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BATTALION TASK FORCE NUCLEAR TRAINING

Contents

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PREFACE

The Battalion Task Force Nuclear Training Manual provides a single source of information for commanders and staff at battalion task force level and below. This manual also gives commanders and staffs the requirements they need to include in their training programs to adequately cover tactical nuclear warfare. The manual specifically looks at battlefield nuclear warfare (BNW) from the perspective of a combat unit, but can be used by combat support and combat service support units also. It is the intent of this manual to simplify as much as possible the materials on nuclear warfighting which are scattered throughout many sources, and are usually not immediately available to most commanders. This manual will consolidate BNW requirements for commanders and staffs so that training and preparing for the AirLand Battlefield will be a continuous and integrated operation for all battalions. The use of the term battalion task force is designed to describe the way the Army fights and incorporates the idea of combined arms warfare. Emphasis is oriented toward how the presence of nuclear weapons can affect mission accomplishment. Special emphasis is placed on discussing unit nuclear training, nuclear warning and reporting procedures, mitigation and survivability techniques, nuclear weapon effects, and the medical effects from BNW and their treatment. The manual provides the commander with a quick-reference battlefield nuclear task list so that he can see what should be done and who is responsible for each task before, during, and after a nuclear attack. FM 25-51 implements STANAGs 2083, 2111, and 2957.

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

INTRODUCTION

Battlefield nuclear warfare (BNW) is the requirement to conduct continuous combat operations in the environment created by the presence of any nuclear capable systems before, during, or after nuclear weapon employment by either friendly or enemy forces. To fight and survive on the AirLand Battlefield, the battalion must train and must understand the concepts behind BNW, nuclear employment, NBC defense, and integrated warfare. These are distinct terms with different meanings and commanders and staffs must understand them so that they can train their units for these types of environments. NBC defense is nuclear, biological, and chemical defense collectively and involves the methods, plans, procedures, and training required to establish defense measures against the effects of an attack by any of these weapons. The term may not be used in the context of US offensive operations. Nuclear employment refers to employment planning, preparation of the weapon, and employment (execution) of a nuclear weapon. Integrated warfare encompasses BNW, NBC defense, and nuclear employment. It involves the conduct of military operations in any combat environment wherein opposing forces employ nonconventional (nuclear, biological, chemical or directed energy) weapons in combination with conventional weapons.

Unit training methods for a nuclear environment are no different than those for a conventional environment. Unit combat training which is only oriented to a nonnuclear battlefield does little to prepare a unit for BNW. Units need to understand how to increase their survivability from enemy nuclear attacks and how to exploit the effects of friendly nuclear strikes in support of the units' operations. Preparing the NBC defense posture of a unit must occur "before the fact" and must be continuously integrated into the unit's training plans. As stated in the definition of BNW, what a unit does before friendly or enemy nuclear employment is just as important as what it does during or after. How we train to react to friendly or enemy nuclear employment also sends a signal to the threat about our ability and resolve to fight and win.

In the following chapters, BNW requirements are emphasized. NBC defense, although very important, is mentioned only where applicable to nuclear defense. More detailed information on all aspects of NBC defense can be found in FM 3-100, BNW requirements for the Air Land Battlefield are not well understood and thus unit training suffers accordingly.

The chapters of this manual attempt to clear up any misconceptions of a most important element of the battlefield--nuclear weapons. Because of the classification of some information, reference is made to particular regulations, FMs, or other source guides.

Chapter 1 describes the characteristics of BNW and provides typical scenarios and conditions during BNW. The purpose of this chapter is to give commanders and staffs a better perspective of the nuclear battlefield so that they can associate it with their own units and train them accordingly.

Chapter 2 reviews the tactical effects of nuclear weapons by providing the commander easily accessible references and guides on the effects of psychological, nuclear radiation, EMP, blast, and thermal.

Chapter 3 then provides mitigation techniques to protect people and equipment against the effects of nuclear weapons which occur before, during, or after the attack to increase survivability.

Chapter 4 provides guidance on unit nuclear training and how the commander can integrate nuclear training into his mission training plan. The intent of this chapter is to provide examples to commanders and their staffs on simple but effective methods for planning and conducting nuclear training in their units.

Chapter 5 discusses methods for treating nuclear weapon casualties.

The Appendix places responsibilities and lists tasks as they relate to BNW. These lists encompass the entire realm of BNW responsibilities from the platoon sergeant to platoon leader, company commander, and, finally, the battalion commander and his staff.

CHAPTER 1

BATTLEFIELD NUCLEAR WARFARE

The Army's concept for warfare is contained in FM 100-5 which applies to all battlefield environments, including nuclear. Consequently, for the purposes of this manual, the terms "nuclear battlefield" and "AirLand Battlefield" can be considered as synonymous. Nuclear weapons are used alone or in combination with other types of weapons. They can be employed by joint, air, and land forces. The threat of nuclear weapons also has a direct impact on tactical operations.

Our knowledge of the battlefield and subsequent planning for future operations is based on military tactics and experience that have evolved over thousands of years. One of the major difficulties that the commander and staff will face is the lack of historical examples or examples or experiences from which to draw valid conclusions about nuclear operations. As of yet, we have no examples of the tactical use of nuclear weapons.

With the development of AirLand Battle doctrine, the tactical use of nuclear weapons is now easier to discern. While it is visualized that fire, maneuver, and air support are still major factors in successful ground combat, the tremendous firepower of nuclear weapons demands vastly increased flexibility in all units. The commander must make an analysis of nuclear weapon effects and place it in a hypothetical frame of reference or synthetic "experience table" to develop sound ideas and theories to bridge the void that exists in our military experience.

We need to train and prepare our soldiers for the devastation and confusion which will exist on the integrated battlefield. The Army constantly emphasizes "training like we will fight in war" but finds it extremely difficult to simulate the reaiities of this type of wartime environment in either CPXs or FTXs. Commanders, and staffs often do not plan nuclear training during CPXs, FTXs, or ARTEPs. When they do plan nuclear training, they do not allow time for challenging and realistic nuclear training to take place. Often, nuclear training does not occur because there is a lack of knowledge of how to provide this type of training. FM 25-50 tells how to conduct nuclear training. This manual tells what the training should consist of. Understanding battlefield nuclear warfare (BNW) and how best to fight under these circumstances will be crucial to success on the integrated battlefield.

The corps and the division commander give guidance to subordinates so they can understand how battlefield nuclear weapons support mission accomplishment. The commander transmits this guidance to his subordinates in stating his intent of the operation. It is one of his responsibilities to ensure all means are employed to increase the effectiveness and survivability of his soldiers and their equipment. To meet this responsibility, commanders rely on nuclear training requirements. Nuclear training requirements must be as challenging and as accurate as possible.

To prepare their units for BNW, commanders and staffs need to understand US policy for use of nuclear weapons, the nature of BNW, and the effects of nuclear weapon employment. The rest of the chapter is devoted to clarifying the BNW environment.

US NUCLEAR POLICY

The United States National Security Policy on the use of nuclear weapons is to develop and maintain a nuclear warfare capability for the primary purpose of deterring nuclear war. This policy, however, *does not preclude the first use of nuclear weapons by US forces* . Such use by land forces, when authorized by the President, will be closely controlled and limited in an attempt to reduce the risks of escalation. At the same time, the attack should be delivered with sufficient shock and decisiveness to forcibly change the perceptions of enemy leaders and create a situation conducive to negotiations. The principle of retaliatory responses is similar: efforts should be made to control escalation by a combination of clearly perceivable limits on retaliatory strikes and the threat of more extensive strikes if the enemy chooses to escalate. Whether in first use or retaliatory response, the primary objective for the use of nuclear weapons by US land forces is the termination of war on terms acceptable to the United States and its allies at the lowest feasible level of conflict. In a conflict involving nuclear weapons, all units are affected by nuclear operations. The corps is the focal point of tactical and operational nuclear employment. All units are involved in nuclear operations to the extent that they know, react, and protect themselves from the effects of friendly nuclear strikes and enemy nuclear attacks.

CHARACTERISTICS OF BATTLEFIELD NUCLEAR WARFARE

As previously stated, the primary function of tactical nuclear weapons is deterrence. The threat of their use should cause any potential enemy to refrain from a possible course of action. When nuclear weapons have failed as a deterrence, then their use to bring hostilities to a close on terms favorable to the United States and its allies may be considered. The key to this deterrence is credibility.

Therefore, to serve as a deterrence, the nuclear warfare capability of the United States must be credible. The basis on which this credibility is built is the implied threat of nuclear weapon use by an effective nuclear capable force, the ability of well-trained Army units to conduct operations in an integrated environment, and the perception of any potential adversary that the United States has the national will to use nuclear weapons if necessary. The threat of nuclear weapons to any operation is a major concern. The ability of units to correctly respond to that threat, whether it is friendly or enemy use, is essential as it allows them to continue their mission. An effective BNW unit training program impacts directly on the credibility of US nuclear policy. If the threat knows that US units are trained in integrated operations, they will view their own use of nuclear weapons as a less viable option.

The planning process for BNW is continuous and integrated. Units need to prepare for possible nuclear weapon use by either side at any time. In addition, planning will include how and where to use nuclear weapons to gain a tactical advantage, as well as where the enemy might use these weapons for the same purpose. Units need to consider how they are deployed and what kind of a target they present for enemy nuclear weapons. What is the advantage of mass in situations versus using dispersion to present less of a nuclear target? What kind of indicators are presented by enemy or friendly forces that may suggest the possible use of nuclear weapons? Commanders should be aware that their units may create a signature which indicates friendly nuclear weapons are to be used. If the threat perceives a signature, then the possibility exists that the threat would attempt to preempt a friendly strike. Preparation, planning, and execution of BNW should be a continuous part of integrated operations.

Indicators of threat intent to employ nuclear weapons are:

- Threat formations leading with armor. The protection of armor allows forces to move across contaminated areas and on the fringes of the nuclear detonation effects area. Speed enables rapid exploitation of the weapon effects.
- Withdrawal of comingled forces.
- Increased air reconnaissance. Prior to firing a nuclear weapon, the threat will attempt to confirm the location of the target.

- Increased activity of nuclear- and chemical-capable units, particularly the rocket and missile delivery systems.
- Activation of special command communications nets.
- Assault elements wearing full protective clothing and armored vehicles "buttoned up."

Threat employment of nuclear weapons includes the following priority targets:

- Enemy nuclear delivery systems—air, artillery, missiles, and rockets. (These receive the highest priority.)
- Headquarters of division and higher levels.
- Prepared defensive positions.
- Reserves and troop concentrations.
- Supply installations, especially nuclear ammunition storage points.
- Communications centers.

THE ASPECTS OF BATTLEFIELD NUCLEAR WARFARE

Official publications have extensive tables, charts, nomograms, and computer aids with which to solve specific nuclear targeting problems. They also have textual material describing individual weapon effects. Although these sources are highly useful, they do not provide a well-rounded description of the nuclear battlefield from the commander, staff, and soldier perspective. This description of the nuclear battlefield brings together the combined effects of various nuclear weapons. Nuclear and conventional warfare are similar in many ways. In both conventional and nuclear war, casualties are caused through blast and thermal effects which kill and wound. Numerous casualties also occur as the result of psychological trauma. Because of these similarities, if you train for nuclear warfare you are also training for conventional warfare. Psychological casualties may be reduced through effective leadership principles and unit cohesiveness. Prevention places an increased burden on commanders and their staffs to anticipate, plan, and train for operations in a nuclear environment. Leaders must understand that any conflict with or supported by a nuclear-capable power must be considered a potential nuclear confrontation from the outset.

The effects from the employment of nuclear weapons will create many unique problems which will pose serious operational and leadership challenges. Commanders and their staffs who understand, anticipate, train, and prepare for battle in a nuclear environment will be effective and will survive the outcome of that battle. In an effort to assist commanders and staffs in understanding the effects of a nuclear engagement and its operational impact, the remainder of the chapter describes a nuclear battlefield. This description is important to visualize, since the threat uses nuclear weapons in a planned and synchronized manner that meets set guidelines and rules. They do this to ensure that the effects support their overall mission plan. Successive chapters provide information on nuclear weapon effects and proper actions to take to mitigate or reduce these effects on friendly units.

DESCRIPTION OF BATTLEFIELD NUCLEAR WARFARE...A SCENARIO

This description is based on the observations of survivors who are in such positions that they can see the effects of a nuclear attack while being shielded from lethal or incapacitating effects that would prevent them from reporting their observations. Some observers are assumed to be in positions protected from thermal radiation and blast and shielded by a protection factor ranging from 2 to 4 from radiation; that is, they have the protection that could be afforded by shallow foxholes, or a tracked vehicle. One observer will be flying in a helicopter to demonstrate the effects of this type of scenario.

Observer positions are at ranges corresponding to various levels of ionizing radiation. These levels correspond to doses ranging from those which will have little or no effect to doses that will immediately incapacitate. Some of the observers are sufficiently shielded from thermal radiation and blast effects so that they may be able to escape immediate incapacitation from those effects, or at least to report their observations at a later time. None of them are looking directly at the point of detonation when the weapon explodes, thereby preventing them from reporting on their surroundings.

The observers experience the effects from a 2-kiloton weapon. This yield is taken to be representative of enemy battlefield nuclear weapons. The narrative description is for the 2-kiloton case; also included is data for effects of the other yields are presented in a format that is easily interpreted to provide visualization of the corresponding environments. These low yields are described because, in general, targets operating closer to the FLOT could expect to be targeted with lower yield weapons and those units operating in the rear areas could expect to be targeted with larger yield weapons. It seems likely that more than one nuclear weapon would be used, if any are used, on a given sector of the battlefield. This is referred to as a nuclear laydown. Because of this the effects observed or experienced during a laydown would be even more devastating.

The effects are described as they would appear to an ordinary observer possessing no special knowledge or means of measuring the phenomena he perceives. The soldier will not perceive a certain number of psi (pounds per square inch) wind (dynamic overpressure) and crushing force (static overpressure). What he will experience directly are the sights, sounds, and feel of the nuclear battlefield. He will at certain levels, see trees blown down, vehicles tumbled, and human bodies fly through the air. Likewise he will have no way of knowing how many calories per square centimeter are incident on a surface, but he may see fires burning, clothing afire, and people with varying degrees of burns on exposed skin. If he does not have immediate access to a dosimeter he will not know how much radiation he or other troops have received, but he will see people vomiting, be nauseated himself, and may see people suddenly incapacitated.

The observers and the other members of the unit have not taken all possible actions to mitigate or prepare for the effects of a nuclear attack. Chapter 3 will review the same scenario, with the same unit and observers. It will discuss why the battalion was a nuclear target and what some of the intelligence indicators were that should have prewarned the battalion of its vulnerability to the nuclear strike. Chapter 4 will then show how adequate prior nuclear training and the use of proper mitigation and survivability techniques should have been implemented by the battalion.

