbase Perimeter:

A4.13.2.1. Security Forces personnel that operate outside of the airbase perimeter are more vulnerable to the effects of NBC attack than forces inside the airbase. Many of the pre-attack and contamination avoidance actions are not executable outside the perimeter because of tactical considerations. For example, special operations forces can easily identify pre-positioned M8 paper locations or automatic alarm sites. They may mine the approaches or ambush Security Forces patrols that return to perform maintenance or check for contamination. The result is that Security Forces patrols will have little, if any, visual confirmation that an area is, or was previously, contaminated. In addition, overhead cover may not be available and safe for Security Forces personnel to quickly enter during NBC attack.

A4.13.2.2. The physical environment outside the airbase is the most hazardous following a chemical attack. The chemical agent sorbs quickly into asphalt and concrete, but sorbs more slowly into grass and soil. Consequently, the vapor hazard from contaminated grass and soil is not only stronger, but also lasts longer than within areas with predominantly concrete and asphalt surfaces.

A4.13.2.3. The Security Forces command and control structure and individual Security Forces personnel training are the key to survival and sustainment. The Base Defense Operations Center (BDOC) plans and trains for operations in the likely NBC threat environment and must know the location of all NBC hazards on, or affecting the airbase. The BDOC and NBC Defense Cell must develop standard operating procedures for NBC detection, warning, and reporting outside the airbase perimeter and within the airbase tactical area of responsibility. The NBC Defense Cell should provide the BDOC with the location of known and likely NBC contamination hazards. This information should include both contact and vapor hazards. BDOC personnel must assess the situation and take positive action to balance force survivability with critical base defense activities. Security Forces personnel must maintain a high level of proficiency on individual NBC protective actions.

A4.13.3. Ground Attack Considerations. During a ground attack situation, the exposure to chemical or biological agents may not immediately incapacitate enemy forces that move through contaminated areas without protective equipment. For example, low volatility chemical or biological agents will not immediately affect enemy forces when they move through an area with this contamination. Security Forces may find themselves in tactical situations where Security Forces personnel are directed to wear the protective mask or assume MOPP 3 or 4, while attack forces are without protective equipment.

A4.13.4. Other Considerations. Security Forces personnel may need to remain at their post or within a defensive fighting position (DPF) for extended periods. They may not be able to leave their posi-

tions to process through a contamination control area (CCA). Security Forces personnel must immediately use the M291 or M295 decontamination kits to decontaminate their protective mask, overgarment, individual and crew-served weapons, and field equipment if contaminated. The Security Forces operating environment makes it likely that they will be among the first to detect contamination and the first to display agent symptoms. Security Forces must be alert for agent symptoms when reducing MOPP levels. If the MOPP level reduction is premature, Security Forces personnel will be among the first to suffer the consequences.

A4.13.5. Considerations for Enemy Prisoners of War (EPW):

A4.13.5.1. Select the EPW holding areas to enhance personnel survivability in a chemically contaminated environment. Provide overhead cover for the EPW and security personnel whenever possible. Develop measures that also enable guards and augmentees to protect themselves from agent effects and maintain security. Locate the EPW holding area on concrete or asphalt to take advantage of the rapid agent sorption characteristics of these surfaces.

A4.13.5.2. If IPE is not available, request assistance from Civil Engineer Readiness personnel to identify alternate protective items. If overgarments are not available, place M9 paper on the EPW clothing. Issue the M291 decontamination kit to each EPW. Request Civil Engineer Readiness personnel to conduct training and provide visual aids on warning signals and protective action. Security Forces should provide an interpreter during the pre-attack phase to assist Civil Engineer Readiness personnel to develop these products. Security Forces personnel should follow standard procedures for pre-attack preparation and post-attack reconnaissance of the EPW areas.

A4.13.5.3. Intelligence personnel may request assistance to gather NBC-related intelligence from EPWs. For example, intelligence personnel may request Security Forces to provide samples of captured equipment for analysis. They also may request blood samples from EPWs to determine if the prisoners received inoculations against specific biological agents.

A4.13.6. Refer to **A4.4.1.1.** and **A4.4.1.2.** for information on weapons decontamination and contaminated weapons handling in armories or closed spaces.

A4.14. Services. The primary focus of Services personnel in an NBCC environment is to ensure continuity of operations and to protect personnel from contamination. Services procedures will focus on the areas of mortuary affairs, search and recovery, billeting, food service, and shelter stocking.

A4.14.1. Mortuary Affairs: ***NOTE:*** This section is reserved for re-write pending the conclusion of the Joint Services Working Group for Decontamination of Human Remains (HQ AF/ILVR).

A4.14.2. Search and Recovery (S&R) Operations. Personnel should limit search and recovery operations in contaminated environments to the minimum processes required to remove remains from the field. If possible, delay S&R operations until the safest time after an attack. Personnel must wear the appropriate IPE required for the operation. Treat all remains as contaminated. Follow procedures outlined in AFI 34-242, *Air Force Mortuary Affairs Program.* Consult Civil Engineer Readiness personnel and follow appropriate personal decontamination procedures at the conclusion of S&R operations.

A4.14.3. Housing Operations. Housing personnel in a contaminated environment will be more cumbersome than in areas where the threat is only from conventional weapons. Services personnel must have an understanding of the hazard environment and the protective capabilities of various types of structures to maximize force survivability. Services personnel should work with Civil Engineer Readiness to identify and modify structures to provide the best NBC protection. Services personnel should

develop plans for rapid reassignment of living quarters if contamination or facility damage renders some living quarters unusable.

A4.14.4. Food and Potable Water Considerations:

A4.14.4.1. There is currently no acceptable means to decontaminate food-packaging materials. Therefore, Services personnel will take all the precautionary steps to safeguard and protect food assets during the pre-attack period and use existing processes to order new stocks of food.

A4.14.4.2. Services personnel should disperse food assets into fixed or hardened shelters or sealed refrigeration units. Cover with plastic and seal with tape. Once the attack is over, request Civil Engineer readiness to test the protected food to identify the contamination and determine if the protected food is contamination free. Air Force Public Health will determine if the food is safe and wholesome for consumption.

A4.14.4.3. Institute shelter stocking with pre-positioned operational rations, such as Meals Ready-to-Eat (MRE) and Unitized Group Rations (UGR). Stock only those shelters in an over pressurized environment (personnel can safely remove mask).

A4.14.4.4. Upon notification of hostilities, work the normal food supply chain to immediately restock and resupply sustaining forces with either in-theater or out of theater clean food assets. To accomplish this, MAJCOM and Services Agency staff will work with in-theater personnel to determine salvageable and reusable assets and to reorder requirements for MRE and UGR.

A4.14.4.5. Do not use contaminated food service equipment. Instead, relocate new bare base assets from other sites within the theater or from stateside locations. Until that time, personnel will eat clean operational rations.

A4.14.4.6. If new science and/or technologies permit the safe decontamination of certain food packaging systems; revise decontamination procedures accordingly.

Attachment 5

MISSION ORIENTED PROTECIVE POSTURE (MOPP) WORK-REST CYCLE AND HYDRATION CHARTS

A5.1. Background.

A5.1.1. This attachment provides work-rest cycle and fluid replacement guidelines for personnel operating in the groundcrew chemical ensemble (GCE). This information, developed by the United States Army Research Institute of Environmental Medicine (USARIEM) and approved by the Air Force Surgeon General, provides general guidelines and an explanation of the factors to consider when determining work-rest cycles and fluid replacement.

A5.2. Heat Stress Considerations While Wearing the GCE.

A5.2.1. Personnel must maintain a body temperature within narrow limits for optimum physical and mental performance. The body produces more heat during work than rest. Normally, the body cools itself by evaporation of sweat and radiation of heat at the skin's surface. Wearing the GCE restricts these heat loss mechanisms because of its high insulation and low permeability to water vapor. In addition, physical work tasks require more effort when personnel wear protective clothing due to added weight and restricted movement. Consequently, more body heat will dissipate than normal and its temperature will tend to rise quickly. The amount of heat acclimatization will depend upon the amount of physical activity, the level of hydration, the clothing worn, the load carried, the state of heat acclimatization, physical fitness, fatigue, and terrain and climatic conditions.

A5.2.2. The use of MOPP and MOPP options (**Chapter 5**) will change barriers to body cooling. Work intensity is a major contributing factor to heat stress, but it is manageable. Military work activities are in three categories to include light, moderate, or heavy work. **Table A5.1.** provides examples of common work activities to use as a guide to estimate the work intensity for a particular mission or task. Use these estimates and the guidelines in **A5.8.** to estimate work-rest cycles and hydration requirements under different work intensities, MOPP levels, and environmental conditions.

Table A5.1. Work Intensities of Military Tasks

Light (Easy) Work	Moderate Work	Heavy (Hard) Work
Weapons maintenance Walking on hard surface at 2.5 mph, with <30 pound load Manual of arms Marksmanship training Tower operations Operations NCOs/officers Pilot ground activities Command post and unit control center activities	Walking on loose sand at 2.5 mph, with no load Walking on hard surface at 3.5 mph <40 pound load Calisthenics Patrolling Individual movement techniques such as low/high crawl Refueling Avionics shop Aircraft maintenance Unit post attack reconnaissance	Walking on hard surface at 3.5 mph, with >40 pound load Walking on loose sand at 2.5 mph, with any load Armament crew Heavy aircraft repair Specialized Teams such as NBC Reconnaissance, search and recovery, rapid runway repair, CCA, fire protection, decontamination, medical, damage assessment and repair, and EOD

A5.3. Understanding the Heat Stress Process.

A5.3.1. Personnel who wear the GCE often experience heat stress. To prevent such heat stress from resulting in heat stress related injury, personnel should follow a prescribed cycle of work and rest periods. The suggested work-rest cycles consider the impact of the environment (temperature, humidity, and solar load), workload of the individual, and the clothing ensemble worn. The work-rest cycles usually relay the amount (minutes) of work allowed per hour. Personnel will use the remainder of the hour (after completing the allowed work) for rest, to allow heat to dissipate, and to allow the individual to cool down. By following the prescribed work-rest cycle, personnel will significantly reduce the chances for heat stress injury.

A5.3.2. Under most conditions, when individuals are wearing heavier garments, the amount of work allowed per hour is less than the amount of work allowed when wearing a lighter garment. It has been observed; however, that under some conditions, the work allowed per hour is actually greater when wearing a heavier garment than when wearing a lighter garment.

A5.3.2.1. When an individual is wearing chemical protective clothing, the primary modes of heat exchange between the individual and the surroundings are by conduction (movement of air), evaporation (of sweat), and (if the sun is out) solar radiation. The nature of chemical protective clothing is such that the garments minimize convective heat transfer. Evaporation will always result in a cooling effect for the individual, as long as the water vapor can escape from the clothing ensemble. The amount of evaporative cooling will be dependent upon the humidity of the ambient air and upon the rate at which the water vapor can escape.

A5.3.2.2. Solar radiation (if present) will always result in adding heat to the individual. As the sun beats down on the surface of the clothing, the garments will heat up, and the heat will eventually transfer through the clothing layers to the individual. This heat from the solar radiation will exacerbate the heat stress situation.

A5.3.2.3. Heat transfer by conduction is dependent upon the skin temperature of the individual and the ambient temperature. When the skin temperature is greater than the ambient temperature, then the heat will transfer from the skin to the surrounding air. When the ambient air temperature is greater than the skin temperature, then the heat will transfer from the surroundings to the skin, heating up the individual.

A5.3.2.4. In most situations, the total heat lost (by evaporation and conduction if the skin is warmer than the ambient air) is greater than the heat gained (by solar radiation, if present, and by conduction if the air is warmer than the skin). Insulation, of course, reduces the rate at which this heat transfer occurs, but cannot prevent it entirely. The greater the insulation, the lower the rate of heat transfer, and the greater the heat stress induced upon the individual. This is the expected situation when the heavier garment (i.e., the BDO) induces more heat stress than the lighter garment (i.e., the CPO).

A5.3.2.5. In some cases, especially under conditions of high ambient temperature or under a solar load, the heat gained from the environment is greater than the heat loss. Insulation acts to reduce the rate at which this heat transfer occurs. In this case, the heavier garment acts to protect the individual from the high external heat load better than the lighter garment. Hence, an individual can actually work longer in the heavier garment (i.e. the BDO) than in the lighter garment (i.e., the CPO) under such conditions. For example, desert nomads wear wool to protect themselves from the high external heat load caused by solar radiation and high ambient air temperatures.

A5.4. Dehydration.

A5.4.1. Because of higher body temperatures, personnel in MOPP gear sweat considerably more than usual. They often lose more than 1.5 quarts of water every hour during work. Personnel must consume water to replace lost fluids or dehydration will follow. Even a slight degree of dehydration impairs the body's ability to regulate its temperature and nullifies the benefits of heat acclimatization and physical fitness, increases the susceptibility to heat injury, and reduces work capacity (including G-tolerance for aircrew), appetite, and alertness. Even in personnel who are not heat casualties, the combined effects of dehydration, restricted heat loss from the body, and increased work effort place a severe strain on the body's functions. These personnel will suffer from decrements in mental and physical performance.

A5.4.2. The difficulty of drinking in the protective mask increases the likelihood of dehydration. Thirst is not an adequate indicator of dehydration. Even when drinking water is readily available, personnel may not sense when they become dehydrated and may fail to replace body water losses. The supervisor and chain-of-command must take responsibility for enforcing regular and timely fluid replacement for their personnel.

A5.4.3. Mitigation. Individuals should drink as much as possible before donning the mask. Frequent drinking while working is more effective in maintaining hydration than waiting until rest periods to drink. The unit chain of command must take responsibility for enforcing regular and timely fluid replacement in their individuals.

A5.5. Inadequate Nutrition.