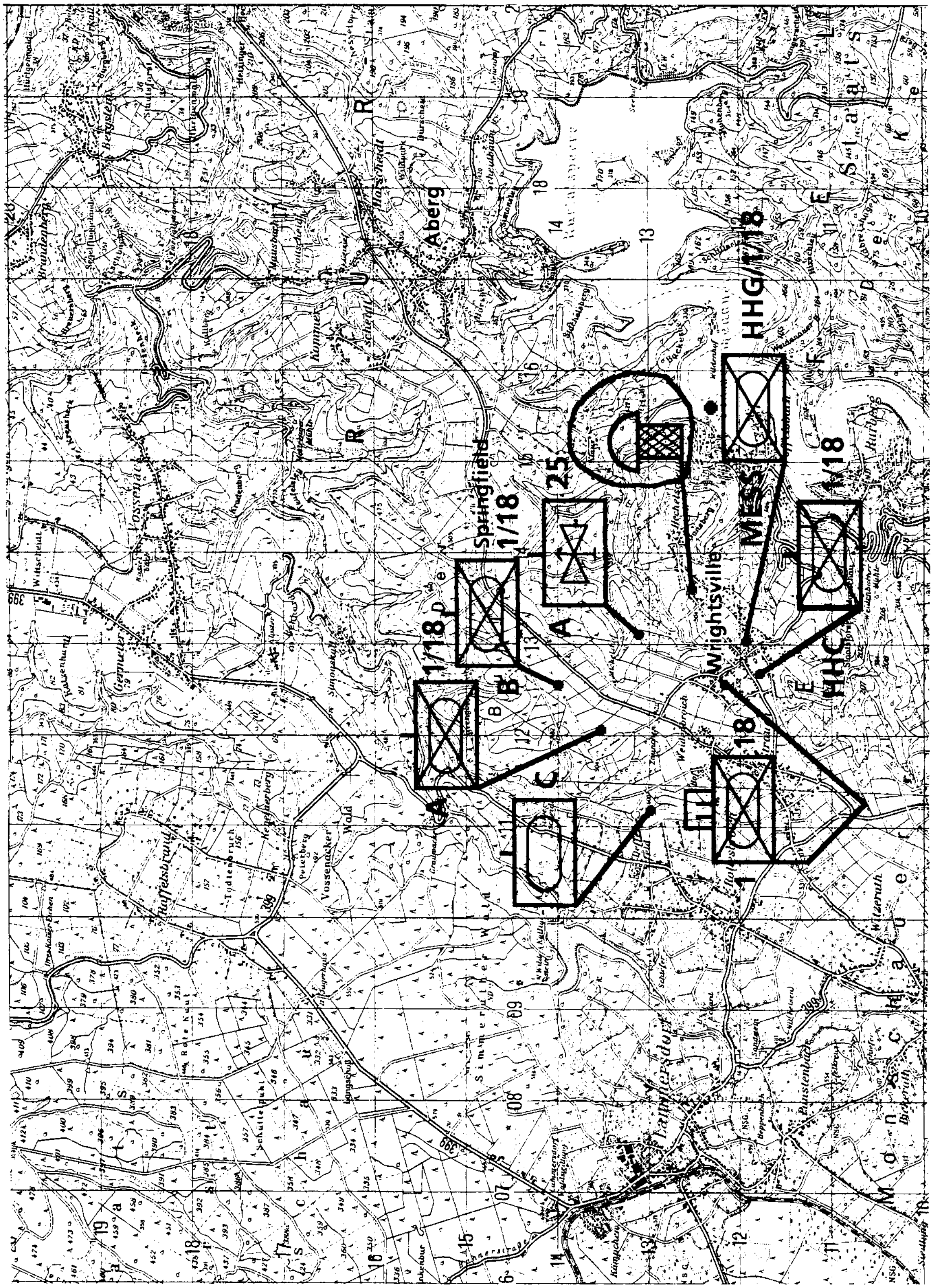
The following is the scenario for a typical battalion task force (bn TF) which is “combat ready” but not prepared for battlefield nuclear warfare.

LTC John Smith, the battalion task force commander, knew that things would not be easy in accomplishing his mission. His TF is in attack positions in the vicinity of Wrightsville (see figure on page 1-5). The battalion task force’s mission is to conduct a supporting attack to the southwest of the village of Aberg. Aberg is an important objective. Lying on a ridge overlooking the upper Red river, it affords a view of the Red River dam. This dam remains a constant threat to any major drive by the 54th Division to the north. Aberg is an important part of the threat plan for preventing the US force’s breakthrough and the destruction of threat forces. The threat knew this and would do anything to stop US forces.

The threat had extensively used toxic, nonpersistent, chemical agents. However, LTC Smith’s task force took only limited casualties. He thought back to the training his battalion had received at the National Training Center and now realized how important chemical defense training was. His battalion had trained hard in preparing for chemical warfare and it had paid off in battle.

LTC Smith called together his company commanders and staff to review his plans for accomplishing the battalion’s mission within the intent of the brigade commander. His mission statement was simple and to the point. After a 15-minute artillery preparation beginning at H minus 15 minutes, his TF would attack at H Hour (0900) 15 April on the main axis of advance through Springfield and toward the southwest of the town of Aberg. An attack helicopter company would make a supporting attack to the northwest in support of the armor company and two mech infantry companies. Their objective is to capture the town of Aberg, allowing a major division breakthrough to the Red River dam.

Battalion deployment



General Condition Prior to Burst

The time is 0830 hours, 15 April. The visibility is about five miles with a light haze. The sky is overcast with a ceiling of about 3,000 feet (914 meters). The temperature is 70 degrees Fahrenheit (21 degrees Celsius). Winds are 10 to 15 KMPH blowing to the northwest. The battalion's task organized units are A and B companies (mechanized infantry), C company (armor), and the attack helicopter company (OPCON). A and B companies are deployed in a dispersed posture of approximately 1 ½ kilometers separating the two companies, but woods are on the other sides of the positions. The nearest village is about 2 kilometers away.

C company is located 1 kilometer north of the village of Tyler, along the main route between Aberg and Wrightsville. The attack helicopter company forward area refueling point (FARP) is located in an accessible wooded area approximately 1 kilometer to the north of the village of Wrightsville.

The battalion tactical operations center is set up in M577 tracked vehicles located on the western edge village of Wrightsville. The HHC motor pool is located in a barn in the southern portion of the village and the mess and administrative area is located as shown in the figure on page 1-5. The battalion JTOC and HHC are in a dispersed posture separated by a distance of about 500 meters.

Soldiers throughout the battalion are conducting routine operations to secure and reinforce their positions and provide routine maintenance functions on their equipment. Some soldiers are in the open, walking across the unit area. Others are in vehicles preparing for the attack on Aberg. One platoon from the attack helicopter company is flying a recon mission in preparation of the attack on Aberg. Our observers are as follows:

- HHC, Mechanized Infantry Battalion - Privates Carter, Baker, and Adams (guards).
- C Company - SGT Downs (MI tank commander).
- Battalion TOC - CPT Anderson (S3).
- Attack Helicopter Company - CW2 Carlson (attack helicopter pilot).

PVT Carter's Preburst Environment

Carter is in his foxhole overlooking a main avenue of approach to the southwest of the village. He is approximately 750 meters from ground zero and is on the radio to the company TOC. The following describes Carter's observations:

0 Seconds The radio set goes dead and simultaneously there is a flash of light brighter than the sun. It shines most intensely from the east, but the entire sky is lit in all directions.

0.25 - 1.2 Seconds Carter's eyes are dazzled as he instinctively ducks down into his foxhole. For several seconds he cannot see; then slowly his vision returns. An intense wave of heat passes over the foxhole. Carter is shielded from the direct rays, but heat reflects from the clouds and from the hazy air. It is as if the door of a giant blast furnace is suddenly opened and then slowly closed.

1.2 - 4.0 Seconds As the heat wave subsides, there is the immediate crackle of flames. As Carter's vision returns, he sees smoke and flames rising from the unit area. The canopy of several of the trees is in flames. Paint is burning on vehicles and tires are smoldering; a portion of the village is burning. Canvas and camouflage nets are on fire. Carter hears screaming and is able to see figures running wildly—soldiers with their uniforms on fire. Some are frantically rolling on the ground in an effort to put out the flames. It is apparent that many of the soldiers caught in the open have been badly burned.

4.0 - 5.25 Seconds A violent percussion, like a tremendous sonic boom, splits the air. Simultaneously, a wind of hurricane force rushes over the foxhole. Flaming trees fall, blown over by the tremendous force of the blast. Some figures running toward Carter's foxhole from the east are picked up and blown off their feet by the hurricane-force winds. Dust and debris cloud the air, obscuring Carter's vision. All the sounds of the battlefield are blocked out by the roar of the wind. At about the same time, the earth shakes, cascading dirt down the sides of the foxhole. The sound of the detonation reverberates and then dies away. The wind stops, but dust still fills the air. As Carter looks around, the village is in complete destruction.

5.25 Seconds - 1 Minute Most of the fires are extinguished by the blast, but there is still smoke, and the air is filled with dust. A vehicle is burning, its fuel on fire. A strong wind blows back toward the direction of the detonation, but not nearly so strong as the first wind. The area is surrounded by an eerie quiet.

1-5 Minutes Soldiers begin to emerge from inside vehicles and foxholes. The wounded begin to call for help. Carter sees a column of smoke and dust—a huge churning cloud—rising from beyond the trees and disappearing into the overcast. Some of the trees in the woods toward the east have blown down. There are other flashes of light in the sky and sounds of distant explosions. He tries to raise the company HQ on his radio, but cannot make contact. He tries to contact Baker and Adams on landline. No luck. Carter is one of the two soldiers in the headquarters platoon who has been issued the IM-93A/UD dosimeter. He checks it and notes a reading of 40 cGy.

5-30 Minutes Carter leaves his foxhole and walks past the mess and administrative area and toward the company operation center. Some burn victims are lying on the ground; some are walking.. others are calling out for help. Tires are smoldering. Truck canvas has blown away or is burning. There are soldiers and civilians with lacerations and broken limbs. Near the mess area, soldiers are vomiting. Most of the soldiers emerging from the foxholes are, like Carter, dazed but apparently unharmed. All the rubber tires and track inserts exposed to the east show signs of charring or are still smoldering. Further on, several hundred meters closer to the point of detonation. Carter can see overturned vehicles. The destruction of the town is almost 100 percent in this area. The column of smoke and dust still rises in the sky.

The physical environment at Carter's foxhole. In quantitative terms the weapon effects at Carter's foxhole, which was located 750 meters from the 2-kiloton burst, were as follows:

- Prompt radiation: 356 cGy. (Actual radiation outside of foxhole was 1,550 cGy.)
- Thermal radiation: 9 calories per square centimeter arriving 1.4 seconds after the detonation. This will cause flash burns to bare skin equivalent to second-degree burns.
- Overpressure: > 4 pounds per square inch arriving at 4 seconds and lasting for 1.25 seconds. This is enough pressure to cause moderate damage to wood-frame building and vehicles.
- Dynamic pressure (wind): 85 miles per hour causing a 165-pound standing soldier to fall down or have difficulty in moving.

PVT Baker's Preburst Environment

Baker's foxhole is located approximately 650 meters from the point of detonation. His platoon is guarding a main avenue of approach to the northwest of the town of Wrightsville. Baker experiences more severe effects over a shorter period of time. The following describes Baker's observations:

0 Seconds An intense flash lights up the entire sky. It seems as though the detonation was directly overhead. Baker's vision is dazzled as he hunkers down as low as he can in the foxhole. While Baker is shielded from the direct effects of the heat wave, enough heat reflects off the clouds and the hazy air to char sections of his clothing and sear blisters on the exposed skin on the back of his neck. Although his eyes are closed, he sees the bones of his hands that are covering his face.

1.2 - 4.2 Seconds Baker hears the sound of flames; then a blast of deafening magnitude is heard and felt. Earth collapses around the edge of the foxhole as a roar of wind rushes overhead.

4.2 Seconds - 5 Minutes Baker cautiously tries to see what is happening, but at first, still dazzled, he can only dimly perceive that some fires are burning around his foxhole. As his vision clears, he sees that the entire area is scorched and littered with debris from trees and crumbled buildings and smoldering materials and equipment. A strong puff of wind blows briefly from the east; then the air is still, thick with dust and smoke. A churning column of smoke and dust rises through the overcast off to the northwest.

10 Minutes - 1 Hour Baker helps several of his buddies and seeks treatment for the painful burn on his neck. Some of the men are vomiting and Baker begins to feel sick to his stomach as he worries about his own condition. None can immediately locate a dosimeter.

The physical environment at Baker's foxhole. The weapon effects at Baker's foxhole located 650 meters from the point of detonation, are as follows:

- Prompt radiation: 800 cGy. (Actual radiation outside of foxhole was 3,350 cGy.
- Thermal radiation: 13 calories per square centimeter arriving within 1.2 seconds after the detonation. This is enough to cause third-degree burns on exposed skin.
- Overpressure: 7.4 pounds per square inch arriving at 2.5 seconds after detonation and lasting for 1.1 seconds. This is enough to cause severe damage to wood-frame buildings.
- Dynamic pressure (wind): 150 miles per hour causing a 165-pound standing soldier to attain a velocity of 12 feet per second (8 miles per hour) by the time he has moved 10 feet from his original position.

PVT Adams' Preburst Environment

Adams' foxhole is located to the east of the village. The point of burst is only 500 meters (1,650 feet) to the northeast of his position. Although he survives the blast and thermal effects due to shielding from the walls of his foxhole, his protection is insufficient to save him from receiving a dose of ionizing radiation that will eventually kill him. The environment he is subjected to is extremely intense. Although he temporarily and partially recovers from the immediate effects of the detonation, his impressions remain blurred and confused. The following describes Adams' observations:

0-2 Seconds The flash of light is like that seen by Carter and Baker; Adams ducks lower and crouches in the foxhole. Like the others, he is temporarily blinded and the subsequent events happen so rapidly that he is unable to tell exactly what is happening. The heat wave passes over the foxhole. Indirect thermal radiation reflected from the haze and clouds penetrates Adams' uniform; he feels a searing pain as his back is burned. His uniform is heavily scorched, but does not ignite.

2-3 Seconds Immediately on the heels of the heat wave, the blast and winds arrive. The ground shakes violently, slamming Adams against the sides of his foxhole. The foxhole partially collapses, throwing dirt and other debris on top of him. Shocked and dazed.. unable to see due to the blinding bright light, Adams is only dimly aware of the high wind and its effects. He has excruciating pain in both ears and his nose is bleeding profusely. He does not see the tree that has blown down and partially covers his foxhole, nor does he see the soldier—hurled through the air as if lifted by some unseen hand—passing directly over his foxhole.

3 Seconds - 1 Hour Dazed and in shock, Adams remains crouched in his foxhole. After a few minutes, he crawls from beneath the smoldering tree and out of his foxhole into a scene of smoke, fires, dust, and overturned and scattered equipment. Several bodies lie alongside trees and vehicles, hurled there by the violence of the explosion. Soldiers who miraculously survived are in various stages of shock and pain from burns and other wounds. Some are bleeding from the ears, their eardrums ruptured. Most are vomiting. Prone bodies are nearby. Some are completely charred black on one side of their body. Adams' head aches and he is sweating profusely. He feels the onset of nausea and begins to vomit. He feels weak. Later, while he is waiting his turn for medical help, he hears that one of the soldiers' dosimeters is pegged at 600 cGy...the maximum reading of the IM-93. He has no way of knowing if he has received a dose greater than that.

The physical environment at Adams' foxhole. The weapon effects at Adams' foxhole in quantitative terms are as follows:

- Prompt radiation: 3,000 cGy. (Actual radiation outside of Adams' foxhole was 11,650 cGy. Foxhole provided Adams a protection factor of 3.)
- Thermal radiation: 21 calories per square centimeter that arrives within 1.2 seconds. This is enough to immediately ignite painted surfaces and cause 100 percent casualties for exposed persons.
- Overpressure: 7.4 pounds per square inch arriving at 2 seconds after detonation and lasting for approximately 1 second.
- Dynamic pressure (wind): hurricane-force winds causing a 165-pound standing soldier to attain a velocity of 60 feet per second (35 miles per hour) by the time he has moved 10 feet from his original position.

SGT Downs' Preburst Environment

SGT Downs is located at a distance of approximately 1,060 meters from ground zero. Just prior to the burst, he and the other members of his tank crew are preparing for the attack on Aberg. Downs is standing next to his M1 tank supervising last-minute PMCS.

0-2 Seconds Downs notices a bright flash. At first he doesn't know what it is or where it came from. He then sees a huge ball of flame in the direction of the village of Wrightsville and feels a noticeable increase in the temperature of the air.

2-7 Seconds The brightness and ball of flame dissipate into a charcoal color ball of smoke. As SGT Downs looks across the rolling fields and toward the village, he sees a fast moving wall of destruction. He sees buildings collapsing, trees falling, and fires everywhere. He finally realizes that a nuclear strike has occurred and recalls from his common tasks testing that he should fall to the ground and cover exposed parts of his body. As he falls to the ground he feels the wind along with dirt, dust, and pebbles blowing by him. His ears feel the pressure difference similar to being in an airplane which is attaining altitude. He attempts to pop his ears by opening his mouth.

8 Seconds - 5 Minutes Downs gets back up to see if his tank crew is OK. One soldier is covering his eyes, complaining that something has blown into his eye. The other is OK. Seconds later a back blast passes back toward ground zero. The back blast seems quite mild compared to the original blast wave and only stirs up the dirt and dust already suspended in the air. As he looks towards the blast he notices a mushroom cloud forming which continues to gain height. He gazes in amazement for almost a minute.

5 Minutes - 30 Minutes Downs surveys the damage, if any, to his equipment and surrounding area. He notices that everything is OK and still operational on his M1 tank. However, the driver is complaining of communications problems. Downs notices one of his soldiers sitting on the turret in a daze. He seems to be in a trance and does not respond to Downs' order. He is breathing heavily and is very depressed. He has never reacted like this before. The immediate area is scattered with debris, to include duffel bags and MRE which were blown off of his M1 and some of the other tanks in his company. Glancing back toward ground zero, Downs notices that the mushroom cloud has drifted extensively to his left front. The air looks hazy and filled with soot. He remembers that the NBC NCO issued him a device that is supposed to detect radiation. He cannot recall its nomenclature. He pulls it out and views a reading of less than 1 cGy.

The physical environment at Downs' Ml tank. The weapon effects at Downs' M1 tank in quantitative terms are as follows:

- Prompt radiation: 150 cGy (SGT Downs had no protection from the initial radiation effects).
- Thermal radiation: 4.7 calories per square centimeter causing only a noticeable increase in air temperature. This may only cause reddening of skin on fair complexioned personnel.
- Overpressure: 2.25 pound per square inch arriving 2 seconds after detonation. This will cause only minor damage, with possible shattering of glass windows.
- Dynamic pressure (wind):

Battalion TOC (CPT Anderson) Preburst Environment

The battalion TOC is located just west of Wrightsville and 1,400 meters from the point of burst. CPT Anderson (S3) is in the M577 tracked vehicles where he controls the battalion operations. The ramp is down and the canvas and track extension are erect. He is on the radio talking to the battalion commander at the time of the burst. The following are CPT Anderson's observations:

0 - 1.2 Seconds CPT Anderson immediately loses communications with his commander. He notices an intense bright light shine through the cracks of the tent canvas attached to his M577.

1.2 -4.0 Seconds The temperature in the M577 increases noticeably. The tent canvas and everything not in the tracked vehicles are blown away. Soldiers inside the track extension are knocked to the ground, some severely injured by flying debris.

4.0 -6.0 Seconds The M577 shakes mildly both from the blast and the return blast which sucks everything not tied down back toward the blast. Simultaneously, a sonic boom above 200 decibels pierces CPT Anderson's ears. The boom seems to go on unceasingly causing almost unbearable pain. He records a flash-to-bang time of 3 seconds.

6.0 Seconds - 5 Minutes As CPT Anderson moves outside of the M577 he notices localized fires and smoke, mostly at fuel storage locations and some of the vehicles. Injured soldiers are everywhere, but for the most part they are up and walking around. Most seem to be rubbing their eyes and complaining that they are having trouble seeing. Some soldiers have severe burns while others seem as if nothing has happened to them. The operations NCO who is in the M577 with CPT Anderson reports a reading of 11 cGy on his IM-93. He observes the developing mushroom cloud to the east of his position.

5 Minutes - 30 Minutes CPT Anderson surveys the area around the TOC. He notices that his OE 254/292 antennas have been blown down, but they seem reparable. He goes to his HMMWV and attempts to call the battalion commander over FM; however, this radio is also dead. He replaces the radio but it still does not work. His operations sergeant reports that all the generators are inoperable and that a good portion of the vehicles won't start. Confused and not knowing what to do, he glances at his watch only to notice that it has also stopped. He asks if anybody has seen LT Clark, the battalion NBC officer. Somebody reports that LT Clark has been seriously injured and is being treated by medics. The battalion NBC NCO cannot be located. The communications officer reports that he is replacing the AN/VRC-46 radio and assessing the damage to the OE/254 antennas. He expects communications to be restored in 30 minutes. LTC Smith arrives at the battalion TOC and assesses the damage with CPT Anderson. He says that A, B, and C companies received only minor damage, however, the soldiers are in a state of psychological despair. The helicopter company has been severely degraded with numerous casualties and equipment damage. LTC Smith realizes he cannot carry on his attack on Aberg as planned. He tells CPT Anderson that he is going to see the brigade commander and to reconstitute the battalion so that operations can be continued. He reminds CPT Anderson, as he did the other company commanders, to prepare defensive positions for any further nuclear attacks. He also wants a report of casualties and equipment damage when he returns. CPT Anderson thinks to himself and only wishes that the battalion had been better prepared for battlefield nuclear warfare.

The physical environment in the M577 for CPT Anderson is as follows:

- Prompt radiation: 16.5 cGy. (Actual radiation outside of the M577 was 23.7 cGy. Tracked vehicles provide a protection factor of 2 to 3). The battalion TOC also received protection from direct radiation since it was located in the town of Wrightsville.
- Thermal radiation: 2.9 calories per square centimeter (outside) arriving 1.2 seconds after the detonation. This is enough to cause second- to third-degree burns to exposed skin.
- Overpressure: 1.5 pounds per square centimeter at 2.5 seconds after detonation and lasting 1.1 seconds.
- Dynamic pressure (wind): > 60 miles per hour.

A Company, 25th Attack Helicopter Battalion (CW2 Carlson) Preburst Environment

Carlson and two other pilots each flying AH-64 Apaches are returning from a map-of-the-earth mission. They are approaching their company area and are approximately 300 meters out from their landing points. At the time of the detonation the pilots are flying at 75 knots and 100 feet above the ground. The helicopters are separated by approximately 100 meters (320 feet) and are flying in a single file. Carlson is trailing the other two pilots. Ground zero is to the left-front of the pilots at a distance of 1,000 meters. CW2 Carlson is on the radio talking to the lead pilot. The following are CW2 Carlson's observations:

0 - 1.0 Seconds CW2 Carlson sees a flash to his left front which dazzles him but not enough to hinder his flying ability. He still has communications with the lead pilot and his instrument panel seems to be operating OK.

1.0 - 3.0 Seconds Almost immediately he notices the lead helicopter pitch from side to side and immediately gain altitude while at the same time lose speed. The second AH-64 loses altitude, and is forced downward into the treetops exploding in a ball of flames. The lead AH-64 blows over CW2 Carlson's right-front and is out of control and on fire.

3.0 - 6.0 Seconds safety plexiglass on the left-front of CW2 Carlson's helicopter shatters, blowing small pieces of plastic into the aircraft. Carlson's eye protectors protect his eyes from the exploding plexiglass, however, plexiglass slightly punctures the skin on his neck and arms. The temperature inside the cockpit increases noticeably. He is immediately forced forward as if his helicopter has come to a complete stop. He notices that his airspeed has dropped drastically, however he is gaining altitude at an abnormally quick speed. His helicopter pitches and rolls from side to side as he fights to gain control of the AH-64.

6.0 - 10 Seconds The blast wave passes by and Carlson still has control of his Apache. He hears the blades flopping and bending erratically and notices that some of his instruments, to include his altimeter, are not functioning. The return wind hits him in what seems to be an eternity, but he is better prepared as he has his AH-64 heading in the direction of the winds. The return blast is much milder causing minor lift changes and bumping of the aircraft.

10 Seconds - 5 Minutes Regaining his composure, Carlson notices that he is bleeding profusely from head injuries. He begins to have trouble flying the aircraft and expects major mechanical problems. He looks for an opening in a wooded area and brings his helicopter in for a rough landing approximately 1,000 meters from ground zero but within walking distance of his company area.

5-30 Minutes As he exits the aircraft, Carlson notices that the airframe has been extensively damaged and he smells JP-4 fuel. Because of local brush fires in the area, he departs hastily. He does not want to be around when the aircraft explodes with its basic load of ammunition. As CW2 Carlson approaches his company area he is shocked at the devastation. Helicopters are overturned and on fire; wheeled vehicles are moderately damaged; and there are injured and dead soldiers everywhere. He sits down next to a tree and is about to go into shock. He thinks about his two friends who just minutes ago were alive and are now dead. He tries to gain his composure and think of what he should do. He remembers that the NBC NCO had given him an IM-93 prior to his recon mission. He removes it from his flight suit and takes a reading of 125 cGy. He isn't sure if this is bad or good.

30 Minutes - 1 Hour CW2 Carlson receives first aid for his injuries. He briefs the company commander on his status. The commander mentions that the company has received over 50 percent casualties and almost all the aircraft have been damaged. He states the task force commander wants them to assess the damages, treat casualties, and remain in place to build up defensive positions until further notice.

The physical environment in CW2 Carlson's AH-64 in quantitative terms is as follows:

- Prompt radiation: 265 cGy.
- Thermal radiation: 5.3 calories per square centimeter. This will cause first- to second-degree burns to exposed skin.
- Overpressure: 2.5 pounds per square inch. This will cause moderate damage to aircraft.
- Dynamic pressure (wind): 85 miles per hour causing a helicopter to pitch and roll uncontrollably and to rapidly gain or lose altitude depending on how the force of the wind hits the aircraft.

1-18 Inf Bn - Postburst Environment 4 to 24 Hours After the Burst

LTC Smith returned from brigade at 1100 hours. CPT Anderson gave him a briefing on the status of the battalion. The figures on page 1-12 summarize the current condition of the battalion. The mechanized infantry units and the armor unit did fairly well during the initial attack in comparison to the rest of the battalion, since they were far enough away from ground zero. Initial radiation in all three companies was less than 15 cGy. EMP damaged some of the electronics equipment in each of these companies. HHC and the attack helicopter FARP are completely combat ineffective and will require both equipment and personnel replacements before they can continue with their missions. LTC Smith mentioned that some personnel and equipment replacement will be provided by the division prior to 1800 hours. He also mentioned that the division has been authorized to employ nuclear weapons and that he fully expects friendly nuclear strikes to be used. LTC Smith stated that other sectors of the division had also been hit with enemy nuclear weapons and that he believed the enemy used them to stop the division attack planned for 0900 hours. The nuclear attack was successful as it caused confusion and a loss of command arid control in the division. The division would continue the attack but intended to support the attack with a nuclear weapon subpackage. LTC Smith's task force would lead the main attack into Aberg as planned. LTC Smith was told to keep a minimum safe distance from friendly strikes, as he exploited their effects against the enemy. The division commander wanted to exploit the advantage of nuclear weapons, which for some unknown reason the enemy failed to initiate after their nuclear strikes. LTC Smith was apprehensive and concerned about how his task force would perform under these conditions. He wasn't really sure how to exploit the advantages of a friendly nuclear strike. He was told that a new FRAGO from brigade would be forwarded to the battalion within the next 2 hours.

CPT Anderson failed to brief LTC Smith on the current radiation exposure status of the battalion (See the figure below) or on the effects that fallout and residual radiation were having on the unit (see the figure on page 1-13). CPT Anderson normally left all the NBC defense problems to the chemical officer and never was concerned with nuclear defense training. This was also LTC Smith's attitude.

1-18 Inf personnel and equipment status

	Personnel		% Operating Strength (Personnel)	Equipment	
	KIA	*INJURED	OH/REQ	SERVICEABILITY	READINESS
HHC	75	5	90/300	50%	45%
A Company	2	5	83/90	85%	81%
B Company	1	4	85/90	90%	89%
C Company	0	3	67/70	89%	89%
AH	11	4	4/15	See Note**	

* Will not return for duty in less than 48 hours.

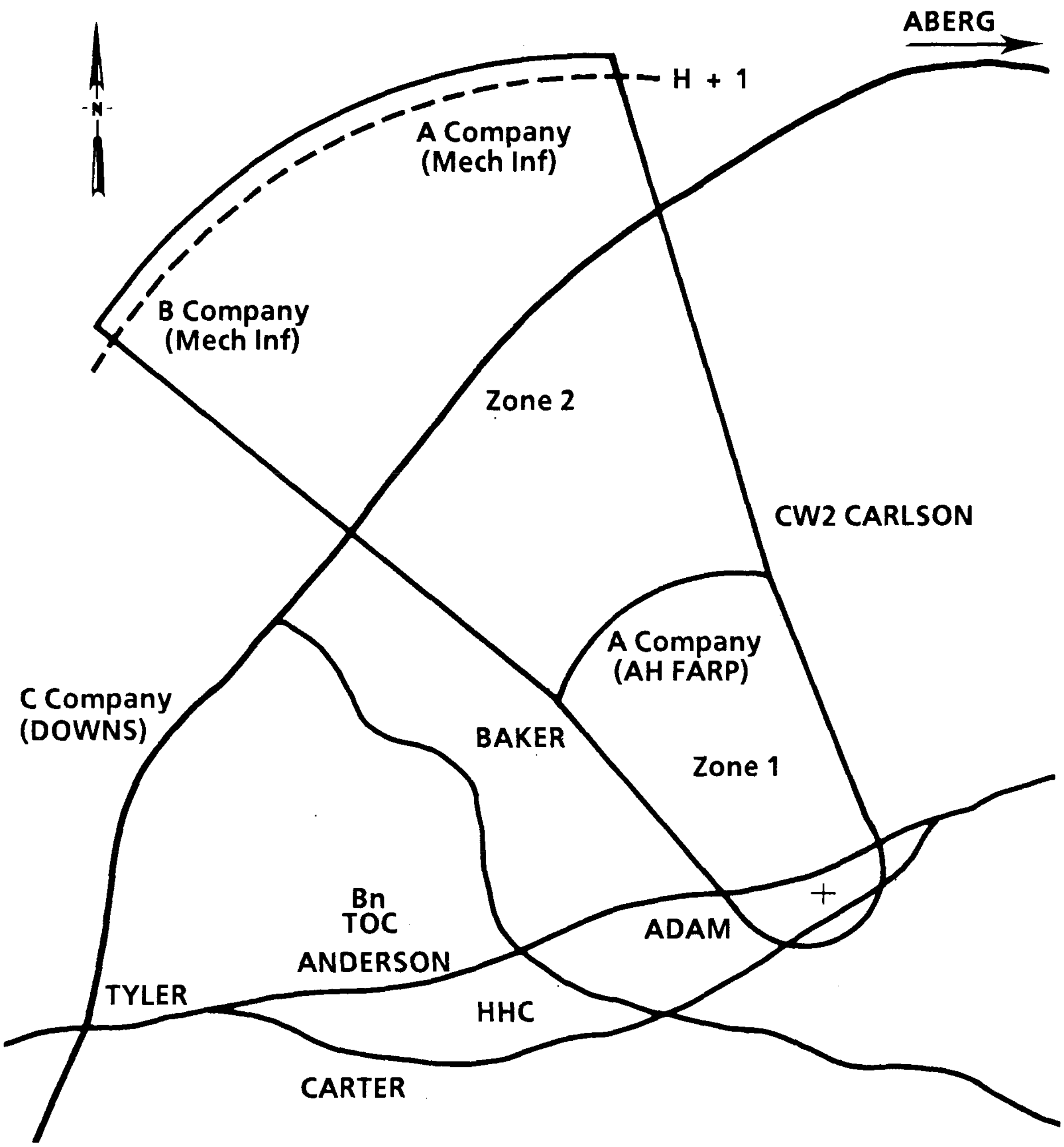
** All equipment not operational. Most damaged beyond repair.