A5.5.1. Impact of Inadequate Nutrition. In addition to bodily requirements for electrolyte (salt) replacement caused by sustained and excessive sweating, the higher work intensities typical of opera-

tions in MOPP lead to an increased demand for calories. Lack of adequate energy supplies can lead to decrements in both physical and mental performance.

A5.5.2. Mitigation Measures. The method selected to minimize feeding-related problems depends on availability of safe, uncontaminated areas, as well as other operational constraints. In a contaminated area where there is also a vapor hazard, move personnel into a contamination free or collective-protection facility. Since collective-protection shelters have limited capacity, rotate small groups through these facilities. In a contaminated area with no collective protection available, relocate personnel to a safe area for feeding by rotating small portions of the unit or by entire unit replacement. If personnel are in a contaminated area with no detectable vapor hazard or in a clean area where they are under a constant threat of NBC attack, use a rotating method for feeding about 25 percent at any one time and take precautions to prevent food contamination.

A5.6. Miosis.

A5.6.1. Impact of Miosis. Although wearing the GCE may be the most common source of performance problems during NBC operations, some chemical agents, (primarily the nerve agents) can produce performance decrements at exposure levels below that which would cause casualties. The tissues of the eye react to levels of nerve agent vapor that will not affect other bodily systems. Minute amounts of nerve agent in direct contact with the eyes, can affect the eyes, causing constriction of the pupil (miosis). Personnel should expect that miosis would negate or reduce the efficiency of performance at night of tasks that depend on unaided night vision. Some examples are aircraft crews and the operation of surveillance devices. Personnel should consider identifying miosis-sensitive critical tasks and protection of critical specialist personnel in unit standard operating procedures for operations in a chemical environment.

A5.6.2. Miosis Countermeasures. Adopt certain precautions to minimize the incidence of miosis:

A5.6.2.1. Perform miosis-sensitive tasks before there is a risk of encountering miosis-producing hazards.

A5.6.2.2. Don the protective mask when in close proximity to areas, equipment, or personnel that were previously contaminated with a liquid nerve agent.

A5.6.2.3. Decontaminate individuals and/or change protective clothing as soon as possible after contamination by liquid nerve agent.

A5.6.2.4. Contaminated personnel remain masked as long as possible; if permitting short unmasking periods, widely disperse personnel in the open air, and segregate contaminated personnel.

A5.6.2.5. Avoid bare skin contact with contaminated surfaces. Do not rub the eyes. Wear protective gloves when there is a suspicion of contamination, and replace gloves that become contaminated.

A5.7. Psychological Factors.

A5.7.1. Psychological Impact. The threat of NBC warfare adds to an already stressful situation because it creates unique fears in personnel and isolates them from their environment. MOPP 4 reduces the ability to see and hear clearly and makes it more difficult to recognize and communicate with others. This creates or increases feelings of isolation and confusion. The awkwardness of wear-

ing bulky, garments, gloves, and boots over duty uniform causes frustration in many personnel and claustrophobia in others. Long periods of reduced mobility and sensory awareness degrade attention and alertness and create or increase feelings of alienation. Chemical filters in the protective mask make breathing more difficult; this, too, may create feelings of claustrophobia or panic. Combat stress can cause significant numbers of psychiatric casualties; estimates range from 10 percent to 30 percent depending on the duration and intensity of battle. Psychological stress stems not only from the death and destruction that characterize combat, but also from the challenging operational conditions: noise, confusion, and loss of sleep. Challenging operational conditions that create fatigue and cause changes in diet and personal hygiene cause physiological stress as well.

A5.7.2. Mitigation Measures. It is possible to minimize the adverse impact of psychological stress during MOPP operations by the experience and confidence that realistic training in the GCE (with protective mask) provides. The use of short rest breaks to provide MOPP reductions and relief, combined with adequate sleep (6 or more hours of uninterrupted sleep per 24-hour period is optimum; 4 hours is the minimum for a few days of sustained operations), and food and drink can sustain performance at an optimal level. During the period of 0100 to 0700, leaders must be aware that the body experiences reduced mental concentration, confusion, nervousness, and lack of clear thinking. Leaders should plan activities to reduce boredom, fatigue, inattention, and discomfort, which are major contributors to ineffective performance.

A5.7.3. Other Countermeasures. Leaders can minimize the effects of combat stress by attaining and maintaining a high level of unit cohesion and individual identity. Units must train together frequently under demanding conditions. If personnel know that they can overcome adversity together, unit cohesion will be high. Leaders must take a true interest in the welfare of their personnel and build the confidence necessary to withstand the effects of stress. Leaders must keep personnel informed about the tactical situation in order to minimize the adverse effects of ambiguity and uncertainty. Give personnel who become ineffective due to combat stress a rest period as well as reassurance and support by all members of their unit. The location where the rest period is provided should be as close to the front as possible.

A5.8. Work-Rest Cycle and Water Consumption Tables.

A5.8.1. If personnel are able to lower their work intensity or take more frequent rest breaks, the incidence of heat casualties will significantly decrease. **Table A5.2.** provides information necessary to estimate recommended work-rest cycles and fluid replacement cycles for various environmental conditions, clothing levels, and work intensities (see **Table A5.1.**). ***NOTE:*** The work-rest cycles specified in the table are based upon keeping the risk of heat casualties below 5 percent. Under some operational conditions, work-rest cycles offer no advantage to continuous work (see No Limit (NL)) entries in **Table A5.2.** Use the information in **Table A5.2.** and guidance provided by the medical staff to estimate work-rest cycles and fluid replacement requirements.

A5.8.2. In minimizing heat stress, it is possible to supplement work-rest schedules by microclimate cooling systems in which an air or liquid cooled vest worn under the overgarment removes body heat away from skin. Personnel can use these systems, such as cooling vests, when available. It is important to recognize that even when using work-rest schedules and cooling systems, an increased risk of performance degradation and heat casualties is inevitable when wearing the GCE in hot weather.

A5.8.3. Due to higher body temperatures, personnel in the GCE sweat considerably more than usual, and personnel must be aware of the need for hydration, especially following deployment. Leaders

ensure that subordinates maintain proper hydration, especially in areas of climatic extreme (i.e., desert environments), and remain alert to any person showing potential heat stress, strokes, or exhaustion symptoms. Personnel must consume water to replace lost fluids or dehydration will follow.

Table A5.2. Work-Rest Cycles and Fluid Replacement Guidelines.

Heat Category	WBGT[1] Index (ºF)	Light (Easy) Work		Moderate Work		Hard (Heavy) Work	
		Work/ Rest[2]	Water Intake[3] (Quart/Hour)	Work/ Rest[2]	Water Intake[3] (Quart/Hour)	Work/ Rest[2]	Water Intake[3] (Quart/Hour)
1	78-81.9	NL[4]	1/2	NL	3/4	40/20 min	¾
2	82-84.9	NL	1/2	50/10 min	3/4	30/30 min	1
3	85-87.9	NL	3/4	40/20 min	3/4	30/30 min	1
4	88-89.9	NL	3/4	30/30 min	3/4	20/40 min	1
5	>90	50/10 min	1	20/40 min	1	10/50 min	1

NOTES:

1. If wearing MOPP 4, add 10ºF to Wet Bulb Globe Temperature (WBGT). If wearing personal body armor in humid climates, add 5ºF to WBGT.
2. Rest means minimal physical activity (sitting or standing), accomplished in shade if possible.
3. ***Caution:*** Daily fluid intake should not exceed 12 quarts. Hourly fluid intake should not exceed 1 quart. The work/rest time and fluid replacement volumes will sustain performance and hydration for at least 4 hours of work in the specified work category. Individual water needs will vary ±¼ quart/ hour.
4. NL=no limit to work time per hour.

A5.8.4. The difficulty of drinking in the protective mask increases the likelihood of dehydration. Thirst is not an adequate indicator of dehydration; personnel will not sense dehydration and will fail to replace body water losses, even when drinking water is readily available. The unit chain of command must take responsibility for enforcing regular and timely fluid replacement in their personnel. In addition, when only consuming water through the protective mask drinking tube, do not include additives such as electrolyte replacement.

A5.8.5. Individuals should go into MOPP levels at full hydration and conduct frequent drinking while working. This is more effective than maintaining hydration and then waiting until rest periods to drink.

A5.8.6. All water (and ice) consumed must be from a medically approved source to prevent waterborne illnesses. Individuals should carry as much water as possible when separated from medically approved water sources. Plain water is the beverage of choice, and personnel will be more likely to

drink sufficient water if it is palatable. Whenever possible, provide cool (60-70°F) water. It is much better to drink small amounts of water frequently than to drink large amounts occasionally.

Attachment 6

NBCC POST-ATTACK RECONNAISSANCE

A6.1. Mission. Post-attack reconnaissance (PAR) is a base-wide effort that incorporates an integrated network of unit control centers, protective shelters, defensive fighting positions, and specialized teams to report information to the Unit Control Center (UCC) and Survival Recovery Center (SRC). PAR includes those deliberate individual, specialized team, and unit actions taken before and after an attack to assess damage and report status to the chain of command. PAR operations provide commanders at each level with a rapid means locating casualties, fires, contamination, and unexploded ordnance (UXO); identifying and marking hazards; and determining status of assessing damage to facilities and, or equipment in unit areas. Commanders and staffs use information collected during PAR to determine the need for and priority to conduct recovery operations, such as MOPP level, firefighting, casualty treatment, UXO safing, rapid runway repair, and facility restoration.

A6.2. Operations. The responsibility for post-attack assessment does not rest with any single organization or specialized team, but with every individual assigned to an installation. Unit and base teams provide reconnaissance for specific unit areas while individuals provide information on activities within their immediate area. Accurate and timely post-attack reporting allows the UCC and SRC to assess the total status of mission resources and assign recovery forces to respond where they are most effective. Actions such as marking hazards and notifying people within the area of post-attack hazards prevents or minimizes further damage, injury, or the spread of contamination. Just as important as reporting actual damage or contamination is reporting that no damage or contamination has occurred. These negative reports enable the UCC or SRC to rapidly identify safe areas, recommend reduced MOPP levels, and resume the mission without the encumbrances of IPE within these areas.

A6.3. Airman (Individual) PAR Actions. Individual actions are normally limited to a person's immediate work area, assigned equipment, or vehicle. **Table A6.1.** summarizes PAR enabling tasks and responsibilities for pre-attack preparations and post-attack actions. When directed to leave their shelter or protected areas, individuals should survey the interior of the structure (if inside) or immediate area (if outside). Personnel should look for evidence of damage, UXO, or contamination and provide aid to casualties. They must remain in protected shelters or under overhead cover (situation permitting) until directed otherwise by the SRC or their UCC. This delay will provide time for Civil Engineer NBC Reconnaissance and Damage Assessment teams to confirm or deny NBC agent use and assess damage. Individuals should follow SRC and UCC instructions and remain vigilant for contamination and other post-attack hazards, avoid marked areas, and continue to survey their area of responsibility and equipment for damage or contamination. If hazards are found, they should be marked as shown in paragraphs **A6.7.** and **A6.8.** Notify other personnel within the area of the hazard or hazards and report the results to the UCC or SRC.

A6.4. Unit PAR Teams:

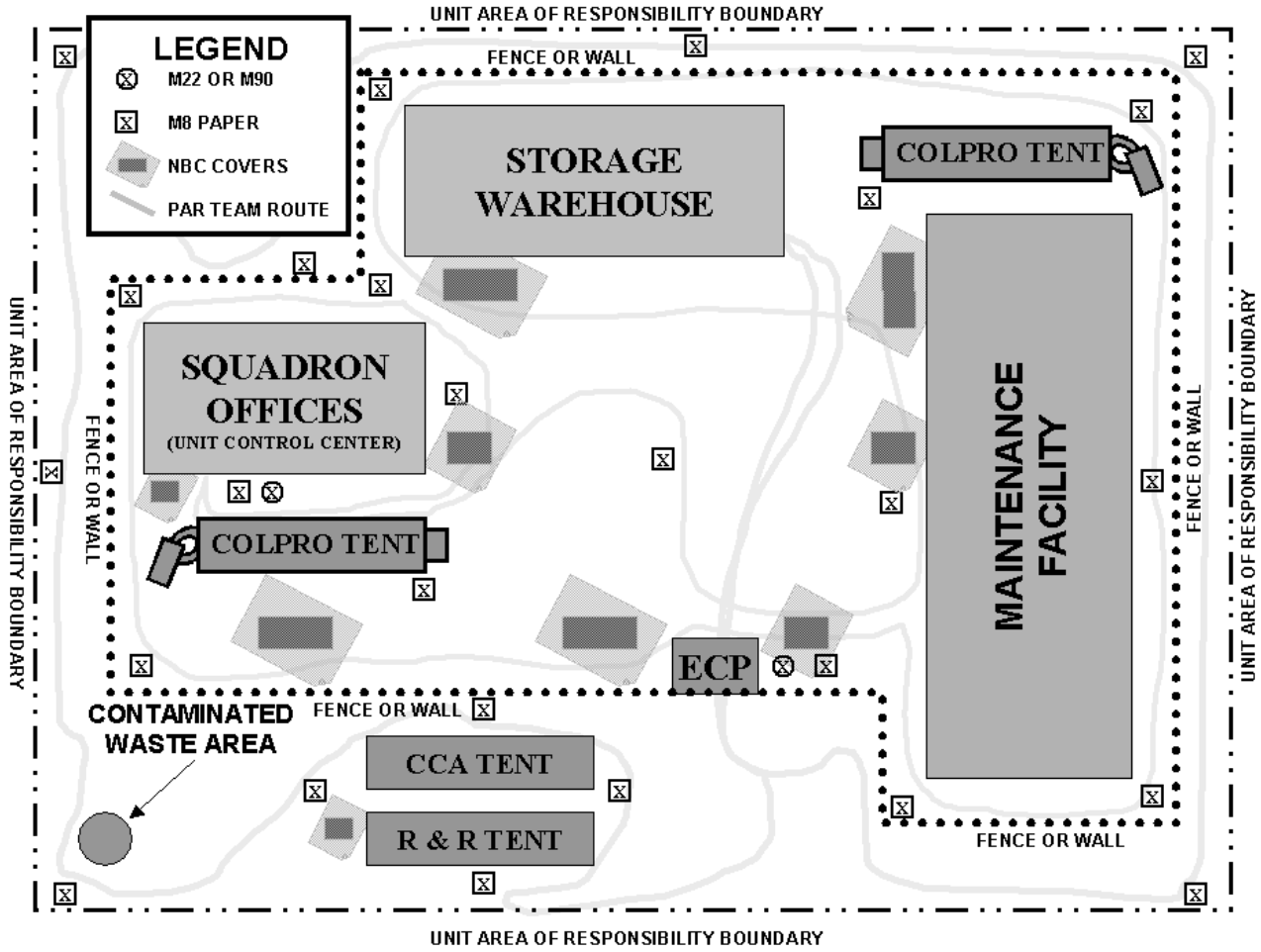
A6.4.1. Concept of Operations. Unit PAR teams are normally directed through the UCC and conduct explosive ordnance reconnaissance activities, survey for contamination, implement contamination avoidance actions, survey unit assets for damage and fire, and perform casualty care. Prior to attacks, the teams should be responsible for executing unit plans for pre-positioning M8 paper on unit assets and areas, dispersing and maintaining security of unit assets, implementing dispersal and expedient hardening measures, placing and maintaining the serviceability of contamination avoidance covers,