Radiation exposure status

UNIT	TOTAL DOSE	RADIATION EXPOSURE STATUS (RES)
HHC	250	RES-3
A Company	150	RES-2
B Company	150	RES-2
C Company	50	RES-1
Company (FARP)	600	RES-3

NOTE: As of 1100 hours and includes initial and residual radiation.

Simplified fallout coverage



He believed if nuclear weapons were used, his battalion wouldn't stand a chance anyway; thus why train for it. The company commander also held this view and, therefore, the battalion had been affected as it was by the nuclear attack. It is also the reason why more soldiers than should will die in the future. As shown in the figure above, three units in the battalion have fallen in either zone 1 or zone 2. Zone 1 of the simplified fallout prediction represents that area on the ground where exposed, unprotected personnel may receive doses of 150 cGy or greater in less than 4 hours after arrival of fallout. Zone 2 represents the secondary hazard and the total dose received by exposed unprotected personnel is not expected to reach 150 cGy within 4 hours after arrival of fallout. However, personnel may receive 50 cGy or greater within the first 24 hours after the arrival of fallout. LTC Smith and his staff did not take the correct precautions in protecting the battalion from being over exposed to radiation. A basic understanding of radiation exposure status (RES) and simplified fallout prediction could save the lives of many soldiers in the battalions. Chapter 2 will discuss RES in more detail. Prior nuclear training in mitigation and survivability techniques would have reduced the detrimental effects of the nuclear burst on the battalion. Chapter 4 will describe how LTC Smith could have better integrated nuclear training during FTXs and how his unit could have better mitigated the effects of nuclear weapons.

The scenario described above for the 1-18 Mechanized Infantry task force is simplified and provided only to give an example of a possible nuclear scenario. As mentioned earlier, nuclear laydowns (the use of numerous weapons at once) is the most likely scenario for threat use of nuclear weapons. A single low-yield nuclear burst was used in the scenario so that the reader could get a better feel for the effects of a single weapon. The next chapter will describe the various effects of a nuclear burst and how to mitigate these effects.

CHAPTER 2

NUCLEAR WEAPON EFFECTS

THIS CHAPTER IMPLEMENTS STANAGs 2083 AND 2111.

Perceptions of conventional-nuclear combat are usually distorted by the popularized versions of the "holocausts" at Hiroshima and Nagasaki in August 1945. Certainly, those two bombs demonstrated explosive combat power that was several orders of magnitude more potent than any other weapon then known. However, the incendiary bombing of Tokyo in March 1945 had created a holocaust that lasted for two days, took more lives, and destroyed a larger area than either of the first atomic bombs. Most current nuclear weapons that will be used for battlefield nuclear fire support are smaller than the Hiroshima or Nagasaki bombs. Although many may have yields as small as 1/10th to 1/100th the size of the first nuclear weapons used, they are still many times more powerful than most conventional munitions. Nevertheless, their effects on the battlefield are finite and limited to "tactical" distances from a few hundred meters (m) to a few kilometers (km). The actual yields of nuclear weapons currently in the field are classified. Consequently, this chapter will discuss only four hypothetical yields, namely 2 kilotons, 5 kilotons, 10 kilotons, and 20 kilotons. These four yields span most of the range of yields likely to be employed to provide nuclear battlefield support, and they are useful in portraying the effects of weapons in this yield range. The nuclear weapon effects data presented in this chapter are realistic.

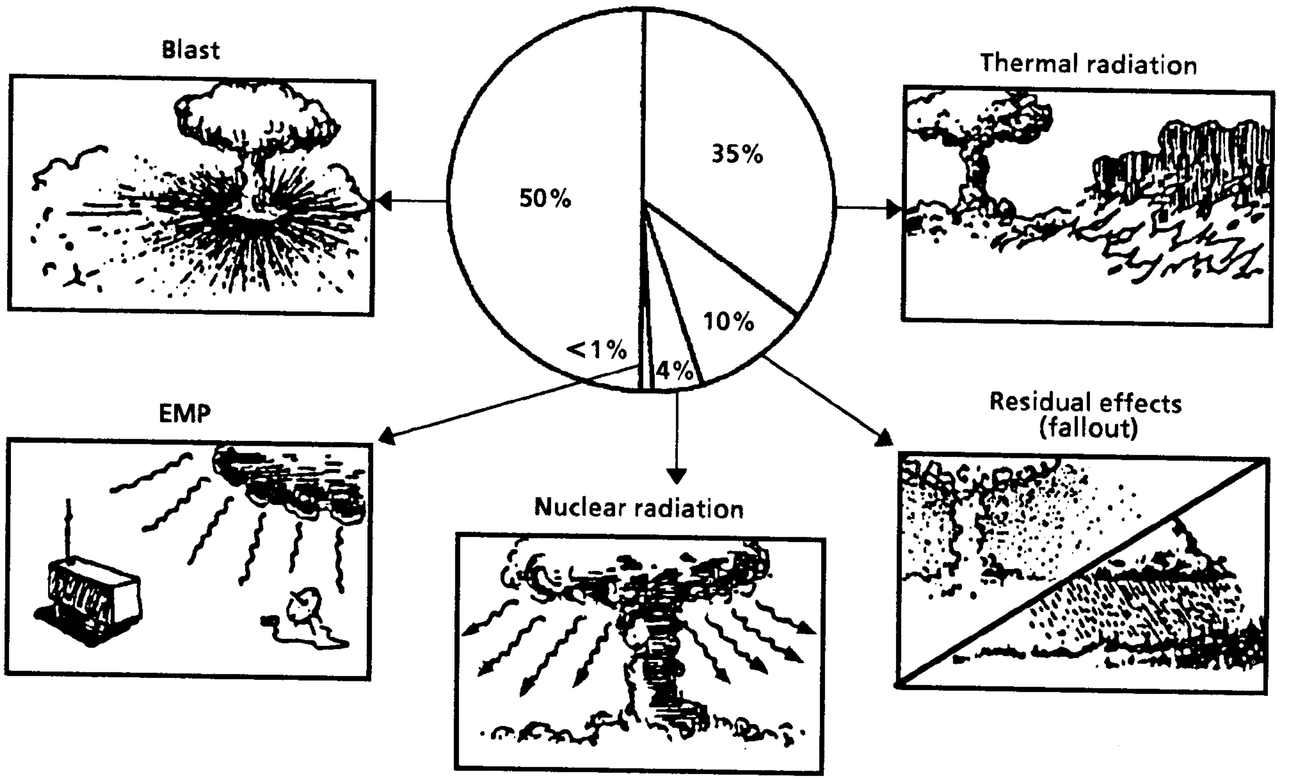
The effects of a nuclear detonation of concern to a commander and to his unit are:

- *Psychological.*
- *Nuclear radiation.*
- *Electromagnetic pulse (EMP).*
- *Blast.*
- *Thermal.*

The extent of each effect occurs in relationship to the yield of the nuclear blast. The dominant effect or the effect which extends furthest out from ground zero depends on the yield of the weapon and is important for a commander to know. This will be provided in the figures and graphs which follow. The figure on page 2-2 illustrates the type of energy, by percentage, that a nuclear weapon will produce. The degree of hazard from each effect depends on—

- *The type of weapon, the yield, the height of burst, and the distance between the point of detonation and the target.*
- *The environment in which the weapon is detonated.*
- *The vulnerability of the target. Nuclear weapons may be detonated in the air, on the surface, or beneath the surface. Each type of detonation produces a different result as shown in the figure on page 2-2.*

Distribution of energy



Results of detonation types

Type Burst	Blast	Thermal	Nuclear Radiation	EMP
Air	Great and widespread.	Great and widespread.	Considerable prompt radiation. No significant residual radiation except for small areas under blast.	Effect 3 to 9 miles from GZ up to altitudes of 19 miles. Great and widespread for burst above 19 miles.
Surface	Great but radius of effect somewhat reduced.	Great but not widespread.	Great, prompt, but not widespread. Residual radiation will appear as fallout.	Extends outward 3 to 5 miles from GZ.
Subsurface	Great but radius of effect greatly reduced.	Negligible.	Little or no instant radiation. Great amount of residual fallout.	Limited to area around GZ.

PSYCHOLOGICAL

An effect that is most often forgotten when talking about nuclear effects is the psychological effect it has on soldiers. It is often referred to as acute combat reaction or stress. Although it is possible to estimate roughly the number of injured and dead which would result from the thermal, blast, and radiation effects of a nuclear weapon used in combat, it is much more difficult to predict the numbers and types of psychiatric patients. It is generally felt that the acute psychological problems which would occur would be essentially the same as those seen in other combat situations, and that the treatment methods developed as a result of experience in past wars would be appropriate.

The primary psychological abnormality which develops in severe stress or disaster situations is a transient, fluid state of emotional disruption. This abnormality occurs when an individual cannot cope with the danger presented to him by his environment. Its major features are fear and the results therefrom. The fear develops largely from the individual's inability to make meaningful decisions or to initiate purposeful actions; and as a result, even minor decisions become difficult to make. A vicious circle of fear-inaction-fear may ensue, and the individual involved may become ineffective. This may vary in degree from very mild to complete helplessness.

Panic defined as frantic, irrational behavior associated with real or supposed trapping would probably be rare since it has been found to be rare in other disaster situations. Chronic mental disease, either psychotic or neurotic, also would probably be rare. This again reflects the finding that these reactions are not commonly seen in disaster situations.

Characteristic disturbances would include stunned mute behavior, uncontrolled flight, tearful helplessness, apathetic depressed states, inappropriate activity, increased tension, or preoccupation with somatic representations. These disturbances can last for minutes, hours, days, or sometimes weeks. Fortunately, people with the milder and shorter reactions are in the majority.

The frequency and severity of the psychological disturbances vary with several factors:

- Intensity and severity of stress. Stressful situations of brief duration are rather easily tolerated, and recovery of individuals with mild degrees of mental disruption under these circumstances is rapid. If stressful situations follow one another rapidly, or if any one of them is of long duration, more severe psychological reactions of longer duration may increase.
- Degree of personal involvement. If an individual has a "close call" or if he sees close friends or relatives severely injured, his reaction will be more severe than if he remains "relatively" remote from danger.
- Degree of training. This is the most important factor in that it is the one which is most easy to modify. A well-trained individual, who can react instinctively to dangerous situations and initiate appropriate actions, will develop a minimum of incapacitating fear. The fear he does develop will, if anything, help him. It will be an integral part of a reaction of increased awareness or alertness allowing more efficient fight or flight.
- Degree of warning. This is closely related to the above paragraph. Warning helps a trained person to prepare. He can initiate proper actions early. For an untrained person, the effect will be variable. If fear of incapacitating degree occurs, then the warning may well result in more harm or danger. If the fear is not incapacitating, then the untrained person who cannot react automatically to initiate proper actions may be able to use the time to improvise appropriate action. Whatever time he has to do this will help.
- Presence or absence of leadership. In a group in a disaster situation, a few individuals will emerge as leaders. These may not be the appointed leaders, although in a military unit this is usually not the case unless the appointed or regular leaders become ineffective or are lost. When effective leadership is available, the group will fare much better than when there is none.
- Group identification. This is a particularly important factor for the military. If group or unit integrity is preserved, the individuals in the unit will do much better. Also, those individuals with mild psychological disruptions will recover faster if they can remain with or close to their unit, thus retaining their personal relationship.

NUCLEAR RADIATION

Nuclear radiation is separated into initial and residual radiation. Initial radiation is emitted within the first minute after the detonation. Residual radiation occurs in the form of fallout or radioactive dirt and dust that falls back to the ground in a plume pattern. When CPT Anderson's operations NCO reported a reading of 15 cGys from his IM-93 dosimeter shortly after the detonation, it is highly possible that this was caused by initial radiation. However, CW2 Carlson's report of 150 cGy 30 minutes after the detonation included both the initial and residual effects. As shown in the figure on page 1-13, the battalion TOC is outside the plume of fallout, while CW2 Carlson and the attack helicopter company are within zone 1 of the fallout plume. Zone 1 has the probability of the highest residual radiation levels. It is essential that soldiers in this area take immediate actions to protect themselves because residual radiation causes damage to the body for an extended time. Chapter 3 discusses the best actions to take when in zone 1. Nuclear radiation consists of radioactive particles, too small to be seen by the naked eye. Radiation travels at the speed of light and interacts with the human body. It causes damage to tissues and cells.

Assessment of the Radiation Hazard

The figure below provides a guide for use by commanders as to the effects of nuclear radiation in terms of combat effectiveness. It is based on the reaction of groups to nuclear radiation and should normally apply to company-or platoon-sized units. It also outlines effects of tactical importance according to the fraction of a group affected at given range of dose.

Biological effects of nuclear radiation (STANAG 2083 Edition 5)

Estimated Dose Range (rad)	Initial Symptoms	Onset of Symptoms	Incapacitation	Hospitalization	Final Disposition
0-70	None to slight incidence of transient headache and nausea. Vomiting in up to 5% of exposed personnel in upper part of dose range.	Within 6 hours.	None.	None.	Duty.
70-150	Transient mild headache and nausea. Some vomiting in up to 50% of group.	Approx 3 to 6 hours after exposure.	None to slight decrease in ability to conduct normal duties in up to 25% of group. Up to 5% of group may become combat ineffective.	Eventual hospitalization (20 to 30 days in upper part of dose range) required for less than 5% in upper part of dose range.	Duty. No deaths.
150-450	Headaches, nausea, and fatigue. Slight incidence of diarrhea. More than 50% of group vomits.	Within 3 hours after exposure.	Can perform routine tasks; sustained combat task may be hampered. More than 5% of group expected to become combat ineffective, increasing with higher dose.	Hospitalization (30 to 90 days) indicated for those in the upper dose range following a latent period of 10 to 30 days.	Some deaths anticipated; probably less than 5% at lower part of dose range, increasing to 50% toward upper end. Return to duty questionable in upper dose range.

Biological effects of nuclear radiation (STANAG 2083 Edition 5)(continued)

Estimated Dose Range (rad)	Initial Symptoms	Onset of Symptoms	Incapacitation	Hospitalization	Final Disposition
450-800	Severe nausea and vomiting. Diarrhea. Fever early is upper part of dose range.	Within 1 hour after exposure.	Can perform simple tasks. Simple tasks. Significant reduction in combat effectiveness in upper part of dose range. Lasts more than 24 hours.	Hospitalization (90 to 120 days for those surviving) indicated for 100% of exposed personnel. Latent period 7 to 20 days.	Approx 50% deaths at lower part of dose range, increasing toward upper dose range. All deaths occuring within 45 days.
800-3,000	Severe and prolonged vomiting, diarrhea, and fever.	Approx 1/2 to 1 hour after exposure.	Significant reduction combat effectiveness. In the upper part of the dose range, some personnel will undergo a transient period of complete combat ineffectiveness followed by capability for some response until end of latent period.	Hospitalization indicated for 100% of exposed personnel; latent period of less than 1 day.	100% deaths occurring within 14 days.
3,000-8,000	Severe and prolonged vomiting, diarrhea, fever, and prostration. Convulsion may occur at higher doses.	Within 5 minutes after exposure.	Will become completely incapacitated within 5 minutes and will remain so for 30 to 45 minutes. Will then recover but will be functionally impaired until death.	Hospitalization indicated for 100% of exposed personnel. Latent period of 1 to 2 days.	100% deaths occurring within 5 days.
8,000-18,000	Severe and prolonged vomiting, diarrhea, fever, and prostration. Convulsions may occur at higher doses.	Within 5 minutes after exposure.	Will become completely and permanently incapacitated for performing physical tasks within 5 minutes.	Hospitalization indicated for 100% of exposed personnel. No latent period.	100% deaths occurring within 2 days.
Greater than 18,000	Convulsions and prostration within 15 hours.	Within 5 minutes after exposure.	Will become completely and permanently incapacitated for performing any tasks within 5 minutes.	Hospitalization indicated for 100% of exposed personnel. No latent period.	100% deaths occurring with 15 hours.

Radiation Exposure Status

The radiation exposure status (RES) is an estimate, indicated by a categorization symbol, which may be applied to a unit, subunit, or to an individual. It is based on total cumulative dose received from exposure to penetrating radiation.

The RES provides a convenient method of enabling information regarding nuclear radiation doses to be exchanged. Since it is directly related to effects of tactical interest, it can be used for estimating the effectiveness of groups and can be employed when planning future exposure.

The scenario for the infantry battalion (page 1-12) lists the RES of each of the companies in the battalion. The commander must use the figures below to make decisions for future radiation exposure of each of his units. Listed are "degree-of-risk" criteria which should be used by unit commanders for assessing the risk of employing their units to additional radiation based on the mission and the tactical situation.

Commanders' guide on nuclear exposure status

Total Cumulative Dose [1] [2]	RES Category	Probable Initial Tactical Effects (after exposure)
0 (no exposure)	0	None
Greater than 0, but not greater than 70	1	None to slight decrease in combat effectiveness in up to 5 percent of group.
Greater than 70, but not greater than 150	2	Decrease in combat effectiveness in up to 25 percent of group; up to 5 percent of group expected to become combat ineffective.[3]
Greater than 150	3	Groups probably not able to perform complex tasks; sustained effort hampered; more than 5 percent of group expected to become combat ineffective, increasing with increasing doses.[3]

NOTES: 1. Injury or exposure to chemical agents may effect response to nuclear radiation.
2. The figures in the dose column may be subject to change in the light of future medical knowledge.
3. Combat ineffectiveness is taken to be the onset of serious nuclear radiation sickness.

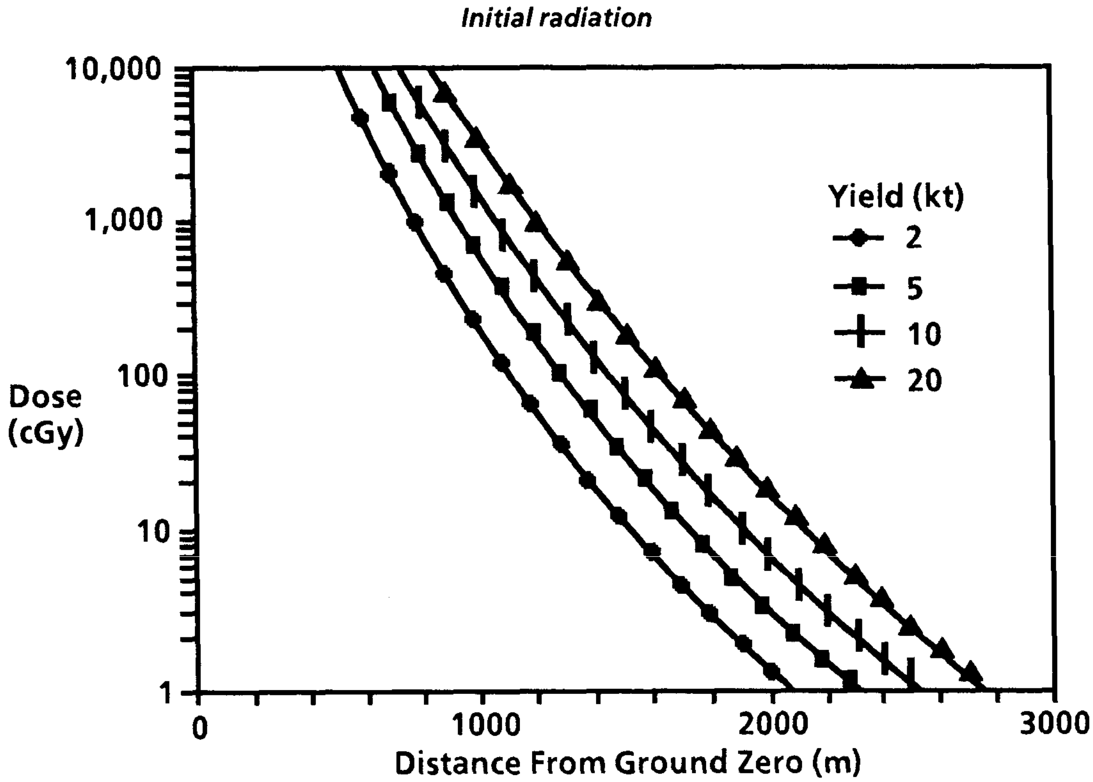
Nuclear radiation degree of risk exposure criteria

Total Cumulative Dose Before Exposure	RES Category[1]	Single Exposure Criteria[2]
No exposure	0	Negligible risk: Less than 50 cGy Moderate risk: Less than 70 cGy Emergency risk: Less than 150 cGy[2]
Greater than 0, but less than or equal to 70[3]	1	Negligible risk: Moderate risk: Emergency risk: That further dose which, when, added to the unit's dose, will not exceed the appropriate OEG risk criterion.
Greater than 70, but less or equal to 150[3]	2	Any further exposure is considered to exceed a moderate risk. Emergency risk: That dose which, when added to the unit's dose, will not exceed the OEG emergency risk criterion.
Greater than 150	3	All further exposure will exceed the emergency risk.

NOTES: 1. Risk levels are graduated within each status category to provide more stringent criteria as the total nuclear radation dose accumulated becomes more serious.
2. Risk levels, as defined in FM 101-31-1 (see STANAG 2111), are:

Risk Level	Percent Incidence of Combat Ineffectiveness	Performance Degrading But Not Casualty Producing Effects
Negligible	1	2 .5
Moderate	2 .5	5
Emergency	5	No limit

NOTES: 3. If a unit's dose within category R1 or R2 is unknown, the unit's dose is assumed to be the midpoint of that category.



The extent to which initial nuclear radiation extends outward from ground zero depends on its yield and whether there are structures or barriers that block its path. The figure above compares the distances with different types of effects. The extent to which residual radiation will cause its effect is based on yield and upper-level wind patterns. Simplified predictions, as shown in the figure on page 1-13, can be used to determine possible hazards. However, detailed predictions and calculations must be performed at brigade and division level to determine actual hazard locations.

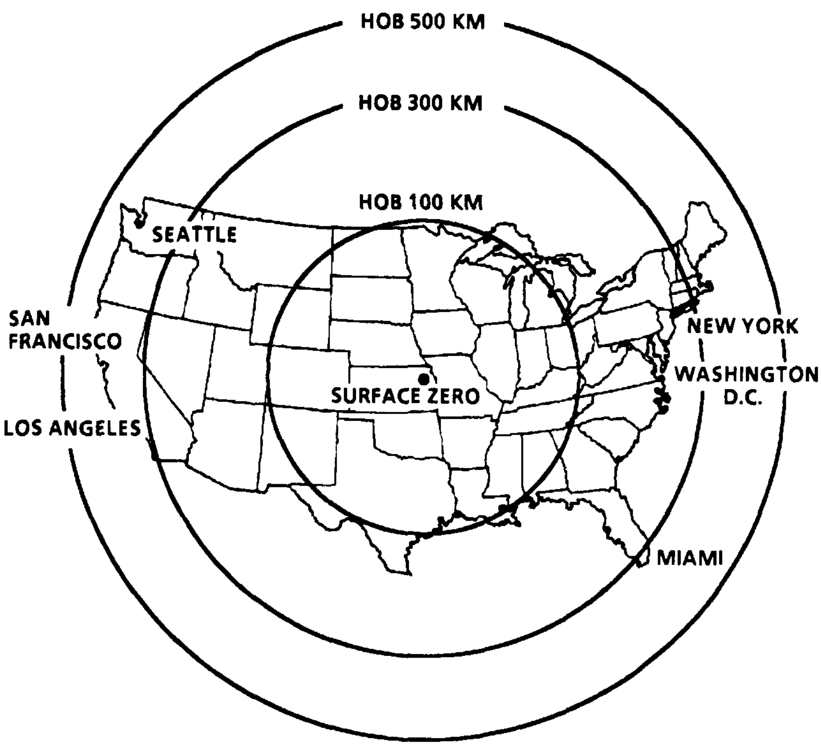
The Warsaw Pact armies have significant numbers of tactical nuclear weapons and assorted means to deliver them. Generally, we anticipate that low-yield weapons would be used against our forces near the forward line of own troops (FLOT) while larger yield weapons would be used against rear areas. Current information suggests that for every soldier receiving an acute incapacitating dose (greater than 3,000 cGy), another will receive a potentially lethal but not immediately incapacitating dose (from about 400 to 650 cGy). Two or more other soldiers would receive doses of radiation significant enough to cause them to be only marginally capable of performing their combat tasks. For yields of 5 to 10 kiloton (or less), initial nuclear radiation is the dominant casualty producer on the battlefield. Soldiers receiving an acute incapacitating dose (3,000 cGys) will become performance degraded almost immediately and combat ineffective within several hours. They will usually die within 5 to 6 days after exposure. Soldiers receiving less than a total of 150 cGy will remain combat effective. Between those two extremes, soldiers receiving doses greater than 150 cGy will become degraded; some will eventually die. A dose of 530 to 830 cGys is considered lethal but not immediately incapacitating. Personnel exposed to this amount of radiation will become performance degraded within 2 to 3 hours, depending on how physically demanding the tasks they must perform are. They will remain in this degraded state at least 2 days. However, at that point they will experience a recovery period and will be effective at performing nondemanding tasks for about 6 days. Then they will relapse into a degraded state of performance and remain so for about 4 weeks. At this time they will begin exhibiting radiation symptoms of sufficient severity to render them totally ineffective. Death may follow.

ELECTROMAGNETIC PULSE

One of the principal effects of nuclear weapons is their ability to produce adverse effects on electronic equipment. These effects are generally referred to as TREE (transient radiation effect on electronics) and EMP (electromagnetic pulse). Although these effects work in somewhat different ways, in both cases electronic equipment, such as field radios, generator controls, and aircraft and missile components, may become upset or inoperable. This will likely cause unit performance degradation as a result of equipment loss. Unique leadership challenges will require great flexibility on the part of soldiers and leaders as normal lines of communication are broken and new ones are established.

Electromagnetic pulse is an electromagnetic wave similar to radio waves which results from secondary reactions occurring when the nuclear gamma radiation is absorbed in the air or ground. It differs from the usual radio waves in two important ways. First, it creates much higher electric field strengths, Whereas a radio signal might produce a thousandth of a volt or less in a receiving antenna, an EMP might produce thousands of volts. Second, it is a single pulse of energy that disappears completely in a few seconds. In this sense, it is rather similar to the electrical signal from lightning, but the rise in voltage is typically a hundred times faster. Unlike lightning, EMP does not produce a flash in the sky nor a loud noise. Likewise, devices that protect equipment against lightning do not necessarily provide protection against EMP. EMP caused by tactical nuclear weapons will extend further than blast, thermal, or radiation. EMP which will have damaging effects on critical electronics equipment will range from 3,000 meters for the lower yield tactical nuclear weapons to about 12,000 meters for the higher yields.

High-altitude EMP coverage at various heights above the United States



Based on this information, the infantry battalion was totally encompassed by the effect of damaging EMP. Survivability of the electronics equipment in the battalion depends on how much of its equipment was designed with nuclear (HEMP) hardening, how well nuclear hardening was protected during maintenance, and how effective EMP mitigation techniques were implemented. The communications problems and equipment failure show that the battalion was not prepared. Proper EMP survivability and mitigation techniques are discussed in Chapter 3.

EMP also results from high altitude (above 31 kilometers or 19 miles) nuclear blast. Nuclear weapons detonated at these heights are strategic and cause more damage to electronics. They extend over a much greater area on the ground than low-altitude or ground-burst EMP.

Detonations that occur at these heights (especially greater than 100 kilometers) will not be seen, felt, or heard by soldiers on the ground. But, the EMP field could damage or destroy critical electronic components in communications systems and other materiel. The figure on page 2-8 shows the area covered from high-altitude nuclear detonation above the center of the United States. As shown, the entire continental United States is covered by the effects of EMP caused by a detonation at an altitude of 500 kilometers (inner ring). A detonation at 300 kilometers height of burst will cover over 80 percent of the continental United States. For a 100-kilometer height of burst, EMP's damaging effects extend out as far as 700 to 800 miles from the center of the burst.

There is no evidence that EMP is a physical threat to humans. However, electrical or electronic systems, particularly those connected to long wires, such as power lines or antennas, can undergo either of two kinds of damage. First, there can be actual physical damage to an electrical component, such as shorting of a capacitor or burnout of a transistor, which would require replacement or repair before the equipment can again be used. Second, at a lesser level, there can be a temporary operational upset, frequently requiring some effort to restore operation. For example, instabilities induced in power grids can cause the entire system to shut itself down, upsetting computers that must be started again. Base radio stations are vulnerable not only from the loss of commercial power but from direct damage to electronic components connected to the antenna. In general, portable radio transmitters and receivers with relatively short antennas are less susceptible to EMP. The vulnerability of the telephone system to EMP cannot be determined.

BLAST

A fraction of a second after a nuclear detonation, a high-pressure wave develops and moves outward from the fireball. This is the blast or shock wave and is the cause of most of the physical destruction accompanying a nuclear burst. The front of the blast wave travels rapidly away from the fireball, behaving like a moving wall of highly compressed air. This wave travels at approximately the speed of sound and consists of wind (dynamic overpressure) and crushing force (static overpressure).

Wind

The wind can range from a few miles per hour up to hundreds of miles per hour, depending on the yield of the weapon, height of burst, and distance from the point of detonation, The wind decreases with distance. For example, a 100-miles-per-hour wind will occur approximately 6 miles from a l-megaton detonation, 4 miles from a 300-kiloton detonation, or 1 mile from a 5-kiloton detonation. However, when a nuclear burst first detonates, the observer will not know the yield or ground zero. The winds have a positive and a negative phase. During the positive phase, the winds travel outward from the point of detonation. As the fireball rises, a slight vacuum is created that will cause the winds to reverse and blow back toward the detonation, The velocities of this reverse wind are mild compared to the positive phase. The reversal of the winds will keep debris in the air longer and possibly cause more damage. Because of the turmoil, ground troops may not even notice the negative phase. Aircrews may notice it more because wind reversal will create more air instability for them to overcome and will worsen any overcorrection effect.

The winds cause damage by drag forces. They overturn buildings, vehicles, or personnel; create missiles from debris, rocks, sticks, or glass fragments; hurl standing personnel against structures; and blow down trees. For nuclear weapons, the time from the initial blinding flash of light until the blast wave reaches the area can be several seconds or longer. For large-yield weapons at great distances, the time can be longer than 30 seconds. This means there will be some time to react before the blast wave hits.