and assisting unit shelter and other specialized teams prepare for operations. Units responsible for large areas and multiple PAR teams may find it more efficient to group teams and areas under sub-unit control centers (or equivalent) that, in turn, report to the UCC. UCCs consolidate PAR team information and report it to their unit SRC representative or to a location designated in airbase FSTR Plan 10-2. PAR teams should mark hazards (i.e., UXO and contamination) as they are discovered. However, extensive marking may create unacceptable delays that prevent rapid reconnaissance of the assigned areas. Under these circumstances, an initial PAR survey may be conducted to identify major hazards and determine if contamination is present. The risk to others within the area is low because all non-mission essential personnel should remain indoors until all hazards have been identified, located, reported, and marked. Once the initial survey is complete and the results are reported, return and properly mark hazards and contamination. **Figure A6.1.** shows pre-attack preparations within a unit area of responsibility and how PAR team coverage is planned for the areas both inside and outside the unit compound.

Table A6.1. Post-Attack Reconnaissance Enabling Tasks - Airman, Unit, and Base Levels.

Action	Responsibility Level		
Pre-Attack	**Airbase**	**Unit**	**Airman**
Assemble and inspect PAR team equipment	X	X	
Survey area of responsibility	X	X	X
Identify primary and alternate routes	X	X	
Annotate map with key information	X	X	
Identify facility power, gas, and fuel cutoffs	X	X	X
Pre-position M8 paper	X	X	X
Identify expedient firefighting assets	X	X	X
Identify location and inspect first-aid kits	X	X	X
Identify blackout actions	X	X	X
Implement CCD actions	X	X	X
Review UXO identification chart	X	X	X
Identify resources that require contamination covers	X	X	X
Implement contamination avoidance actions	X	X	X
Post Attack	**Airbase**	**Unit**	**Airman**
Survey pre-determined route	X	X	X
Find and report casualties, fire, damage	X	X	X
Conduct explosive ordnance reconnaissance	X	X	X
Mark hazards where needed	X	X	X
Report NBC detector alarms and indicators of attack	X	X	X
Post, check, and report on M8	X	X	X
Conduct expedient firefighting		X	X
Take injured to the casualty collection point		X	X
Report enemy activity (S-A-L-U-T-E format)	X	X	X
Report enemy casualties and abandoned weapons	X	X	X
Survey vehicles and equipment for damage	X	X	X
Maintain contact with the UCC or SRC	X	X	X
Request UCC or SRC assistance	X	X	X
Advise UCC or SRC on ability to conduct mission		X	X
Verify integrity of collective protection systems		X	
Verify the operation of NBC detectors	X		
Practice contamination avoidance	X	X	X
Conduct immediate decontamination	X	X	X

Figure A6.1. Example of Pre-Planned Routes for Unit Post-Attack Reconnaissance.



A6.4.2. Organization. PAR teams are organized, trained, and equipped by the unit. The minimum size for a PAR team is two people. This enables one member to maintain a constant watch for hazards, provide security, and call for assistance if accidents or injuries should occur. There is no maximum number of PAR team members; however, team size should be kept to a minimum to reduce the number of people exposed to post-attack hazards and still accomplish the mission. Larger teams may be appropriate depending on the unit mission, weather, or if additional security protection is required. PAR teams should be knowledgeable of the unit area, mission and assigned equipment. Organize, train, and equip enough teams to enable a complete reconnaissance of all unit areas of responsibility within 15-20 minutes after the start of the reconnaissance mission.

A6.4.3. Training. Specialized training, beyond that received in the current NBCC Defense course and Explosive Ordnance Reconnaissance (EOR), is not required. Team proficiency is gained through practice and unit exercises.

A6.4.4. Equipage. **Table A6.2.** provides a recommended list of team equipment items suitable for a two-person PAR team. Where appropriate, designate vehicles and communications equipment for team use. Adjust actual team equipment needs to match the threat, area of coverage, terrain, weather,

and mission. Team equipment may be dedicated and stored into team kits. The team may use existing equipment from shelter management team or other unit team kits.

A6.5. Specialized PAR Teams. Various base specialized teams fill this role in one or more areas. They include EOD teams, NBC reconnaissance teams, airfield damage assessment teams (ADAT), and BEE teams. Specific actions and duties of these teams are contained within functional area publications. The NBC reconnaissance teams operate under the direction of the Base Civil Engineer, through the SRC, and include CE readiness personnel. The primary mission of the NBC reconnaissance team is to deploy and maintain the base NBC detection network and conduct post-attack reconnaissance of base areas. Civil Engineer NBC teams also provide pre-attack and post-attack expert assistance to base and unit PAR teams. The teams also provide pre-attack and post-attack expert assistance to base and unit shelters, mortuary collection points, casualty collection points, contamination control areas, and to units that request assistance or supplemental training. These teams work with base and unit representatives to resolve technical issues related to NBC defense. During the pre-attack phase, they assist teams and units develop M8 paper detection post plans and PAR survey routes, brief team members, develop training drills for team member to practice for likely scenarios, and provide training on specialized equipment. During the post-attack phase, these teams may be tasked to assist or advise on operations for units and teams within their area. Although their first priority is base NBC defense, these teams provide the SRC with a rapid response capability that can provide on-the-spot advice and assistance to base recovery teams. AFMAN 32-4017 outlines the team responsibilities and concept of operations.

Table A6.2. Recommended Equipment for a Two-Person PAR Team.

Item	Quantity
Flashlight (high quality, >5000 candlepower) with Batteries*	2 each
Chemical Light Stick, White	2 boxes
Chemical Light Stick, Red	2 boxes
Surveyors Tape, White	2 rolls
Radio on Unit Network with Spare Batteries*	1
M8 Paper	5 booklets
M9 Paper	2 rolls
Personal Weapon and Ammunition	1
Hot, Cold, and Wet Weather Gear (as appropriate)*	2 sets
Magnifying Glass	1
NBCC Marking Kit or local equivalent	1 set
Masking Tape (1-2” Wide) and Indelible Marking Pen*	2 Rolls/2 Pens
Map or Diagram of PAR Routes and Responsibility Area	
*Indicates this item is normally a dual-use unit resource and designated for team use in wartime.	

A6.6. Post Attack Reconnaissance. The SRC or UCC may direct PAR operations to begin immediately following the attack or they may delay operations to avoid or reduce exposure to NBC contamination fall-

out or UXO hazards. Specialized base teams (EOD, airfield damage, assessment, BEE, and NBC reconnaissance) may be directed to start operations immediately following the attack to provide senior leadership with a quick-look assessment of airfield status and the overall post-attack situation. If communications fail, commanders may also direct specialized teams to "auto-roll" as soon as the attack is over.

A6.6.1. Hazard and Contamination Avoidance:

A6.6.1.1. When conducting post-attack reconnaissance, be cautious when traveling or walking. Make every reasonable effort to avoid crossing through cordoned and contaminated areas. If chemical contamination is present on vehicles or equipment, use the M291 or M295 decontamination kits to decontaminate. Concentrate on areas where individuals will sit or touch. Examples include access handles, equipment controls, bare metal, glass, and other non-porous surfaces. Do not enter damaged structures or walk across downed power lines.

A6.6.1.2. Consider site security when selecting pre-positioned base NBC detector and unit M8 paper sites. Detection sites should be located within areas where minimum owner-user security procedures are in force. The intent is to reduce the possibility that pre-selected and routinely checked sites could be mined or PAR teams targeted for ambush during routine operations. As a rule, detection sites should not be located outside of the airbase-controlled areas or base perimeter unless they are coordinated with and approved by security forces.

A6.6.1.3. Personnel who travel outside of airbase-controlled areas may receive little or no warning or indication that they are in a contaminated area. They must look for contaminated area marking signs, be alert for the initial symptoms of contamination, and have protective equipment ready for immediate donning at all times.

A6.6.1.4. Personnel within facilities, expedient bunkers, and defensive fighting positions (DFPs) should preposition some M8 paper in locations where it can be observed without having to physically leave the protected position. This will generally mean placing the M8 paper on a raised surface that is slightly canted towards the observation point. Binoculars or a spotting scope can be used during daylight to better observe M8 paper from the protected position or from beneath overhead cover. For nighttime operations, attach a rope or string to the observation stand or pad and pull it to an opening to observe the M8 paper. Use a white light to accurately read the M8 paper colors. Do not use night vision devices or flashlights with colored lenses (such as red or blue) because they will not accurately show color changes.

A6.6.2. NBCC Hazard Marking. Follow MAJCOM or theater standards for marking hazards. When these standards are not provided, use the standard hazard markers shown in **Figure A6.2.** to mark NBC and UXO hazards. Construct expedient markers, such as those shown in **Figure A6.3.**, when standard markers are unavailable. Construct the markers to the approximate size and shape of the examples using any suitable material. Options for expedient marking include locally produced marking signs or decals and the use of masking tape, chalk, or paint to mark the hazard. If no markers are available, use any means to mark the hazard that draws attention to the problem and communicates to others that a hazard exists. See paragraph **A6.7.** for UXO hazard marking and paragraph **A6.8.** for NBC contamination marking techniques.

A6.6.3. PAR Reporting:

A6.6.3.1. How to Report. Individuals and unit PAR teams report post-attack information through their UCC by the fastest available communication means. Each element that receives a PAR report has two responsibilities. The first is to provide the information to the next level in their chain of

command or designated agency. The second responsibility is to provide the information to others within the unit or within the area affected by the hazards. If normal communications fail, submit PAR reports to the next higher level in the chain of command. The SRC uses PAR information to evaluate attacks, determine attack patterns and probable targets, and evaluate the effectiveness of passive defense measures. Consider placing M8 paper on an elevated stand (as shown in **Figure A6.4.**) to simplify post-attack examination and reduce PAR survey time. Installations, tactical units, and detached Air Force elements may designate a central reporting element for consolidated PAR reporting; however, UCCs and individuals remain responsible collecting and disseminating information within the unit area or areas of responsibility.

A6.6.3.2. What to Report. Report information on casualties; unexploded ordnance; tactics employed by the enemy; nuclear, biological, or chemical weapons indicators; and damage to equipment, facilities, vehicles, aircraft, or roads. Look for activated NBC detectors, M8 and M9 paper positive indications, operating or spent munitions delivery systems or spray tanks, aerosol generators, and sub munitions or bomblets. Include your name, rank, unit, present location, and a phone number or method of contacting you for further information. Be as accurate in your details as possible. The UCC and SRC will consolidate PAR reports to provide a complete assessment of the installation. AFMAN 32-4014V4, AFMAN 10-100, and local publications also provide common formats for NBC damage and UXO reporting.

Figure A6.2. Standard Nuclear, Biological, Chemical and Conventional (NBCC) Hazard Markers.

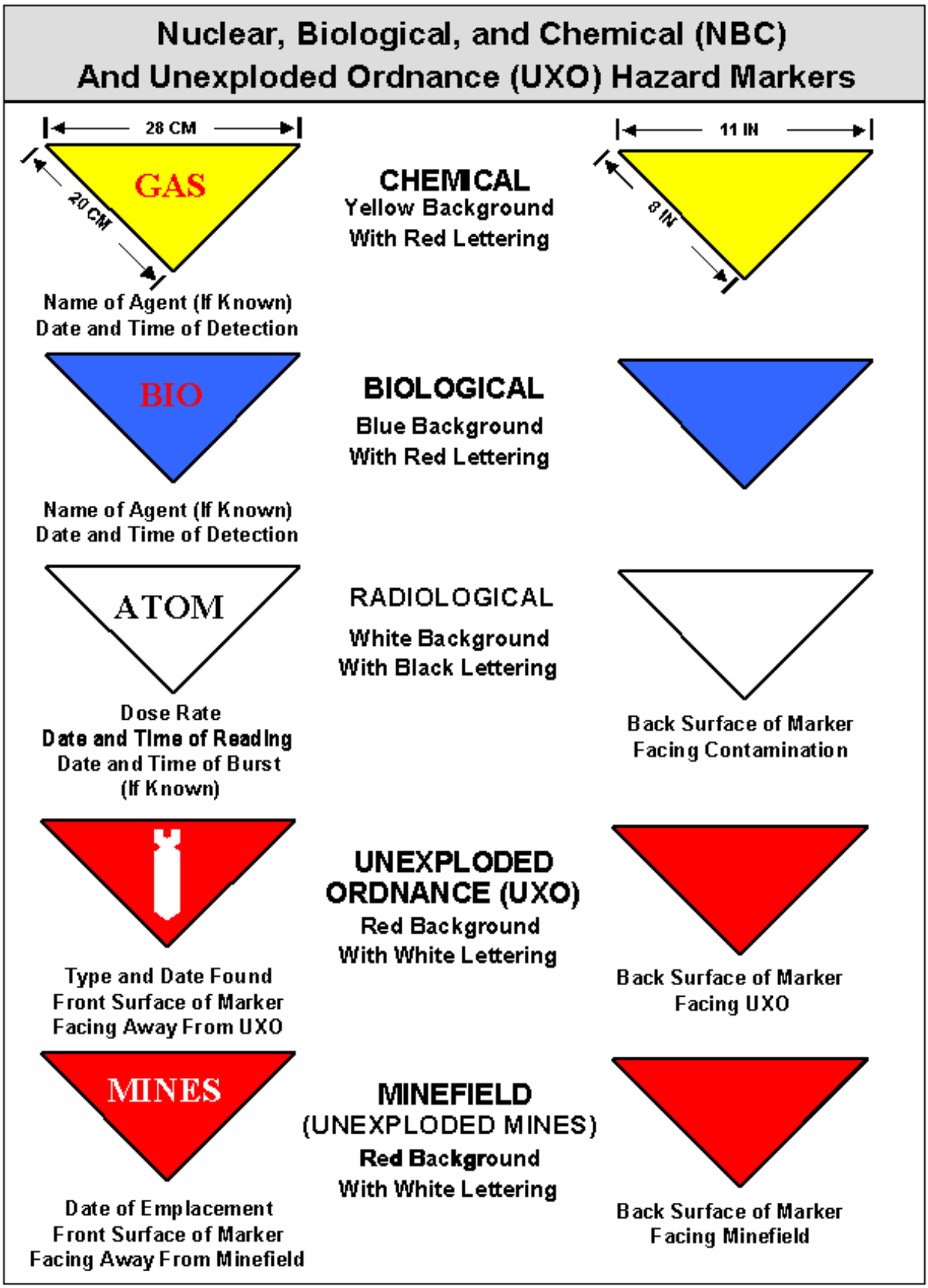


Figure A6.3. Expedient Nuclear, Biological, and Conventional (NBCC) Hazard Markers.

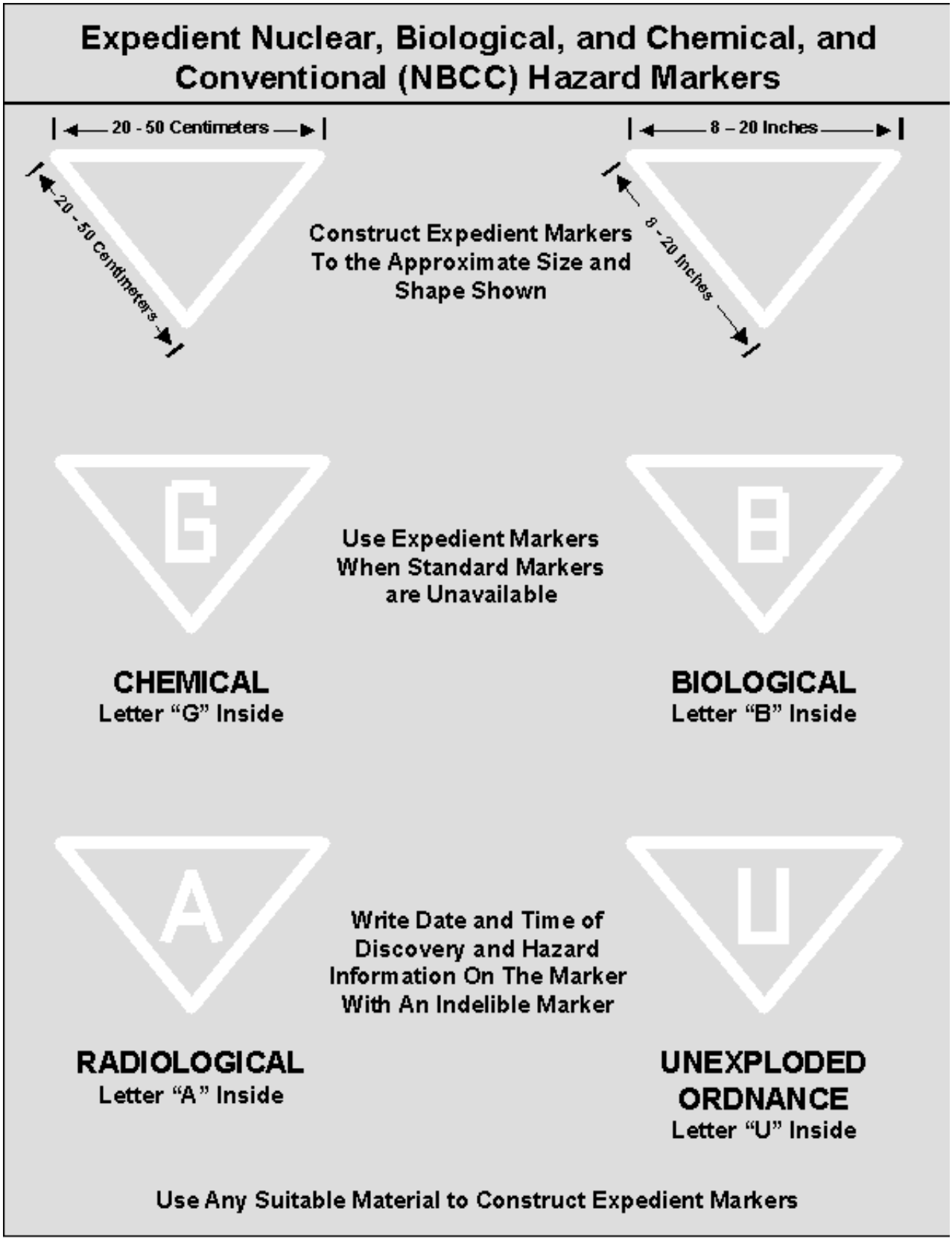


Figure A6.4. Post-Attack Reconnaissance Team Member Checks M8 Paper.

A6.7. Explosive Ordnance Reconnaissance (EOR) Operations:

A6.7.1. Introduction. This section implements STANAG 2002, W*arning Signs for the Marking of Contaminated or Dangerous Land Areas, Complete Equipment, Supplies, and Stores, Edition 7,* and STANAG 2143, *Explosive Ordnance Reconnaissance/Explosive Ordnance Disposal*. The enabling tasks for the airbase explosive EOR mission are shown in **Table A6.3.**

A6.7.2. UXO Identification. Recognizing a UXO hazard is the initial and most important step in reacting to a UXO hazard. All ordnance can incorporate anti-disturbance or anti-removal devices; therefore, clearing any UXO without proper training, tools, and information is extremely dangerous. Indiscriminate destruction of ordnance without a positive identification of the type, function, and filler (i.e., explosive, chemical, or biological) can result in extreme consequences. Friendly and threat forces use a multitude of ordnance manufactured in all shapes and sizes. This appendix explains and provides examples of the general identifying features of the different types of ordnance of both U.S. and foreign manufacture. See AFVA 32-4022, *USAF Unexploded Ordnance Recognition and Reporting Chart* (**Figure A6.5.**), to recognize and accurately report unexploded ordnance. Generally, there are four main ordnance types: dropped, projected, thrown, and placed.

A6.7.2.1. Dropped Ordnance. Regardless of its type or purpose, dropped ordnance is dispensed or dropped from an aircraft. There are three subgroups of dropped ordnance: bombs, dispensers (containing submunitions), and submunitions. Consider all bombs and submunitions to have magnetic/seismic or anti-disturbance fusing. Simply stated, this means approach could detonate the ordnance. Conduct all observations of ordnance with binoculars or spotting scopes and at the greatest distance that still allows gathering of required information.

Table A6.3. Explosive Ordnance Reconnaissance Enabling Tasks.

Identify
Identify the type of UXO
Observe and identify the UXO features (Use AFVA 32-4022 or AFH 32-4014V4)
Mark
Mark the hazard from where you are
Use the standard UXO or mine markers; if standard markers are not available, use whatever material is available
Ensure markings are visible in all directions, even at night
Evacuate
Evacuate all personnel and equipment from the area
If evacuation is impossible, isolate or barricade the area
Report
Report the incident, use the EOD Spot Report format in **Table A6.4.** or AFH 32-4014V4
If sending the report by radio, transmit from a minimum-safe distance of 8 meters (25 feet) for handheld and 30 meters (100 feet) for vehicle radios
Provide detail such as the size, shape, color, condition, landmarks, and grid coordinates
Report any injuries or casualties discovered during the operation

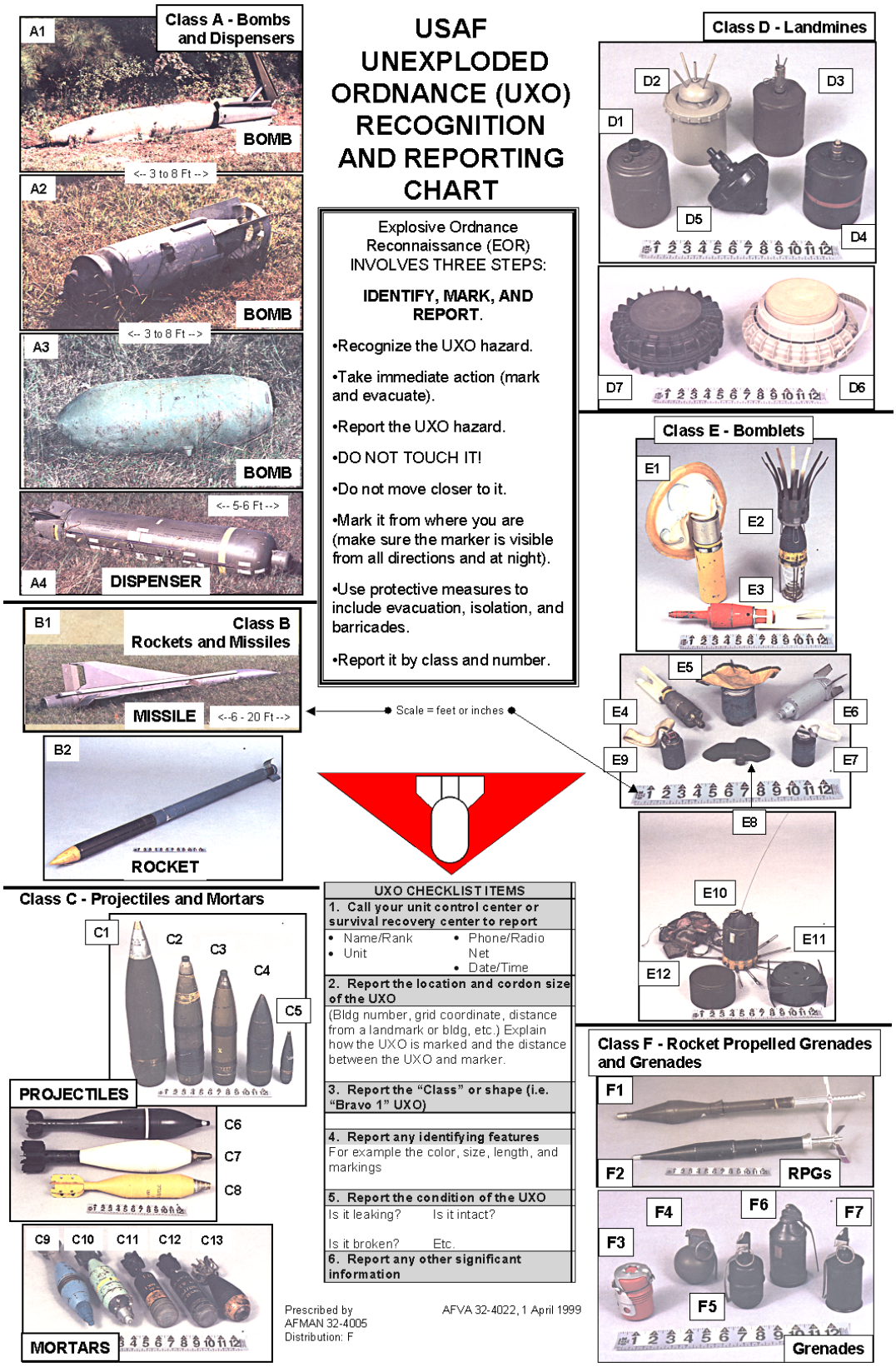
A6.7.2.1.1. Bombs. General-purpose bombs of all countries are similar in construction. About 50 percent of the weight of most bombs is the filler. The filler may be high explosive, chemical, biological, or other hazardous materials. Observe all safety precautions, such as evacuating personnel, closing off areas, and preventing unnecessary activities near the unexploded bomb.

A6.7.2.1.2. Dispensers. Dispensers are another type of dropped ordnance. Like bombs, they are carried by aircraft. The dispenser payload--the submunitions--is smaller ordnance. Submunition dispensers come in a variety of shapes and sizes, depending on the payload inside. Never approach a dispenser or any part of a dispenser, because the payload of submunitions may have scattered in the area where the dispenser hit the ground.

A6.7.2.1.3. Submunitions. Bomblets, grenades, or mines are classifications of submunitions. They are small and can contain explosives or a chemical or biological agent fill. These items are designed for saturation coverage of a large area.

A6.7.2.1.3.1. Bomblets and Grenades. Dispensers, missiles, rockets, or projectiles spread submunitions; these may be either antipersonnel, anti-material, antitank, dual-purpose, incendiary, or chemical. Each of these delivery systems disperses its payload of submunitions while still in flight; the submunitions drop over the target.