Both wind and drag forces significantly affect the aerodynamics of both fixed and rotary-wing aircraft. As was seen in the scenario, CW2 Carlson was extremely lucky to be able to control his helicopter under such harsh conditions. Nuclear blast winds have the same effects on aerodynamic surfaces and airframes as any other type of high wind. The nuclear weapons can produce enormous wind velocities, extreme turbulence, and wind shear. The length of time that the winds persist is longer than that produced by conventional munitions. Wind effects on rotary-wing aircraft may result in yaw, pitch, roll, and lift changes. They can also cause blade flapping and bending, mast bumping, loss of tail rotor effectiveness, flameout, and airframe crushing.

Crushing Force

Blast also results in a crushing force (static overpressure) which can be hundreds of times greater than the ambient air pressure. As with winds, the crushing force decreases with the distance from the point of detonation. Normal outside ambient air pressure at sea level is about 15 pounds per square inch. Static overpressure decreases with greater height and increases at deeper levels under water. At increasingly deeper levels of water, the human body can feel a constant force on all parts of the body. This is no different than the crushing force caused by a nuclear blast, except that with a nuclear detonation the increase of crushing force occurs immediately, causing the effects to be even more detrimental. The figure below summarizes both wind and crushing force effects for a 2-kiloton, 5-kiloton, 10-kiloton, and 20-kiloton nuclear detonation.

In the figure, the distances given for each yield represent the point outward from ground zero where the effect as shown will occur. Thus, in the first example a 2-kiloton burst will cause a 1 pound per square inch crushing force, with 45 MPH winds at a distance of 2,670 meters from ground zero. Arrival time for the peak crushing force and winds described is shown in the crushing force figure on page 2-11. In the scenario for the infantry battalion, Carter's foxhole is 750 meters from ground zero for the 2-kiloton burst. He had just over 2 seconds to protect himself from a 4 pounds per square inch overpressure and 70 MPH blast wave. If he were not inside his foxhole or protected by some other sturdy structure, he might have been seriously injured.

Blast effects

Yield/Dist (m)	Crushing Force PSI	Wind Velocity MPH	Effect
2 kt - 2,670 5 kt - 3,600 10 kt - 4,569 20 kt - 5,750	1	45	Glass windows shatter; light damage to parked helicopters; soldiers endangered by flying debris.
2 kt - 1,620 5 kt - 2,200 10 kt - 2,700 20 kt - 3,500	2	70	Moderate damage to wood-frame buildings; light damage to some tactical wheeled vehicles; moderate damage to parked helicopters.
2 kt - 1,000 5 kt - 1,350 10 kt - 1,700 20 kt - 2,150	4	120	Sever damage to wood-frame buildings and helicopters; winds high enough to kill soldiers.

Blast effects (continued)

Yield/Dist (m)	Crushing Force PSI	Wind Velocity MPH	Effect
2 kt - 880 5 kt - 1,200 10 kt - 1,500 20 kt - 1,900	5	150	Severe damage to tactical wheeled vehicles; moderate damage to tanks and tracked vehicles; possible lung damage and eardrum rupture; 165-lb men lifted off the ground and thrown in a rolling, tumbling motion; 90 percent of trees blown down.
2 kt - 610 5 kt - 825 10 kt - 1,050 20 kt - 1,300	9	250	Severe damage to concrete buildings and multi-story masonry buildings; 165-lb men lifted off the ground; attains a speed of 20 ft/second for a distance of about 15 ft.

Peak crushing force

Distance From Ground Zero	2 kt	5 kt	10 kt	20 kt
	Time in Seconds			
500 m (1/3 mile)	2.0	1.0	.2	0.0
1,600 m (1 mile)	4.2	4.0	3.6	2.8
3,200 m (2 miles)	10	9	8.1	7.4

THERMAL

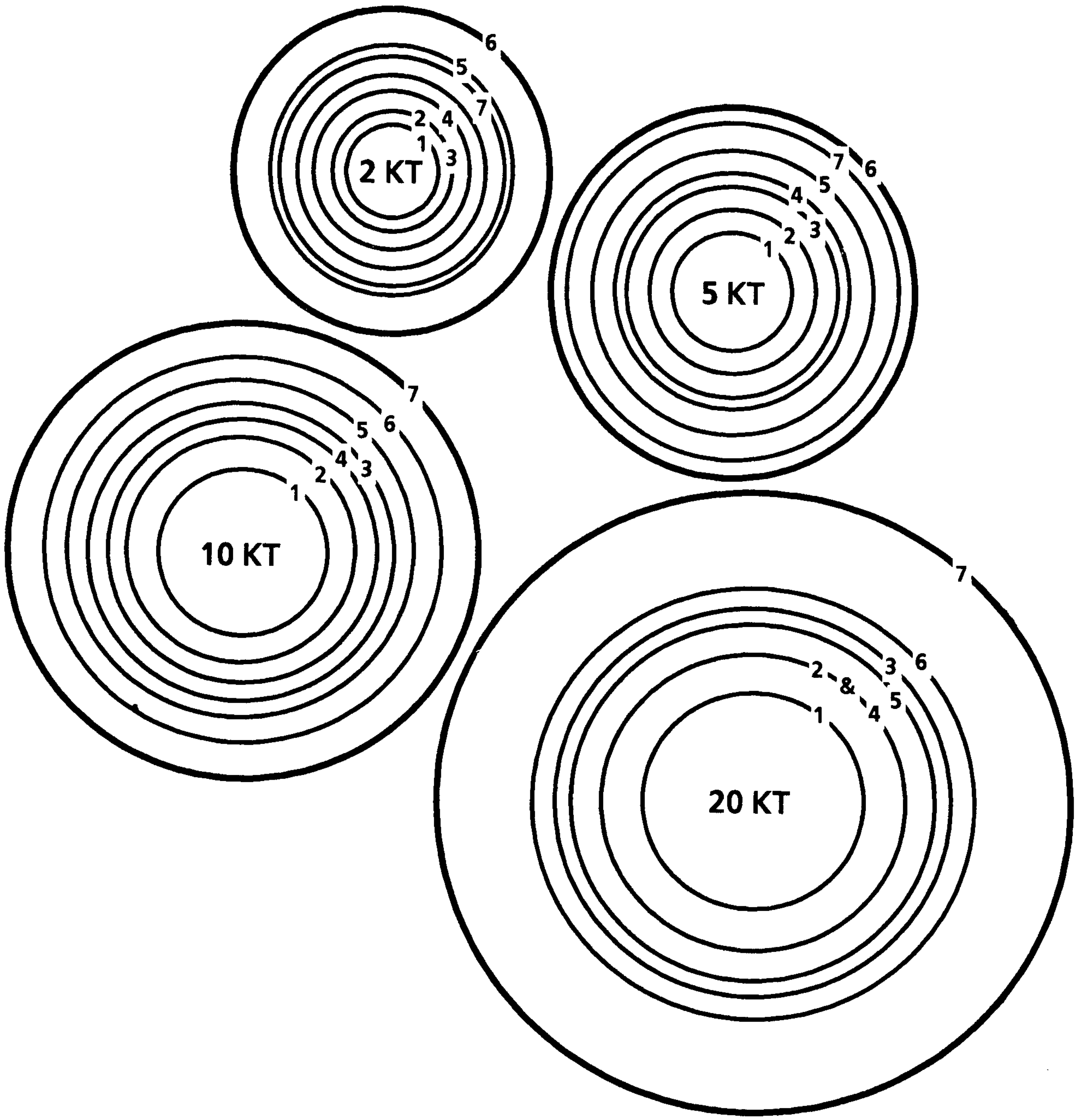
As was shown in the figure on energy on page 2-1, approximately 35 percent of the energy from a nuclear explosion is an intense burst of thermal radiation or heat. The effects are roughly the same as the effect of a 2-second flash from an enormous sunlamp. Since the thermal radiation travels at the speed of light, the flash of light and heat precedes the blast wave and occurs immediately, just as lightning is seen before thunder is heard. The visible light will cause "flashblindness" in soldiers who are looking in the direction of the explosion. Depending on the yield, flashblindness can occur even if not looking in the direction of the attack. In the scenario for the battalion TF, none of the observers received flashblindness; however, it is likely that in an actual situation numerous soldiers will be affected by the flash. Flashblindness increases significantly during nighttime burst.

The figure on page 2-13 compares safe separation distances to avoid flashblindness for both daytime and nighttime burst. As shown in the figure, the effects of flash extend further out than any other effect produced by a nuclear detonation. Flashblindness is normally only a temporary effect on soldiers, and full eyesight will return in a matter of minutes. However, under certain circumstances, serious eye damage leading to loss of sight can occur. This damage will vary with the height of burst, yield, location, and circumstances for each soldier at the time of the burst. Skin burns result from higher intensities of light and therefore take place closer to the point of explosion. The distance at which burns are dangerous depends heavily on weather conditions. Extensive moisture or a high concentration of particles in the air (smog) absorb thermal radiation. Thermal radiation behaves like sunlight, so objects create shadows behind which the thermal radiation is indirect (reflected) and less intense. Some conditions, such as ice on the ground or low white clouds over clean air, can increase the range of dangerous thermal radiation.

Thermal Effects

Nuclear Weapons Radii of Damages
Scale 1:50,000

1. Moderate damage, wheeled vehicles
2. 90% tree blow down - coniferous forest
3. 30% tree blow down - coniferous forest
4. 3000 cGy initial radiation - exposed personnel
5. 650 Gy initial radiation - exposed personnel
6. 150 cGy initial radiation - exposed personnel
7. Third-degree burns and fires



Safe separation distances from ground zero to avoid flashblindness

	Daytime (miles)	Nighttime (miles)
2 kt	1-2	50-60
5 kt	5	60-70
10 kt	8-9	80-85
20 kt	10-12	90-100

Thermal energy will also affect the battlefield by setting flammable items on fire. These items could include grass, trees, loose tinder, and possibly the paint and rubber tires on vehicles. In addition to flash burns to the skin, the thermal energy may be strong enough to ignite clothing, etcetera.

To make a comparable assessment of the different effects of a nuclear burst, the nuclear weapon radii of damages chart on page 2-12 can be used as a template on a 1:50,000 scale map. The 2-kiloton template can be used to compare damage radii to position of observers in the infantry battalion. Note that as the yield increases, thermal effects become the dominant effect which can cause injury to soldiers. For all yields shown, EMP would extend out the farthest.

CHAPTER 3

MITIGATION TECHNIQUES FOR NUCLEAR SURVIVABILITY

The purpose of this chapter is to provide commanders and staffs with an understanding of techniques used to help mitigate the effects of nuclear weapons on their units and increase survivability. Mitigation refers to techniques which lessen the vulnerability of personnel and equipment to nuclear weapon effects. These techniques must be taken before, during, and after a nuclear strike or attack. Mitigation techniques for friendly strikes are much easier since a prewarming or nuclear STRIKWARN will notify units of the location and time of the strike. For enemy nuclear attacks there will be little or no warning, thus units must prepare in advance.

Survivability in any battlefield environment results from the combined application of proper mitigation techniques and other survivability measures that reduce vulnerability to detection and, if detected, reduce chances of being attacked and destroyed. Mitigation can make a unit highly survivable from nuclear strike or attack, but incapable of performing its mission. It will require tradeoffs between mass and dispersion, mobility and hardness, concealment and reconnaissance, decontamination and continuous attack, and other "either-or" conditions. Survivability measures and practices are important during conventional warfare, but take on added importance during BNW. The specific application of each measure and practice varies with the mission of each unit and the threat to the unit. All of the following survivability measures are related to mitigation techniques.

- *Risk.*
- *Operations security.*
- *Concealment.*
- *Dispersion.*
- *Shielding.*
- *Interlocking.*

Risk *is inherent in war and is involved in every mission. It is common to commanders, who are proactive and take the initiative. Risk results in greater gains and at times is required to overcome the effects of the nuclear battlefield.*

Operations security *is essential to avoid detection by the enemy's sophisticated intelligence system. It includes resources to monitor communications, locate emitters, control special agents located deep in rear areas, and see the battlefield from overhead. To offset the enemy intelligence, commanders must use effective countermeasures. These include deception, information security, physical security, and signal security. Units that properly use these measures of operations security increase their chances of not being detected, located, and possibly targeted by enemy nuclear attack.*

Concealment *of signatures, profiles, and patterns derived from physical presence, unit activity, and from doing things the same way each and every time is another important aspect of survivability that must be considered by the commander.*

As mentioned earlier, it is not possible nor desirable to attain a degree of dispersion that is directly proportional to the enemy's numbers and yields of nuclear weapons. A unit that is too dispersed loses command and control. The best degree of dispersion is that which permits mission accomplishment while not subjecting the unit to unacceptable risk. In many instances, the same measures that provide security against detection also provide a degree of protection against attack or minimize the effects of being attacked.

Terrain shielding not only minimizes the risk of detection but also reduces the extent and degree of weapon effects. Any cover to include natural vegetation reduces thermal radiation significantly and may even diminish the intensity of nuclear radiation. Natural and manmade terrain features modify blast waves and, particularly on reverse slopes, diminish the intensity of the blast wave.

It is also possible to provide survivability against nuclear attack, especially for close combat forces, by maintaining contact with (interlocking) the enemy. The enemy is much less likely to employ nuclear weapons that may also have an effect on their own forces.

In addition, the active and passive measures to physically reduce vulnerability, training, and prudent task organization assist in maintaining or regenerating combat power. Psychological preparation and cross training in individual skills facilitate uninterrupted performance of critical control functions and key combat tasks. The better prepared the unit is to absorb a nuclear attack, the less effort is required to maintain and regenerate combat power.

The battalion task force described in Chapter 1 did not base their tactics on these six key survivability measures mentioned above. If the commander had balanced the risk of his mission with sound judgment on operations security, concealment, dispersion, shielding, and interlocking, the requirements to regenerate his combat power would have been greatly decreased. If CPT Anderson had cross trained personnel on the S3 staff and been more knowledgeable in the area of radiological contamination, he would not have had to be totally dependent on his chemical officer for advice, Since his chemical officer was seriously injured in the attack, critical nuclear defense information was lost and decisions were not made. A basic understanding of mitigation and survivability techniques could have saved many lives and reduced the total dose of radiation that the battalion received.

Survivability against a nuclear attack is both an individual and unit responsibility and must be continuous and ongoing. There must be constant plarming to achieve a posture that minimizes injuries and damage and maximizes speed of recovery. To enhance the survivability measures described earlier, individuals and units must take active mitigation measures before, during, and after an attack. The rest of this chapter will discuss some of the active mitigation techniques which can be used to increase the survivability of the individual soldier, his equipment, and the unit as a whole.

ACTIVE MEASURES FOR MITIGATING NUCLEAR EFFECTS AND FOR PREPARING PERSONNEL

Troops need to know the facts about nuclear effects. Exaggeration and understatement both undermine efforts to effectively cope with the real effects of nuclear weapons.

Preattack Actions - Personnel Actions When Warned

Friendly units likely to be affected by a planned friendly nuclear strike will be warned by a nuclear STRIKWARN message. While the amount of warning time the units will receive is variable from minutes to hours, there are some actions to be taken that are not time-dependent. Those actions form a strike-warned posture based on the troops' guidance and training.

Protect your eyes — DO NOT LOOK AT THE FIREBALL. The intense light of a nuclear burst can temporarily blind or dazzle you. Covering eyes with the palms of the hands and looking away prior to the flash is the best move.

Minimize and protect exposed skin. Second- or third-degree burns over only 30 percent of the body can cause incapacitation within 24 hours. Uniforms and gloves will reduce the thermal radiation on exposed skin. A scarf or hood can effectively protect the more vulnerable areas of the head and the back of the neck. Assume a position that protects the eyes and exposed skin area of the face, arms, or hands. For example, in your covered position, shelter, or vehicles, keep the arms protected under your body. An effective sunscreen or cream may provide additional protection.

Keep clothes loosely fitted. Skin burns occur more readily where the clothing is in direct contact with or drawn tightly over the skin.

Wear headgear at all times. Headgear can shield the face and eyes from thermal burns and (to a lesser degree) flash blindness, protect your head from debris or impact with solid objects, and provide some limited radiation protection for the head.

Remove dark camouflage face paint. Darkly painted areas can absorb more thermal energy and may burn more rapidly than bare skin.

Wear ear protection. Ear plugs or headsets can be worn to protect you from eardrum rupture or hearing loss. Alternatively, covering ears with cupped hands and opening your mouth after detecting the flash will be effective.

Do not wear the individual protective mask. The individual protective mask should not be used as face protection before a nuclear detonation. Dark colors absorb thermal radiation.

Take temporary cover. Digging in or taking cover provides the best protection against blast, thermal radiation, and initial and residual nuclear radiation. The protection level depends on the type of cover.

- *Digging in saves lives.* Nuclear radiation, not foxhole collapse, is the predominant casualty-producing mechanism for personnel in foxholes. Thus, the primary concern should be shielding from initial gamma and neutron radiation. The thicker the layer-shielding material, the better the overall radiation protection.
- *Earth is a good shielding material.* A properly constructed fighting position offers excellent protection against both initial and residual radiation. Damp earth or concrete will protect from both gamma and neutrons. Only 12 inches of concrete or 24 inches of damp earth are required to reduce neutron exposure by a factor of 10.
- *Dig round foxholes.* Foxhole walls can collapse under the force of the blast wave. Rounded walls hold up better than square or rectangular walls, are easier to dig, and have smaller openings which permit less initial and residual radiation to enter.
- *The smaller the foxhole opening, the better.* A majority of the gamma radiation in the bottom of a foxhole enters through the opening. The smaller, one-man foxhole reduces the gamma radiation 2 to 4 times below the levels in the two-man foxhole.
- *Cover foxholes.* An overhead covering of earth or other material will help prevent the entrance of fallout, reduce blast over-pressure, and reduce thermal and initial radiation in the foxhole. The following figure illustrates the

value of increasing amounts of earth cover for shielding from a free-in-air dose of 2,400 cGy. An open foxhole provides a protection factor of eight because it blocks most line-of-sight radiation and passes only a fraction of the scattered radiation to the bottom of the foxhole.

The shielding values of earth cover for a hypothetical 2,400 cGy free-in-air dose

Depth of Earth	Radiation Protection Factor*	Resultant Dose (cGy)
Man in open	None	2,400
Man in 4-foot deep open foxhole	8	300
• With 0.5 ft of earth cover (6 inch)	12	200
• With 1.0 ft of earth cover	24	100
• With 1.5 ft of earth cover	48	50
• With 2.0 ft of earth cover	96	25

*The flat earth cover of an underground shelter provides much more protection than an equivalent thickness of cover on a similar aboveground structure.

- *Keep shelter openings small.* A blast wave can enter a shelter and be reflected to increase the interior pressure to hazardous levels. This pressure increase depends strongly on the total volume of the shelter. Opening-to-volume ratios of less than 0.03/pounds per foot reduce internal overpressure while larger ratios amplify; for example, assuming you have built a 5 ft x 10 ft x 6 ft shelter, the door and window should not exceed a total area of 9 square feet to prevent pressure multiplication.
- *Protect yourself even inside a shelter.* A blast wave can enter a shelter with great force carrying hot sand and burning debris that can cause burns and missile injuries. Lying face down on the floor provides some protection.

Buildings for cover. Many buildings offer excellent shelter and cover. The strongest structures are heavily framed steel and reinforced concrete buildings. The poorest choices are shed-type industrial buildings that have light frames and long beam spans. Even well-constructed houses are stronger than the latter. Good choices are buildings, such as farm houses, churches, and municipal buildings that are constructed with thick, full-span floor and ceiling beams; heavy roofing tiles; dense, reinforced walls; and in most cases, a full basement (pre-World War 11 European). Look for—

- Wall thicknesses greater than one foot.
- Full basements constructed of concrete or stone.

Beware of windows. Troops behind windows exposed to blast are subject to severe injury from flying glass. Windows also allow the entry of blast winds and create the possibility of troops being blown about or injured by the blast and debris. Window openings should be blocked off with sandbags.

Tents as shelter. Tents are poor shelters against all nuclear effects except thermal radiation and fallout. While they do shield against these two effects, the thermal wave may create a serious fire hazard. In the case of fallout, it is preferable to be sheltered in a structure that puts more shielding between you and the fallout particles.

Tanks provide the best vehicular protection. Lightly armored vehicles, such as armored personnel carriers and self-propelled artillery, provide a lesser measure of protection. To improve this protection—

- *Get as low as possible inside the vehicle.* A position in the bottom of an armored vehicle can reduce by as much as a factor of four the radiation exposure expected as opposed to normal tank crew positions in a tank turret.
- *Keep hatches shut.* An open hatch will expose the crew to the effects of the explosion and could allow entry of fallout particles and scattered gamma radiation. Openings, such

as the main gun breech, vision block covers, and sight and range-finder covers, should be closed.

- *Protect yourself while inside an armored vehicle.* Personnel will be violently thrown about when the blast wave hits. Wearing combat vehicle crewman (CVC) helmets and helmets with chin straps secured will help prevent head injuries. Wear seat belts and shoulder straps when available.
- *Secure loose equipment inside the vehicle.* The blast can turn loose items, such as tools, rifles, and helmets, into lethal missiles.
- *Stop neutron radiation.* Water slows down and absorbs neutrons, but some gamma radiation is given off in the process.
- *Dig in armored vehicles.* Armored vehicles in hull defilade or in trenches or cuts in roadways gain limited line-of-sight radiation protection and considerable blast protection. A hull-down fighting position or trench covering over half of the sides of the vehicle can reduce the gamma radiation by a factor of two and prevent rollover.

Avoid shelter in wheeled vehicles. They provide little or no protection from nuclear effects, and are particularly vulnerable to overturn. Vehicles can, however, make good overhead foxhole covers. A heavy armored vehicle is better than a wheeled vehicle but a wheeled vehicle is better than nothing.

Preattack Actions - Equipment Posture

Much of what has been said about personnel protection applies to equipment. Digging-in, sheltering in buildings, immobilizing loose equipment, et cetera, are good tactics to improve equipment survivability.

To protect tanks and armored vehicles—

- *Rear-on or head-on to the blast is best.* For a blast-only environment, the most survivable configuration for a tank or armored vehicle is head-on to the blast. From the standpoint of total systems survivability, a rear-on orientation to the blast appears preferable because radiation shielding by the engine results in about half as much gamma exposure to the crew as does a side-on or head-on exposure.
- *Cover exterior optical sighting equipment.* At distances where blast damage might be considered insignificant, glass surfaces, such as optical sighting devices, can be sand-blasted, even when pointed away from the blast. Noncritical night vision devices should be turned off, and all other glass surfaces covered or taped.
- *Cover gun muzzles and rotate the turret away from the blast.* Sand and debris can be blown into the gun bore if not covered and/or rotated away from the blast.
- *Remove or secure equipment from the exterior of the vehicle.* Of concern are combustible or explosive items, such as fuel cans,. smoke grenades, and canvas, which may be damaged and/or ignited by blast and thermal effects. Where possible, critical signal and sighting equipment should be secured inside the vehicle. Radio antennas should be removed or tied down.
- *Assume positions behind hills.* Peak pressure and overpressure impulses caused by a blast wave increase significantly as the blast wave travels up an increasingly steep slope. On the reverse or leeward side of the hill they are significantly less. The greatest decrease in air blast pressure occurs part way up the reverse slope. Therefore, the best shielded position is over the brow of a hill and part way down the slope.

Wheeled vehicles can be severely damaged by blast waves. Several steps can be taken to mitigate the blast effect.

- *Place vehicles head-on to blast.*
- *Place two or more vehicles side-by-side and fasten securely together.*
- *Leave brakes and transmissions engaged.* Damage to wheel and tracked vehicles and surrounding equipment and personnel will be less if brakes and transmissions are engaged to restrict vehicle movement.
- *Anchor or tie down vehicle to prevent overturn.*
- *Cushion and secure shock-sensitive equipment in trucks.* Additional shock isolation can be gained by padding items inside of packaging crates, carrying cases, and storage racks. Two to four inches of space should be left

between van or shelter walls and equipment and equipment racks to protect against the rapid inward movement of the wall. Latches, catches, and panels securing equipment to mounting brackets and racks should be locked shut.

PROTECTION DURING NUCLEAR ATTACK

An enemy attack will be an unwarned attack, so survival will largely depend on actions taken prior to attack. Nevertheless, there are some protective actions that can be taken. In the open—

- *Immediately drop to the ground.* Lying on the ground face down with the head towards the blast reduces the chance of injury by 85 percent as opposed to standing, facing the blast wave. Prone personnel will not be picked up and moved by blast winds at peak crushing force below 14 pounds per square inch. Soldiers wearing combat helmets are more protected from the blast wave. Turning the head toward the blast reduces injuries if a soldier is picked-up by the blast wave.
- *Protect eyes and exposed skin areas from dust, sand, and debris.* Drop face-down to the ground or assume a position as low as possible in a covered position, shelter, or vehicle. Place the palms of the hands over the eyes and face and keep the arms protected under the body.
- *Protect ears.* Attempt to cover ears to help prevent eardrum rupture or hearing loss. Continue protecting eyes and face.
- *Stay down.* After the initial shock wave has passed, violent winds will pick up rocks, debris, dust, and equipment, which can cause injuries. Wait for the winds to die and the debris to stop falling before getting up.

In a foxhole, get as low as you can as fast as you can to put more earth between you and the blast. After 60 seconds, the greatest danger from thermal radiation, blast wave, initial radiation, and falling debris will be over.

WHAT TO DO AFTER NUCLEAR ATTACK

To be able to continue the mission and to ensure it is accomplished, we must quickly and correctly respond to a nuclear attack. Remember to—

- *Stay calm.* The violence of the blast winds, burns or injuries, dazzle, and possible concern over radiation exposure may combine to create panic. The blast winds will generally end 1 to 2 minutes after the detonation. Burns, cuts, or bruises, resulting from a nuclear explosion are *no* different than those from conventional explosions, Dazzle is temporary, and vision should return in minutes. The chance of being exposed to a lethal dose of radiation is relatively small unless you are located in an early fallout area.
- *Consider options before moving.* Consider how best to secure and organize equipment, repair and reinforce positions, assist casualties, and begin to prepare or improve protection against possible fallout.
- *Expect some initial disorientation.* The blast wave may blow down and carry away prominent and familiar terrain features, such as trees, buildings, and underbrush, and displace or overturn equipment. There may be many small fires in the area and some smoke and dust.
- *Consider threat doctrine.* The threat will immediately attempt to exploit nuclear strikes with violent, fast-moving armored attacks. Immediately after the effects of nuclear strikes have subsided, PREPARE TO REPULSE ATTACK.
- *Beware of weakened structures and trees.* Movement of personnel and operation of equipment may shake loose additional debris, collapse walls, and topple large trees and branches.
- *Put out fires before they spread.* Secondary fires caused by smoldering debris and overturned stoves and heaters, and damage to

electrical wiring will be the immediate fire hazards. Extinguish these initial fires to preclude having to fight larger fires later.

- *Prepare to continue your mission.* Render first aid, right overturned vehicles, check weapons and clean if necessary, re-lay artillery pieces, et cetera, quickly since THREAT ATTACK IS IMMINENT.
- *Improve your cover if possible.* It is possible that enemy or friendly forces will employ additional nuclear weapons or that you will receive fallout from the first attack. Improved cover is the best protection from both initial and delayed effects. As a minimum, foxholes and shelter openings should be covered to prevent the entry of fallout particles.

Aircraft Protection While Parked

Aircraft on the ground need to be protected from strong winds. In high-nuclear threat environment, rotary-wing aircraft should be parked using terrain masking techniques or in close proximity to built-up areas. Rotor blades should be tied to the aircraft. They should also be covered as much as possible to protect them from fallout. Intelligence personnel can estimate where enemy weapons will be targeted. When friendly nuclear strikes are planned, information on ground zero is given.

Blast is not line-of-sight as with thermal radiation. The blast wave bends around obstacles and rolls over hills the same as normal daily winds. The reverse slope of a hill may lessen the winds substantially. Just because an explosion cannot be seen from behind a hill does not mean the blast wave will not affect that location. Little can be done to protect aircraft from static overpressure. Most damage from static overpressure can be expected with components that are hollow in nature (tail booms, rotor blades, and instrument sight gauges). Taping the windscreen may help, but it is not effective for high-pressure regions. On the ground, fixed-wing aircraft are more vulnerable to gusts of wind than rotary-wing aircraft because of their wings.

Aircraft Protection During Terrain-Altitude Flight

Aircrews can take several immediate actions to protect the aircraft in a nuclear attack. When a nuclear detonation occurs during the day, the aviator will not immediately know the yield or distance. At night, the pilots may become blinded. Immediate action depends on whether the pilot is blinded. During the day there is little chance of flash blindness unless personnel actually focus on the fireball. At night, however, there are substantial risks.

For friendly nuclear strikes, the pilots should mark the areas during premission planning so they stay outside the minimum safe-distance limits. However, once a nuclear detonation occurs, there is no indication who tired it. When a nuclear detonation is observed, the rotary-wing aviator in terrain flight should turn away from the fireball immediately and land the aircraft as soon as possible. Even though nuclear detonation would be visible, the aircraft may not be within range to receive severe damage.

The pilot has to make a quick decision. By turning away from the fireball immediately, the pilot increases the chances of surviving. Also, the missile effect of the plexiglass will be less hazardous to the pilot, because it will travel away from the cockpit. In addition, the aircraft body protects from external missiles. After landing the aircraft, the pilot should remain inside, since the SPH-4 helmet offers little or no ballistic protection. The aircraft should be kept on the ground for several minutes to ensure that either the blast wave has passed or the aircraft is far enough away that it is not affected by the blast. The positive and negative phases of the blast will occur about the same time. Therefore, the pilot should wait until debris stops falling before exiting the aircraft. After checking the airframe to be sure it has no structural damage, the pilot continues the mission.

At night, 10-second flash blindness can occur at distances beyond the range of any other effect, including EMP. For large-yield nuclear detonations, this can occur at the horizon. Flash blindness will occur before individuals can react. Protective measures for rotary-wing aircrews are limited. When the aircrew is wearing the nonmodified PVS-5 that fits flush against the face, the amount of light that can enter around the goggles is reduced. Also, another protective measure is for one pilot to wear an eye patch over one eye. When either of these protections is worn, then one pilot should have enough vision to land the aircraft. For the first few seconds when the pilot removes either the goggles or the eye patch, the immediate action is to gain altitude. This is the same action to take as with goggle failure. If able to see, the pilot should land the aircraft in the nearest suitable area. If no protection is worn, then the pilot must instantly decide about vision limits. If there is little or no vision, then the pilot should gain altitude and attempt to wait until vision returns. If there is some peripheral vision, the pilot should use night-vision techniques to scan the area.