Figure A6.5. AFVA 32-4022, *USAF Unexploded Ordnance Recognition and Reporting Chart.*



A6.7.2.1.3.2. Air Delivered Mines. This is a large category of submunitions. It is important to understand the difference between scatterable and placed mines for accurate reporting. The major difference between scatterable mines and placed mines is that the scatterable mines land on the surface and are often more easily visually detected. Placed mines, discussed later in this attachment, may be placed on the surface, hidden, or buried under the ground.

A6.7.2.2. Projected Ordnance.

A6.7.2.2.1. Projectiles, Mortars, Rockets, and Rifle Grenades. All projected ordnance is fired from some type of launcher or gun tube. Projected ordnance falls into the following five subgroups: projectiles, mortars, rockets, rifle grenades, and guided missiles. Projected ordnance may have a warhead that is solid metal, filled, or partially filled with an explosive, chemical or biological agent, or submunitions. These items may not detonate on impact. Personnel must not attempt to move or disturb these items. Like bombs, these items can have impact or proximity fusing. They can also be fused with time-delay fusing that functions at a preset time after firing. If a person approaches a proximity fused UXO too closely, the fuse may function and cause the UXO to explode.

A6.7.2.2.2. Guided Missiles. Guided missiles allow for control of the munitions after firing. They are guided to their target by various guidance systems. The tube-launched, optically tracked, wire-guided (TOW) missile is an example of a wire-guided missile. Guided missiles may have internal, proximity fusing. Therefore, personnel should not approach any guided missile.

A6.7.2.3. Thrown Ordnance. Commonly known as hand grenades, classification of thrown ordnance is by use as follows: fragmentation (also called defensive), antitank, smoke, and illumination. Moving, jarring, or otherwise disturbing this ordnance may cause it to explode. Never pick up or disturb a hand grenade, even if the spoon and safety pin are still attached. Consider all grenades to incorporate anti-disturbance or anti-removal devices.

A6.7.2.4. Placed Ordnance. Placed ordnance is commonly referred to as land mines. Land mines are hidden, buried, or placed on the surface. Visual detection of land mines is often difficult. Consider all mines to have anti-disturbance or anti-removal devices. Mines equipped with magnetic or seismic influence fuses may detonate when disturbed. Conduct all observation of this ordnance with binoculars or a spotting scope and at the greatest distance that still allows gathering of required information. Placed land mines destroy vehicles and inflict injuries on personnel who step on or drive across them. There are three basic types of land mines: anti-tank, anti-personnel, and chemical.

A6.7.2.5. Sea Mines. Sea mines, also called naval mines, are those mines emplaced in deep or shallow waters, coastal areas, harbor entrances, rivers, canals, and estuaries. Aircraft, submarines, or surface ships emplace sea mines. Sea mines may also be hand-laid. Observe all safety precautions associated with ordnance having influence or anti-disturbance fusing by evacuating personnel and equipment, securing access to the area, and preventing unnecessary activities near the mine. The two major categories of sea mines are antisubmarine and surface ship mines and very shallow water anti-landing or amphibious mines.

A6.7.3. Marking Unexploded Ordnance:

A6.7.3.1. Confirm the Presence of UXO. The strict observance of basic safety precautions and sound judgment lessen the danger of UXO.

A6.7.3.1.1. Safe Distance. Upon identification of a UXO, retire to a safe distance and enforce evacuation measures when evacuation is possible. Do not remain in the immediate danger area any longer than necessary. Personnel must seek SRC guidance via the UCC to determine the appropriate evacuation distances for UXO present. Personnel should evacuate and use available cover to an initial distance of 100 feet for munitions smaller than 3 inches in diameter, and 300 feet for munitions 3 inches and greater in diameter.

A6.7.3.1.2. Disturbances. Do not touch or disturb the UXO or associated components, including loose wires or parachutes. Disturbances, either mechanical or otherwise, may cause the item to detonate.

A6.7.3.1.3. Nuclear, Chemical, or Biological Hazards. Assume the presence of a chemical or biological agent if you detect the presence of liquid droplets, dead animals, dissolved paint, or peculiar odors. Put on your protective equipment immediately, notify personnel within the immediate area, and notify your unit control center. Mark chemical or biological hazards as outlined paragraph **A6.8.**

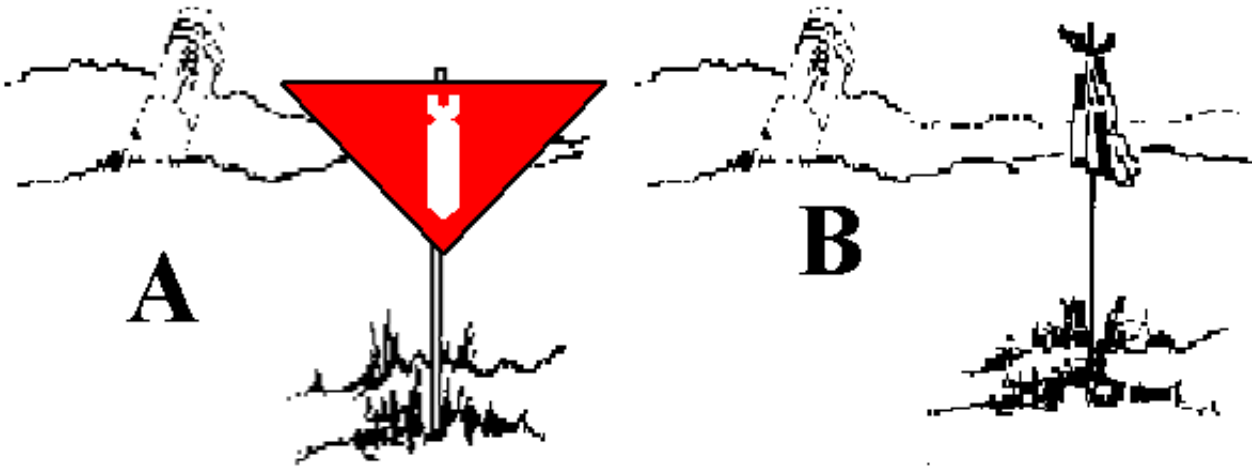
A6.7.3.1.4. Radio Transmit Hazard. Do not transmit or key radios within 8 meters (25 feet) of a UXO when using a handheld radio or within 30 meters (100 feet) of a UXO when using a vehicle radio. It may cause a detonation.

A6.7.3.2. Mark the UXO:

A6.7.3.2.1. Marker Description. Marking a UXO or mine hazard is just as important as marking other hazard areas, such as NBC contaminated areas. When marking these hazards, use the standard triangular signs (if available) to indicate the danger. These markers have a red background and a white inset indicating the type of UXO. Order the standard UXO marker using NSN 7690-01-463-3422. Order the standard mine marker using NSN 6230-00-926-4336. Both are available through service supply systems, and are shown in **Figure A6.2.** Units may locally manufacture these markers, provided they adhere to standard specifications as addressed in this paragraph and in **Figure A6.2.** and **Figure A6.3.**.

A6.7.3.2.2. Marker Placement. Place the markers above the ground at waist level (about 1 meter (3 feet)) with the point down as shown in **Figure A6.6.**(A). Place the marker no closer to the hazard than the point at which you first recognize the hazard. Attach the marker to a stake (as shown in **Figure A6.6.**(B), a tree, or other suitable holder. Make sure that the marker is clearly visible from all directions.

Figure A6.6. Examples of Elevated UXO Marking (A) and Expedient UXO Marking (B).

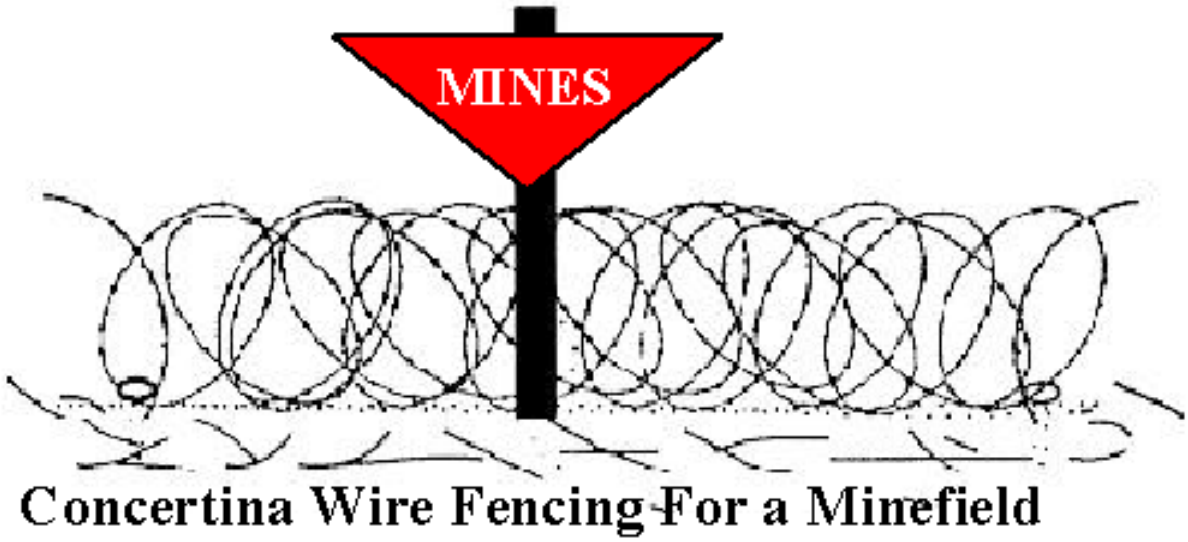


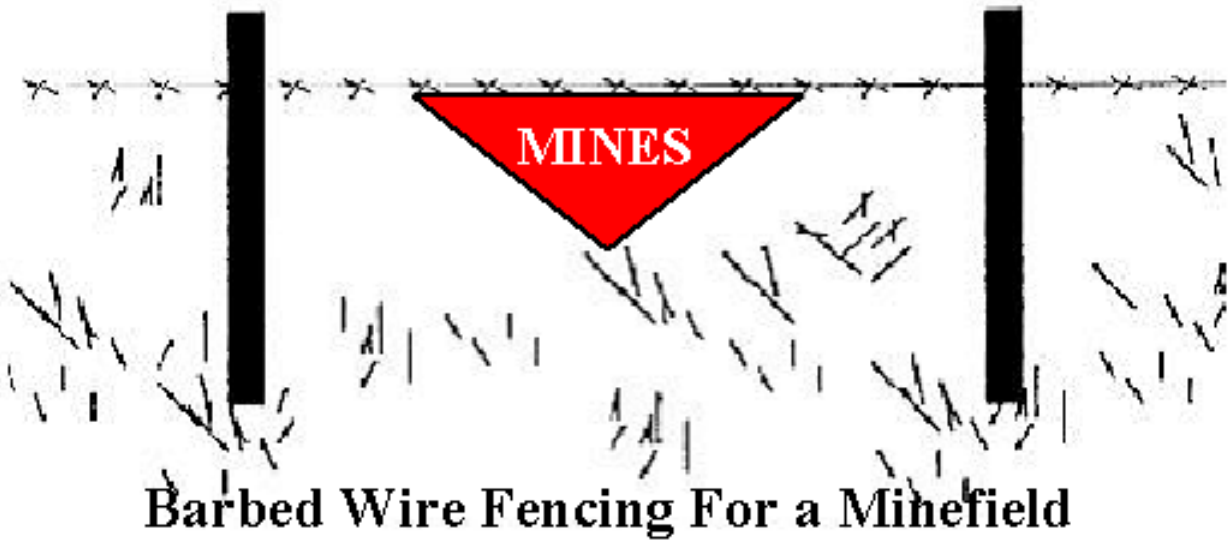
A6.7.3.2.3. Marker Visibility. Mark all logical approach routes to the area. If the hazard is near a road, put a marker on each side of the road approaching it.

A6.7.3.2.4. Field Expedient Methods. If standard markers are not available, use other suitable materials (such as engineer tape or colored ribbons). Standardize markers used within the area of operations by using the same color marker and material to avoid confusion. When using field-expedient materials, the same marking principles apply; i.e., place about 3 feet off the ground and clearly visible from all approach routes.

A6.7.3.2.5. Minefield or UXO Area Hazard Marking Considerations. **Figure A6.7.** provides an example of marking a minefield or other UXO area hazard. This example uses the mine marker. Marking of UXO uses a different marker, but all other procedures for marking mines and UXO are identical. If there is a large concentration of hazards such as submunitions, mark the area as you would a scatterable minefield by placing at least one sign every 15 meters (~50 feet) around the area. As a rule, the hazard itself must be easily seen from any of the markers.

Figure A6.7. Examples of Marking a Minefield or UXO Area Hazard.





A6.7.4. Reporting Unexploded Ordnance:

A6.7.4.1. UXO Spot Report. The UXO Spot Report is a timely and detailed, two-way reporting system. It clearly identifies the location of the UXO hazard, briefly describes the hazard, and provides the opportunity to include other significant information. The UXO Spot Report is the first-echelon report that is sent when an observer detects UXO. Units can use the report to request help in handling a UXO hazard if the unit cannot reduce the hazard either by using protective works or moving away from the UXO. It clearly identifies the location and characteristics of the UXO hazard. The report also assists the airbase commander and EOD experts to set priorities based on the situation. A sample report is shown in **Table A6.4.** It includes multiple lines for

recording information. Once the information is recorded, the report is sent or called in to the SRC EOD representative by the fastest means available.

A6.7.4.2. Report Routing. Forward the UXO Spot Report to the Unit Control Center or chain of command. Each level in the reporting chain that receives or reviews the report should make the appropriate mission changes based on the current tactical situation and mission priority. Each level in the chain is also responsible for forwarding UXO Spot Reports to the next higher level or the Survival Recovery Center (SRC). The SRC, in conjunction with the SRC EOD Representative, uses the UXO Spot Reports to prioritize and sequence the EOD response.

Table A6.4. Example of A UXO Spot Report.

1. Call your unit control center or survival recovery center to report.
Name and Rank: Unit: Phone or Radio Net: Date and Time:
2. Report the location and cordon size of the UXO.
Building number, grid coordinate, distance from a landmark or building: Explain how UXO is marked: Distance between the UXO and marker:
3. Report the "class" or shape (i.e. "Bravo 1" UXO) (See AFVA 32-4022).
Class: Shape:
4. Report any identifying features.
Color: Size: Length: Markings:
5. Report the condition of the UXO.
Is it leaking? Is it intact? Is it broken?
6. Report any other significant information.

A6.7.5. Protective Measures. There are three methods to protect personnel and equipment: evacuate, isolate, or barricade (or any combination of these methods). Refer to AFH 10-222V14, *Guide to Fighting Positions, Obstacles, and Revetments*, for detailed guidance on protective construction options and standards.

A6.7.5.1. Evacuate. When possible, personnel, aircraft, and equipment evacuation is the best protective measure. Allow occupation of the area only by personnel performing mission essential

tasks. After evacuating all personnel and equipment, allow movement within the area only for essential operations. Use barricades to protect mission-essential personnel and equipment that must stay in the area. Personnel who must remain in the area should also wear the appropriate protective equipment (to include Kevlar helmet and personal body armor).

A6.7.5.2. Isolate. Sometimes, for mission-related, operational, or other reasons, evacuation of personnel or equipment is not possible or it is not possible to leave a particular area. In these situations, isolate the assets (personnel, equipment, and operations) from the UXO by establishing a safe area and limiting exposure.

A6.7.5.3. Barricade. A barricade provides limited protection by blocking the blast and fragmentation from an explosion. Suppressive barricades are constructed to isolate an explosion, to deflect the thermal and shock wave, and absorb low-angle, high-speed fragments. Protective barricades are constructed around exposed resources to shelter from overpressure and impact of high-angle, low-speed fragments, which can escape over the top of suppressive barricades. Natural terrain features can provide adequate frontal and overhead protection. EOD or safety personnel should assess the potential of existing natural terrain barricades. If natural barricades are judged inadequate, construct artificial barriers. Constructing barricades is very time consuming and requires a large number of sandbags or earth-moving equipment. While building barricades, personnel should not disturb the UXO and should wear all appropriate protective equipment (to include Kevlar helmets and personal body armor). Depending on the size of the UXO, build suppressive barricades around the UXO to protect the entire area, or build protective barricades next to non-evacuated personnel or equipment. Priority should be given to evacuation of resources and building protective barricading. **Figure A6.8.** shows examples of UXO barricades.

A6.7.5.3.1. Small Yield UXO. For small yield UXO, generally ***less than 3 inches in diameter***, a double-wall thickness of sandbags should surround the area of the UXO. Stack the sandbags to at least 3 feet high and thick enough (minimum two sandbags deep) to protect personnel and equipment from the blast and fragmentation.

A6.7.5.3.2. Medium Yield UXO. For medium yield UXO, generally from ***3 inches to seven inches in diameter***, a wall thickness of four or five sandbags should surround the area. Stack the sandbags to a height of at least 5 feet to protect assets.

A6.7.5.3.3. Large Yield UXO. UXO ***over 7 inches in diameter*** are generally too large to build effective barricades around them. In these cases, barricade the equipment and personnel activity areas.

A6.8. NBC Contamination Marking:

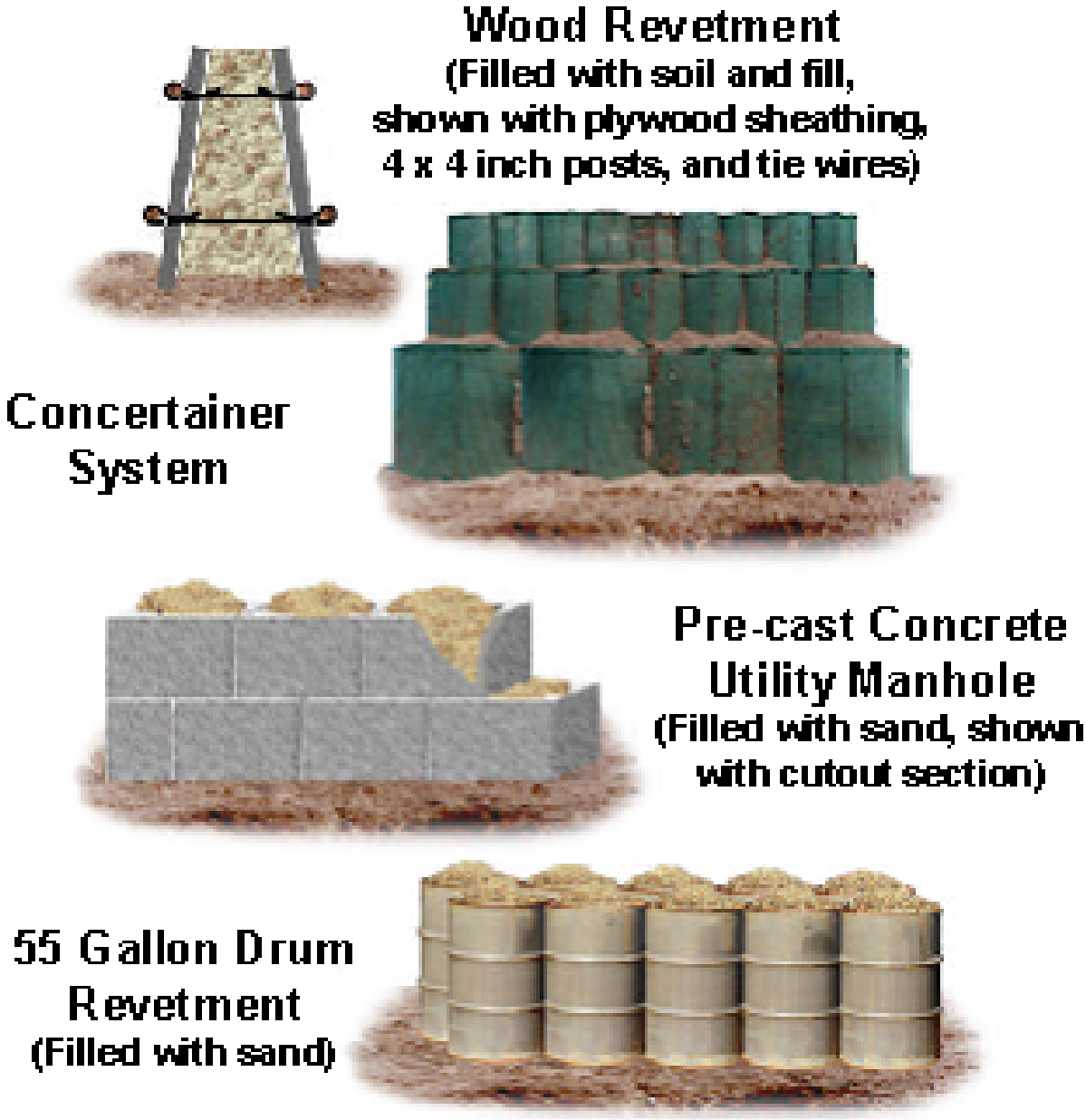
A6.8.1. Marking Contaminated Areas. A critical component of NBC contamination avoidance is marking contaminated areas or material. Contaminated areas should be marked and reported as soon as they are found. Contaminated vehicles, waste, equipment, and other material must also be marked to prevent unintentional contact and alert personnel to the hazard. This marking alerts other personnel that a hazard is present so that they can avoid entering the contaminated area or touching the material without taking protective actions. Marking a contaminated area merely indicates the presence of a hazard; a detailed reconnaissance of the area may be required to determine the extent of the contamination. Once areas or items are marked, report the information and location to the UCC or command chain.

A6.8.2. Standard Area and Material Marking:

A6.8.2.1. As with unexploded ordnance marking, the Air Force uses the standard North Atlantic Treaty Organization (NATO) signs to mark and identify contamination. **Figure A6.2.** shows standard NBC marking signs. **Figure A6.3.** provides expedient marking methods. The primary or background color indicates the type of contamination, and the secondary color gives specifics on the hazard. The shape of the signs is a right isosceles triangle with the base approximately 11 inches (28 cm) and the sides approximately 8 inches (20 cm). Expedient marker sizes may vary between 8 and 20 inches (20-50 cm) depending upon the type of material used to construct the marker and the size of the item to be marked. These signs can be made using tape, decals, paper, wood, plastic, metal, or any other available material. Post or position the signs with tip of the triangle pointing downward. PAR teams may also use the NBC Marking Kit. The kit includes everything needed to mark a contaminated area – flags, ribbons, crayons, mounting stakes, and a carrying container. When signs are posted, annotate the front of the sign, where possible, with the time, date, and type of contamination discovered.

A6.8.2.2. To be effective, marking signs must be positioned so they are most likely to be seen by approaching individuals or vehicles, such as at the point of entry and exit. Use rope, surveyor's tape, or any other method to prevent unintentional entry or contact. All roads, paths, and other ways into the area or to approach the material should also be marked. At night, use portable lights or chemical light sticks to call attention to markings. Once the initial reconnaissance survey is completed, specialized or unit PAR teams should cordon off contaminated areas or place barricades to prevent entry into high traffic or common use areas.

Figure A6.8. UXO Barricades.

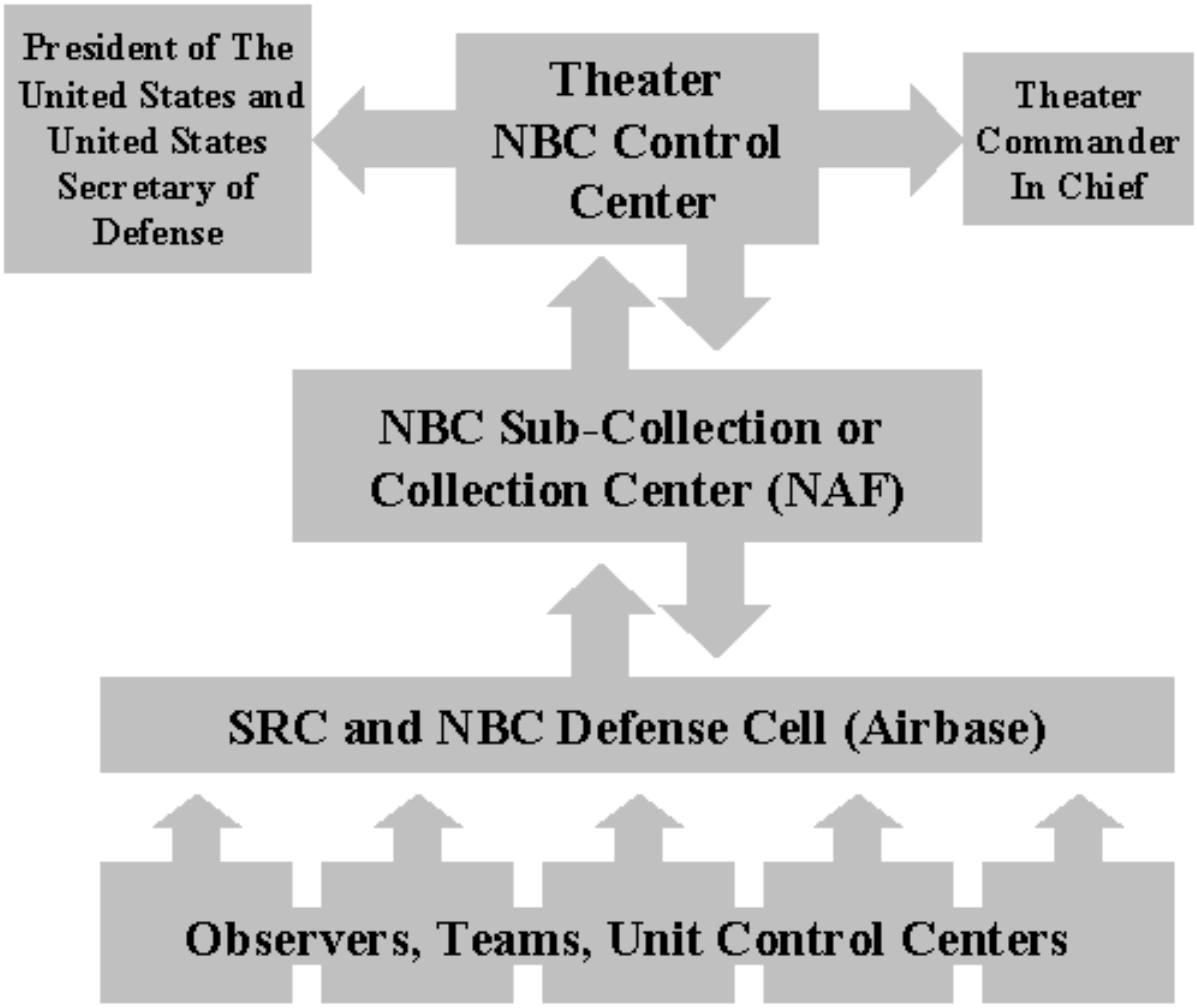


A6.9. Joint NBC Warning and Reporting. An additional requirement for NBC forces is to receive and disseminate NBC attack warnings to joint and host nation forces and report attacks to higher headquarters. This system allows the airbase to report nuclear detonations, radioactive contamination, enemy biological or chemical attacks and resulting contamination. It also enables the airbase to predict and provide warning of off-base nuclear fallout and chemical hazard areas. Joint doctrine requires commanders to verify and report the first use of NBC weapons to the President of the United States and United States Secretary of Defense and to inform US forces, allies, and friendly governments of the impending or actual use of NBC weapons by an enemy. Standard procedures for reporting NBC attack are outlined in AFMAN 32-4017

and Allied Tactical Publication 45B (ATP-45B). Refer to MAJCOM and theater standard operating procedures and plans for additional requirements.

A6.10. NATO NBC Reporting and Warning System Organizational Structure. The NATO NBC reporting and warning organization is divided into the following categories: source (airbase level), NBC collection or sub-collection centers (numbered Air Force or air component level), and theater NBC control centers (combined or joint command level). Subsequent notifications follow procedures in theater and Joint Chiefs of Staff publications. See **Figure A6.9.** for an example of a typical NBC warning and reporting system structure.

Figure A6.9. Notional Example of A Theater NBC Warning and Reporting System Structure.



Attachment 7

NBCC DEFENSE HARDENING CRITERIA

A7.1. Guidelines. Protect alternate facilities at one level less than the primary facility but not less than siting considered and Class V collective protection. Hardened or semi-hardened protection applies only to new construction. Provide splinter protection for existing unprotected facilities with hardened or semi-hardened requirements. Include off-base sites that support essential base missions and air traffic control functions. Coordinate construction with Security Forces to ensure fields-of-fire planning surveys are incorporated.

A7.2. Criteria. Protection requirements in **Table A7.1.** are in addition to those in DoD Unified Facilities Criteria 4-010-01, *Minimum Antiterrorism Standards for Buildings*.

Table A7.1. Nuclear, Biological, Chemical, and Conventional Defense Hardening Criteria.

Structure, Resource, or Function to Protect	Hardening Level									
	MTA					HTA				
	H	SH	SP	SC	C	H	SH	SP	SC	C
Theater Command, Control, Communications, Computer, and Intelligence Center	X				I	X				I
Wing Command, Control, Communications, Computer, and Intelligence Center, Survival Recovery Center, Security Forces Command Center		X			II	X				I
Tactical and Rotary Wing Aircraft Shelter[1]		X				X				
Squadron Operations, Intelligence, Photographic Reconnaissance, Aircrew Life Support, Communications and Computer Network Control, Telephone Switching System			X		III		X			II
Dormitory, Dining Facility[2]			X				X			II
Drone and Remotely Piloted Vehicle Shelter			X				X			III
Medical Treatment Facility			X					X		I
Unit Control Center, Security Forces Sector Command Post, Critical Security Post, Entry Control Point			X					X		III
Medical Casualty Collection Point, Precision Measurement and Calibration, Air Traffic Control System				X	III			X		III
Fire Protection Facility[3]				X	III			X		II
Large Framed Aircraft, Aeromedical Evacuation Aircraft, Transient Aircraft, Helicopter Parking Area				X					X	
DoD School, Child Care Center, Non-Combatant Evacuation Order Holding Area				X	IV			X		III
H – Hardened; SH - Semi-hardened; SP - Splinter Protected; SC - Siting Consideration; C – Collective Protection Class (I through V)										

Structure, Resource, or Function to Protect	Hardening Level									
	MTA					HTA				
	H	SH	SP	SC	C	H	SH	SP	SC	C
Vehicle, Aircraft, and Munitions Maintenance and Repair Functions; Key Unit Work Center; Transient Aircraft Passenger Holding Area; Transient Billeting				X				X		III
Power, Water, and Liquid Fuel Generation and Distribution, Critical Supply and War Reserve Material Storage; Air Freight Holding Area; Liquid Oxygen Storage and Generation; Critical Vehicle and Equipment Dispersal Sites; Hazardous Waste Accumulation and Storage Point, Consolidated Hazardous Materials Storage, Mortuary Collection Point or Theater Mortuary, Fuel Storage Tank (Above Ground), Aircraft Arresting System, Navigational Aid, Airfield Lighting Control, Water Storage Tank (Above Ground)[4]				X				X		
Other Structures or Tents with Collective Protection				X				X		
H – Hardened; SH - Semi-hardened; SP - Splinter Protected; SC - Siting Consideration; C – Collective Protection Class (I through V)										

NOTES:

1. Shelters must be available for 100% of aircraft authorized at main operating bases, 100% of aircraft deployed to the main operating base within the first 72 hours, and 100% of aircraft deployed to collocated operating bases within first 72 hours. When space is available, consider sheltering C-130 and larger aircraft.
2. Protected to 4-foot height above ground floor level (e.g., courtyard walls, area landscape berms).
3. Survivable bunkroom. Hardening for 100% of major crash and fire rescue vehicles either assigned at the main station or dispersed locations.
4. Survivable fuel storage and servicing of a least a 7-day supply (without resupply) and with at least two survivable dispensing points. Aircraft refueling truck parking areas or shelters must also be survivable. Survivable munitions storage, assembly, and loading areas when they directly support sortie generation. Survivable back-up electrical power protected to the same level as the facility it serves. Survivable integral facility water storage and protected or redundant distribution.

Attachment 8

IC 2003-1 TO AFMAN 10-2602, NUCLEAR, BIOLOGICAL, CHEMICAL, AND CONVENTIONAL (NBCC) DEFENSE OPERATIONS AND STANDARDS

29 MAY 2003

SUMMARY OF REVISIONS

This interim change (IC2003-1) updates guidance on: estimating chemical warfare agent hazard duration, provides the web site location for the HQ AF/XO-approved Chemical Warfare Agent Hazard Duration Charts, and provides guidelines for use of the 10-foot rule in chemical warfare environments.

Table 5.5. Change line 13 from "AFPAM 32-1147(I), *Design and Analysis of Hardened Structures to Conventional Weapons Effects*" to "US Army Corps of Engineers, UFC 3-340-01, *Design and Analysis Of Hardened Structures To Conventional Weapons Effects*."

A2.4.9. Chemical Warfare Agent Hazard Duration Estimation.

A2.4.9.1. Hazard Duration. Hazard duration is the time that must pass after a chemical attack before airmen can safely unmask or reduce MOPP without being affected by a subsequent one-hour exposure to vapor or a two-hand surface touch.

A2.4.9.1.1. Knowing the hazard duration time is critical to helping commanders maintain operational tempo following a chemical attack. Previous chemical warfare defense training tied unmasking and MOPP posture to chemical agent detection devices, such as chemical agent monitors (CAM), the M-8, or the M-22s. However, the review of chemical agent hazards has demonstrated that these devices may not always be sensitive enough to register the presence of an unsafe liquid contact or vapor hazard.

A2.4.9.1.2. An exhaustive review of scientific literature (and recent live agent testing from several technically sound sources) provides a framework for determining the probable hazard duration associated with chemical agents. Hazard duration times vary by type (liquid contact vs. vapor), agent, surface, temperature, etc.

A2.4.9.2. Liquid Contact Hazard. Knowledge of liquid hazard duration is critical to the commander's risk management decision process. Liquid hazard duration determines the time until it is safe for personnel to have limited bare-skin contact with a contaminated surface. Previously, these times were tied to

M-8 paper response. However, current procedures no longer rely exclusively on M-8/M-9 results. The liquid hazard table extends mission oriented protective posture (MOPP) times beyond M-8/M-9 sensitivity.

A2.4.9.2.1. Times (shown in hours) represent liquid contact hazards causing severe effects for 16% of the personnel that come into contact with the contaminated surface; they start after completion of the droplet fall. Recent studies noted that droplet fall may last up to one hour after the attack (munition function) occurs. Contact is defined as briefly placing the bare palms of both hands on the contaminated surface.

A2.4.9.2.2. Contact hazard does not equate to pickup and transfer hazard (transferring the liquid and cross-contaminating another person/object); it only refers to the contamination of skin after touching the liquid. For porous surfaces, such as asphalt and concrete, there is no expected pickup and transfer risk. Although a relatively large percentage of agent can transfer from one surface to another, contact with a third surface (even if most impervious) will result in a very small fraction of agent transferred. So while there may be a contact hazard there is not an operationally significant pickup and transfer hazard (reference Defense Threat Reduction Agency, *Data Report for the Chemical Warfare Agent Contamination Transfer Test,* WDTC-DD-02-067, October 2002).

A2.4.9.2.3. **Table A2.10.** provides a general summary of expected liquid hazard durations. Always remember that Civil Engineering Readiness Technicians and Bioenvironmental Engineering Officers/ Technicians have the necessary tools and training to provide more refined estimates of the actual liquid hazard duration following a chemical attack. Liquid hazard toxicology is based on the Department of Defense accepted toxicology values from AD A392 849, Institute for Defense Analyses, *Report of the Workshop on Chemical Agent Toxicity for Acute Effects*, June 2001,for severe incapacitating dose of liquid at the 16% population response level.

A2.4.9.2.4. Liquid Hazard Table guidelines.

A2.4.9.2.4.1. The liquid hazard table includes results from temperatures between –5° and 50°C.

A2.4.9.2.4.2. Times used in the table are represented in hours (e.g., 0.1 equals 6 minutes, 0.5 equals 30 minutes, 0.9 equals 54 minutes, etc.).

A2.4.9.2.4.3. The table includes data for sixteen surfaces, any of which could be present on an air base.

A2.4.9.2.4.4. Times are listed for Tabun (GA), Sarin (GB), Soman (GD), Cyclosarin (GF), Distilled Mustard (HD), Russian VX isomer (R-33), and VX.

A2.4.9.2.4.5. An entry of “0” in a cell means that the contamination density is below the toxicology standard of either 100% transfer from the surface (for those cases where no transfer data is available) or below the level reported to be transferred by the experimental literature.

A2.4.9.2.4.6. A variety of munition types were used when estimating the hazard duration. Those, as well as temperature and wind speed, are combined in single cells within the table. This simplifies data display; however, the importance of wind speed on some surfaces, specifically grass and aircraft topcoat, is hidden.

A2.4.9.2.4.7. Example. Table A2.9. provides an example of chemical liquid hazards on concrete for wind speeds between 4-18 kilometers (or 2-11 miles) per hour:

Table A2.9. Chemical Liquid Hazard Example.

	KPH	MPH	GA	GB	GD	GF	HD	R-33	VX
Concrete	4-18	2-11	**0**	**0**	**0-0.5**	**0***	**0**	**0-***	**0-0.1**

A2.4.9.2.4.7.1. GA: The value is 0. This means there is no liquid hazard that would cause severe effects for 16% of personnel who briefly touch the contaminated surface, regardless of delivery means, wind speed or temperature.

A2.4.9.2.4.7.2. GD: The value is 0 in most cases; however, in a few (particularly in areas of high concentrations consistent with bomb delivery and ground burst craters, and low winds), the value was 0.5 (30 minutes).

A2.4.9.2.4.7.3. The entry for VX is 0 – 0.1. In some cases, the hazard would not cause severe effects for 16% of personnel who come into brief bare hand contact with the contaminated surface. Other cases show the hazard lasting up to 6 minutes. These variances were caused by differences in wind speed, delivery system, temperature, and method used when calculating the hazard duration.

Table A2.10. Liquid Contact Chemical Hazard Estimates for Selected Airbase Surfaces.

Temperature -5 -50o Celsius ---- Wind Speed 4-18 KPH (2-11 MPH) ---- Severe effects for 16th Percentile Population Response	**Liquid Chemical Agent Hazard (In Hours)1,2**

Surface	GA Tabun	GB Sarin	GD Soman	GF Cyclosarin	HD Distilled Mustard	R-33 (Russian VX Isomer)	VX
Concrete	**0**	**0**	**0-0.5**	**0***	**0**	**0-***	**0-0.1**
Asphalt	**0**	**0**	**0***	**0***	**0***	**0***	**0-0.9**
Grass	**0**	**0**	**0***	**0***	**0-0.2**	**0***	**0-33**
Sand	**0**	**0**	**0***	**0***	**0***	**0***	**0-0.5**
Sandy Loam	**0**	**0**	**0***	**0***	**0***	**0***	**0-1**
Bare Ground	**0**	**0**	**0***	**0***	**0-0.1**	**0***	**0-1**
Tar and Chip	**0**	**0**	**0***	**0***	**0***	**0***	**0***
AC Topcoat	**0**	**0**	**0***	**0***	**0-0.3**	**0***	**0-14**
CARC Paint	**0**	**0**	**0***	**0***	**0**	**0***	**0***
Alkyd	**0**	**0**	**0***	**0***	**0**	**0***	**0-1**
Polyurethane	**0**	**0**	**0***	**0***	**0**	**0***	**0***
Glass	**0**	**0**	**0-3**	**0***	**0**	**0***	**0***
Bare Metal	**0**	**0**	**0-3**	**0***	**0-0.8**	**0***	**0***
Wood	**0**	**0**	**0***	**0***	**0***	**0***	**0-1**
Snow	**0**	**0**	**0***	**0***	**0***	**0***	**0**
Ice	**0**	**0**	**0***	**0***	**0***	**0***	**0***

NOTES:

1. Based on 95th percentile highest deposition results from VLSTRACK 3.1 using a range of tactical ballistic missile and bomb attacks.

2. Assumes 420 cm2 hand as pick-up area for severe effects 16% response dose based on experimental pickup data adjusted by relative skin penetrability of palm vice whole body spatial average.

* The entries reflect the expected hazard duration (after the completion of liquid deposition; may take from 2-60 minutes), but in some cases, particularly involving high concentrations of large droplets associated with bomb delivery and/or ground burst craters, the contact hazard could extend for longer periods. However, there is currently not sufficient data to estimate what that hazard duration would be with 100% transfer. Hazards are possible but we cannot predict if/how long the risk exists.

A2.4.9.3. Temperature, wind speed, and atmospheric stability are key factors when determining where the agent is deposited, its contamination density, and droplet size. Deposited liquid will spread across the surface it contaminates. On porous surfaces, the agent will tend to be sorbed from the surface. Concrete tends to sorb agent quickly. Bare metal, on the other hand, sorbs very little agent. An agent remains a liquid contact hazard until it has sorbed, evaporated, or been decontaminated.

A2.4.9.3.1. Because hazard duration times reflect the 95th percentile of the highest contamination density area of the footprint, it is possible that 5% of the areas will have higher liquid hazard durations than those depicted in the table above.

A2.4.9.3.2. For ground burst munitions, the crater is expected to be the most highly contaminated area. It should be considered a liquid hazard longer than the time indicated on the table above while the rest of the deposition footprint will most likely have a lower contamination density/shorter hazard time.

A2.4.9.4. The table augments M-8/M-9 paper as a tool when making MOPP related decisions. However, it is important to understand the limitations and uses of M-8.

A2.4.9.4.1. When pre-positioned, M-8 is fairly effective at indicating the presence of liquid agent. Equipment, facilities, and vehicles with M-8 paper depicting the presence of an agent will be marked to identify contamination.

A2.4.9.4.2. Swiping/Patting a surface with M-8 paper after an attack has occurred may not detect the presence of a liquid hazard on a contaminated surface. Therefore, it is imperative that M-8 paper be pre-positioned before an attack.

A2.4.9.5. The skin on the palm of a hand is considered less sensitive than the average skin surface on the body. As such, it will allow less agent to penetrate than many other skin surfaces. Current practices do not allow live agent testing on live human skin, thus skin simulants are used (e.g., silicon rubber). The actual relationship between agent transfer amounts onto simulated skin vs. live human skin is unclear.

A2.4.9.6. Vapor Hazard. Vapor hazard duration associated with any chemical agent depicts the time after the agent reaches the surface until it is safe to unmask.

A2.4.9.6.1. Vapor hazards result from three processes:

A2.4.9.6.1.1. Munition function (generates both a chemical vapor and liquid contact hazard).

A2.4.9.6.1.2. Evaporation of droplets as they fall to the ground.

A2.4.9.6.1.3. Evaporation of droplets after landing on a surface (secondary evaporation).

A2.4.9.6.2. Munition function and fall phase evaporation constitute the primary vapor carried downwind. After liquid droplets reach the ground, they evaporate at rates determined by the volatility of the agent, wind speed on the surface of the droplet, and surface area of the droplet.

A2.4.9.6.3. As a liquid droplet spreads, the agent moves into voids and sorbs into the surface. This reduces the rate of vapor generation. Liquid agent deposited on an airbase will spread across surfaces and will be sorbed at different rates. Some surfaces tend to sorb agent very quickly. The longer it takes an agent to sorb, the more vapor is generated.

A2.4.9.6.4. The Vapor Hazard Tables are available through the HQ Air Force Civil Engineer Agency Web Site at: **https://wwwmil.afcesa.af.mil/**. These tables were developed using VLSTRACK 3.1. They characterize vapor dosage levels from chemical agents delivered by various weapon types in a variety of weather conditions. Weather conditions are characterized by atmospheric stability, wind speed, and temperature. Atmospheric stability is represented as either NEUTRAL (Pasquill stability category (PSC) D) or STABLE (PSC F). PSC D was used to represent conservative daytime atmospheric conditions; PSC F, nighttime conditions. The tables depict the time after an attack (e.g., munitions function) that vapor generated at breathing height would be expected to cause either lethal or mild effects for 16% of the personnel exposed. The DoD accepted values for mild effects (e.g., miosis), as listed in AD A392 849.

A2.4.9.6.5. Calculations use the 95th percentile highest dosage level of the footprint.

A2.4.9.6.6. Vapor hazard times are directly influenced by surface type, temperature, wind speed and atmospheric stability. However, these were assumed constant when producing the vapor hazard duration tables. Since these conditions change regularly throughout the day, actual hazard times may be different from those depicted on the tables. Civil Engineering Readiness Technicians and Bioenvironmental Engineering Officers/Technicians have the necessary tools and training to provide more refined vapor hazard duration estimates.

A2.4.9.6.7. Vapor Hazard Tables. The chemical agent vapor hazard duration tables available through the HQ Air Force Civil Engineer Agency Web Site for GA, GB, GD, GF, HD, R33, and VX. These tables include expected hazard times for the seven primary operating surfaces found on airbases that contribute to area vapor hazard (e.g., Asphalt, Bare Ground, Concrete, Grass, Sand, Sandy Loam, and Tar and Chip). Other surfaces, such as glass and bare metal, represent a very small percentage of surface area on a base and are not expected to impact the area vapor hazard; however, they could present a local hazard for personnel working directly with/in close proximity to them. In these cases, personnel should use the 10-foot rule (see **A2.4.9.7.** below).

A2.4.9.6.7.1. The tables list predicted times a chemical agent remains a vapor hazard at temperatures of –5, 10, 25, and 50 oC. If using a temperature between the listed values, use the higher temperature values to quickly determine the worst case. Release altitude is listed by either low (20m - 250 m above ground level (AGL)) or high (over 1000 meters AGL). Tables are listed by agent and primary operating surface and include four data sets:

A2.4.9.6.7.1.1. Time Vapor Hazard causes lethal effects in 16% of the population exposed (LCt 16).

A2.4.9.6.7.1.2. Time Vapor Hazard caused mild effects (e.g. miosis) in 16% of the population exposed (ECt 16).

A2.4.9.6.7.1.3. Times M-22 ACADAs detect the presence of a Vapor Hazard.

A2.4.9.6.7.1.4. Times CAMs detect the presence of a Vapor Hazard.

A2.4.9.6.7.2. Multiple delivery types and various meteorological conditions were examined for each agent and surface combination.

A2.4.9.6.7.3. Cases are color-coded to indicate the time range of the hazard, as follows:

A2.4.9.6.7.3.1. **Dark Green**: Hazard duration is less than 1 hour

A2.4.9.6.7.3.2. **Lighter Green**: Hazard duration is between 1 and 6 hours

A2.4.9.6.7.3.3. **Yellow**: Hazard duration is between 6 and 12 hours

A2.4.9.6.7.3.4. **Orange**: Hazard duration is between 12 and 24 hours

A2.4.9.6.7.3.5. **Red**: Hazard duration is between 24 and 72 hours

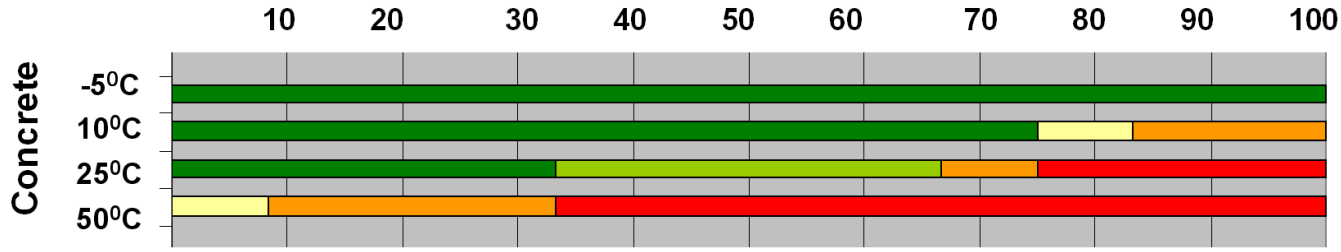
A2.4.9.6.7.4. **Table A2.11.**. details times VX on concrete will cause mild effects in 16% of the exposed population. For a daytime TBM attack (high altitude) at 10°C with 2 knot winds, a vapor hazard is expected to be present for 9 hrs. The same attack with at night would not be expected to produce a significant vapor hazard. **NOTE:** A low altitude reflects optimal release for small droplets given a supersonic TBM, while a high altitude reflects optimal release for large droplets given a subsonic TBM.

Table A2.11. Vapor Hazard Duration Estimate for VX on Concrete (16% Mild Effects).

Vapor Hazard VX On Concrete ECt 16									
		Stability		PSC D	PSC F	PSC D	PSC F	PSC D	PSC F
		Wind Speed (knots)		2		6		10	
Agent	Release	Munition	Temp °C (°F)						
VX	Low Alt.	TBM	-5 (23)	0.21	0	0.0	0	0.03	0
VX	High Alt.	TBM	-5 (23)	0	0	0.0	0	0	0
VX	Low Alt.	TBM	10 (50)	24.0	16	0.49	0	0.3	0.1
VX	High Alt.	TBM	10 (50)	9	0	0	0	0.1	0.0
VX	Low Alt.	TBM	25 (77)	72	72	3.57	1.5	1.88	0.9
VX	High Alt.	TBM	25 (77)	72	20	4.6	0.43	0.6	0.22
VX	Low Alt.	TBM	50 (122)	72	72	56.19	72	45.19	22.19
VX	High Alt.	TBM	50 (122)	72	72	43.19	16	7.8	13.5

A2.4.9.6.7.5. **Table A2.12.** summarizes the results as a percentage of cases examined. For example, at 10 ºC on Concrete, the VX Vapor Hazard was less than 1-hr in 75% of the cases, 6-12 hours in 8% of the cases, and 12-24 hours in 17% of the cases. The impact of temperature on the duration of the vapor hazard is a function of the agent volatility. Therefore, the temperature range creating the longest vapor hazard will differ for each agent. Wind speed is also a very important factor. Lower wind speeds cause all agents to have longer vapor hazard durations.

Table A2.12. VX Vapor Hazard Duration Estimate on Concrete (% of cases).



A2.4.9.6.7.6. **Table A2.13.**. shows the expected M-22 ACADA vapor detection response (in hours) for the same VX combination of weapon, temperature, wind speed and atmospheric stability on concrete. By comparing the times listed in **Table A2.11.** and **Table A2.13.**, one can see that vapor hazards are present in many cases when the ACADA would not alarm. The same is true of CAM Detector Response Duration tables on the HQ AFCESA Web Site. Therefore, it is important to work with Civil Engineering Readiness Technicians and Bioenvironmental Engineering Officers/Technicians to establish safe unmasking guidance based on these tables rather than relying solely on currently available vapor detectors when making unmask decisions.

Table A2.13. VX on Concrete M-22 Detector Response Duration.

Vapor Hazard VX On Concrete ACADA Detector Times									
		Stability		PSC D	PSC F	PSC D	PSC F	PSC D	PSC F
		Wind Speed (knots)		2		6		10	
Agent	Release	Munition	Temp °C (°F)						
VX	Low Alt.	TBM	-5 (23)	0.01	0	0.0	0	0	0
VX	High Alt.	TBM	-5 (23)	0	0	0.0	0	0	0
VX	Low Alt.	TBM	10 (50)	0.0	0	0.01	0	0.0	0.0
VX	High Alt.	TBM	10 (50)	0	0	0	0	0.0	0.0
VX	Low Alt.	TBM	25 (77)	0	0	0.06	0.03	0.04	0.0
VX	High Alt.	TBM	25 (77)	0	0	0.0	0.01	0.01	0.01
VX	Low Alt.	TBM	50 (122)	4	3	0.66	0.39	0.35	0.27
VX	High Alt.	TBM	50 (122)	3	4	0	0	0.2	0.1

A2.4.9.6.7.7. The vapor hazard tables hold temperature, wind speed, and atmospheric stability constant for the duration of the hazard measurement period. In reality, these environmental factors are constantly changing throughout the day. If the hazard time reported in the table is long (e.g., greater than 6 hrs), changes in temperature and wind speed would be expected to affect the real duration of the hazard. It is crucial that Civil Engineering Readiness Technicians and/or Bioenvironmental Engineering Officers/ Technicians conduct base-specific assessments of the vapor hazard duration using actual temperatures and wind conditions. This helps refine hazard estimates and may allow the return to reduced MOPP postures quicker than the use of static tables would allow. In some cases, hazards may have appeared to pass only to appear at a later time as environmental changes occur.

A2.4.9.7. 10-Foot Rule. The 10-foot rule was developed in order to provide guidance for protecting personnel that had to use and/or handle chemically-contaminated resources or work in locations with materials that might retain a residual chemical hazard longer than the major terrain surface area on which it is located. The 10-foot rule embodies a safety factor that goes beyond current OSD guidance (which allows removal of IPE whenever detectors no longer detect a chemical agent vapor hazard).

A2.4.9.7.1. The basic tenets of the 10-foot rule:

A2.4.9.7.1.1. The 10-foot rule provides guidelines in the form of probable time ranges that residual chemical hazards are likely to exist. The times are not absolute guarantees of safety. Personnel must be cognizant of the circumstances that significantly affect the time estimates and remain alert for evidence of chemically-induced symptoms in themselves or co-workers.

A2.4.9.7.1.2. The 10-foot rule addresses the potential presence of residual contamination originating from relatively non-porous equipment surfaces such as painted or bare metal and glass.

A2.4.9.7.2. There are two phases associated with the 10-foot rule.

A2.4.9.7.2.1. Initial Phase. During the initial phase, personnel will remain in MOPP 4 whenever they stay within 10 feet of the contaminated equipment for more than a few seconds. This MOPP level provides personnel the maximum protection from the chemical agent as it transitions from a contact and vapor hazard to a vapor hazard only.

A2.4.9.7.2.2. Follow-on Phase. In the follow-on phase, personnel will use gloves of any sort (i.e., leather, rubber, cloth, etc.) when operating on or handling the contaminated equipment. Although a contact hazard is unlikely, relatively small amounts of the agent may still be present. The use of gloves will ensure that unnecessary bare skin contact with agent residue is avoided.

A2.4.9.7.3. **Table A2.14.** shows times associated with initial and follow-on phases of the 10-Foot Rule. To simplify response processes, commanders may choose to use the worst case scenario as the foundation for all 10-foot rule actions i.e., 24 hours for the initial phase and all periods of time greater than 24 hours for the follow-on phase.

Table A2.14. Time Ranges Associated with the 10-Foot Rule.

"10-Foot Rule" Time Standards*		
Agent	**Initial Phase**	**Follow-on Phase**
HD	0-12 hrs	Greater than 12 hrs
GB	0-12 hrs	Greater than 12 hrs
GD, GF, GA	0-18 hrs	Greater than 18 hrs
VX, R33	0-24 hrs	Greater than 24 hrs
* Rule is based on expected contamination on an airbase following a chemical attack. Adjust times if agent concentration is higher than expected.		