Aircraft Protection During Cruise Altitude

Whether at night or during the day, aviators have the best chance of survival if they turn away from the point of detonation and gain altitude. They should also protect their faces and necks from plexiglass fragments. In fixed-wing aircraft, they have options for protection from flash blindness at night. If there is no EMP damage, they may be able to use the autopilot. In rotary-wing aircraft, they may be able to gain time until vision returns. Nuclear detonations can affect threat electronic ADA components. Placing distance behind the point of detonation and the aircraft and gaining altitude lessen the blast damage. If there are multiple detonations, then the pilot estimates the direction of the smallest detonation. Turning away from the detonation would lessen the possibility of thermal radiation damage to the eyes. After the blast wave passes, the crew should attempt to estimate damage by control feedback, while attempting to land the aircraft as soon as possible to conduct a visual inspection.

MITIGATION OF EMP

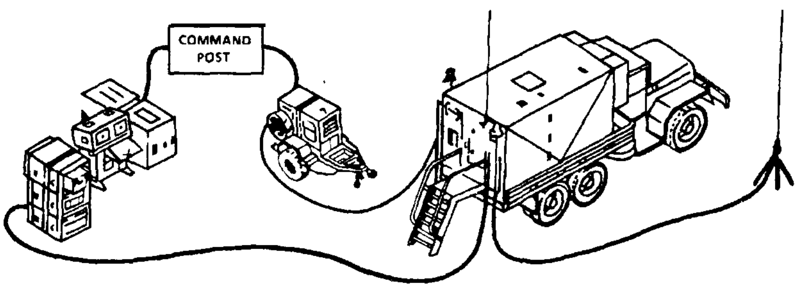
While it is not practical to list all of the possible EMP mitigation procedures to follow in tactical situations, some general guidelines serve as examples of the proper use of equipment to minimize its exposure to EMP and to avoid damaging effects.

Equipment Installation

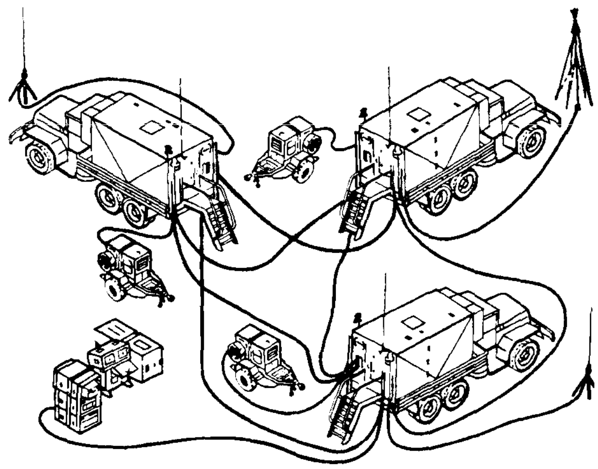
When a choice is available, avoid use of antennas designed for frequencies found in EMP bands or ranges (l0k Hz-100 MHz). These inelude long wires or rods, wide angle doublets, and omni-directional antennas. Small directional antennas and those designed to pick up frequencies above 100 MHz are recommended. If practical, limit the extension of antennas to the minimum amount that is consistent with operational requirements. This limit also will reduce the potential for EMP damage.

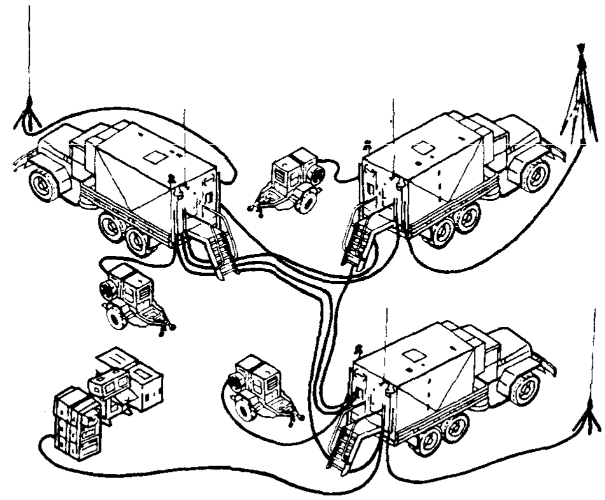
Avoid the creation of wire loops which are very efficient receptors, much like magnetic dipole antennas. Learn to recognize unintentional loops created in the process of installation. For example, a phone line may run from a van through a switchboard to a command post which normally has a power line to a generator. If the same generator has a connection to the van also, the result would be an effective loop antenna as shown in the figure below.

Equipment interconnection showing cable loop



C^3 system configurations



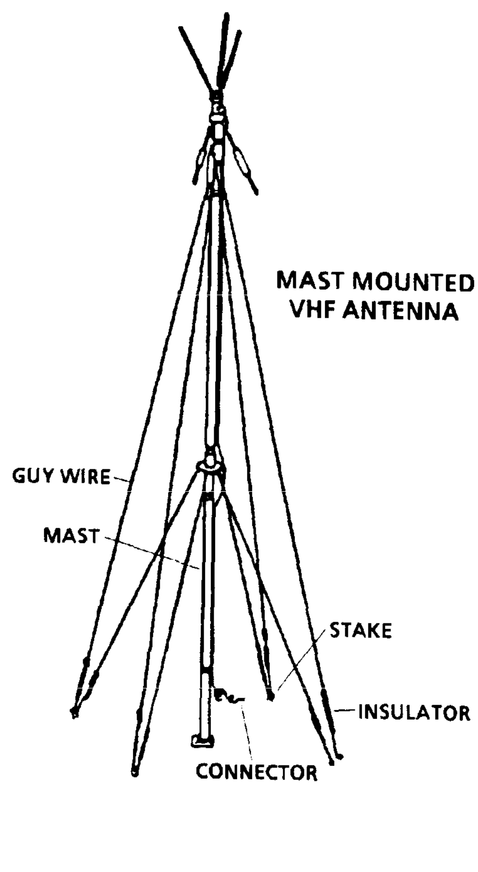


Preferred Method

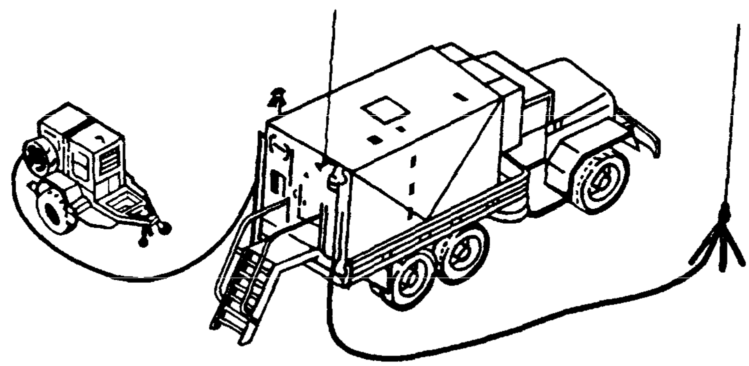
A similar situation may be found in field installations where unintentional loops are created by the interconnecting communication cables between shelters as shown. To avoid cable loops, run interconnecting cables in parallel groups and in as close proximity to one another as cable length and available space will permit, as shown in the preferred figure.

Some large antennas use guy wires as braces to provide stability. These wires can also function as EMP receptors unless the line connections are well insulated, as shown. Cable runs should be kept short and straight as much as possible, as shown in the figure on page 3-10. The length of a cable is a major factor in determining the amount of EMP energy that is picked up and transmitted to the equipment. Cables should be run on the ground and clustered wherever possible. Cables strung on poles can pick up more EMP than those on the ground. Burying cables underground is not worth the effort, since deep burial (10 feet or deeper) is needed to have reasonable EMP protection. Shallow burial will not provide significant protection to EMP although protection against other combat hazards may be enhanced (that is, vehicles, shrapnel, et cetera). Balanced shielded, twisted pair cable should be used whenever practical instead of a coaxial cable.

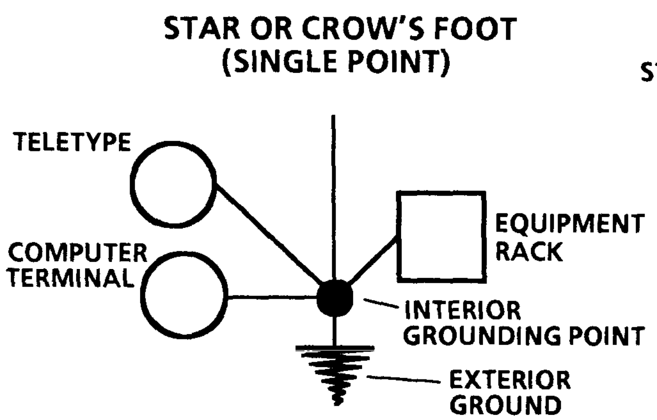
Field installation—VHF antenna

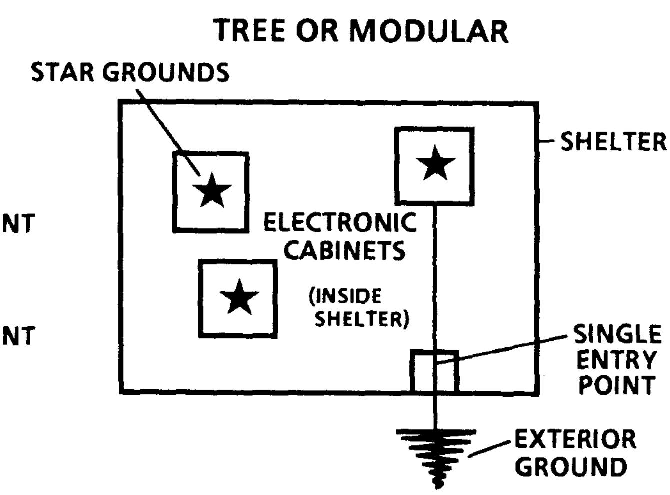


Typical power and communication cable field installation



Grounding of equipment





The proper grounding of equipment, shelters, and cable shields is very important. The best grounding method in field installations is the single point "star" (or "crow's foot") and the "tree" configuration. The "tree" is likely to be the most practical grounding scheme for many systems, as shown in the figure above. Furthermore, a good electrical grounding system must be maintained. In dry areas the ground around the anchor point must be kept moist.

Equipment Maintenance

The EMP hardness that has been built into a system can easily be lost through improper maintenance and parts replacements. Equipment will deteriorate in the course of its normal use and also from its exposure to the field environment. The recommended maintenance procedures and schedules for the equipment as well as for the shelter that houses the equipment must be followed. In addition, using the correct replacement parts is necessary to maintain the hardening. A periodic inspection of such hardening features as metal gaskets around the doors, gaskets around windows and vents, cable penetrations through the walls is essential to maintain the built-in EMP protection. It is also important to keep metal connections clean and to provide a good metal-to-metal contact without gaps or breaks in the connectors. Damage to walls, shields, and enclosures must be repaired without delay, ensuring that a clean metal-to-metal contact is restored. Cable shields that become worn or damaged from heavy use must be repaired or replaced even if the damage does not impair the operation of the equipment. Any break in a protective shield can result in a total loss of EMP protection. The accumulation of rust and dirt on connecting metallic surfaces must be prevented by periodic cleaning. Field units must be discouraged from adding "home-made" connections of any kind to hardened equipment. Even a small break in the shielding designed to provide EMP protection can result in the loss of the protection. In general, the maintenance required to meet chemical warfare requirements will also be advantageous for EMP protection. Vans and cases which are designed to survive in a chemical warfare environment are often airtight with clean contact between edges of the outer surface of the container. This is the same clean contact required to maintain EMP shielding and hardness.

Operational Considerations

In addition to the installation and maintenance procedures outlined above, there are also operational considerations that mitigate EMP effects. If mission conditions permit it, for example, the electronic equipment can be shut down during off-time periods and all antennas and interconnecting external cables disconnected from the equipment. Simply turning the equipment off does not provide the same protection since damaging EMP can still enter through the external connections. In dispersed operations, multiple mode communications should be established. Units generally have access to alternate modes of communication, such as field telephones, messengers, aircraft and vehicle radios, flares, and other signal devices. Most EMP energy is contained in the frequency spectrum below 100 MHz. While many tactical radios operate in this frequency range, others, like microwave systems, do not. Consequently, a microwave grid could survive when other radios fail and could, therefore, be a very effective alternative communications mode. The possible loss of radio communication from the impact of EMP and also from battle damage reinforces the need to develop and practice alternate communication schemes for backup. Because of the very high sensitivity of computer equipment to EMP, special steps have to be taken to provide protection. Computer tapes, discs, and drums tend to be relatively resistant to EMP. However, a copy of all stored data and information must be kept and maintained separately from the system. It serves as back-up in the event that the original tape, disc, or drum is damaged due to EMP-induced operational upsets. For mission essential information, two copies are recommended and they should be stored separately. It is also important to disconnect computer equipment from power lines, and from other external cables when not in use

EMP Field Expedients

Commanders and staff officers have experts within the staff to advise them on EMP mitigation. But like everything else that may affect their combat mission, their personal interest in and attention to the problem is likely to obtain the best results. In the course of conducting business within the command and moving throughout your own and subordinate command posts, there are some EMP mitigation "observables" that will let you know whether or not appropriate EMP mitigation expedients are being used.

The mitigation expedients reflect a necessity for training not only the C-E personnel but equipment operators and maintenance personnel as well. This can range from training computer operators to duplicate computer disks and tapes and providing them separate EMP protection to training equipment operators to properly maintain factory-hardened equipment so it stays that way. The command C-E officer should be of assistance in recommending special training subjects.

While the field expedients will be of some substantial help, a further prudent step is to plan that EMP *will* affect your organization and plan to cope with the problem. One example of such planning is distributing the existing hardened radios in such a manner as to ensure continuity of communications if the organization comes under nuclear attack. For example, all of the hardened radios should not be at brigade headquarters. If there is nuclear attack, the brigade headquarters may be the only echelon capable of communicating but has no subordinates with surviving radios with whom to communicate. See the figure on page 3-12.

Commander's EMP expedient guide

The following list of expedients are suitable for a commander's attention or for incorporation into his guidance:

- Shut down and protect unneeded and redundant radio systems.
- Use ultra high frequency (UHF) and super high frequency (SHF) communications equipment in preference to very high frequency (VHF) equipment when possible.
- Avoid the use of broadband radios. Radios operating at frequencies below UHF are particularly sensitive to EMP.
- Ensure all antenna guy lines are properly insulated. Uninsulated guy lines collect current that will be directed through the antenna to the radio equipment.
- When possible, use antennas that have small radiating elements. The smaller the radiating elements, the less EMP energy will be picked up and, consequently, the less the susceptibility of the associated equipment to EMP.
- Remove exterior conductors. EMP can couple with external metal conductors even if covered with insulation. Potential conductors include radio antennas; wire or cable connections to include handset, external speaker and headset cables, power cables, computer interface connectors, telephone lines, field wire, and extension cords; and other metal conductors, such as pipes, ducts, and fences.
- Avoid the use of commercial sources of power. Commercial power systems and long-haul power grids are more susceptible to EMP damage than mobile power generators.
- Keep cable and wire runs as short as possible. The longer the run, the greater the EMP collected by the cable.
- Keep cable runs as straight as possible—AVOID LOOPS. Loops or bends in cables will pick up more EMP energy than straight runs.
- Keep cables and wires on the ground where practical. Elevating cables and wires may increase the EMP-generated voltages and currents.
- Shield against EMP. Electrical and electronic equipment can be protected from the effects of EMP if placed in a totally enclosed electric shield. Metal ammunition cans and propellant charge cans make excellent storage containers for smaller electronic items, such as handheld calculators and radio components. Placing items in vehicles, vans, and underground shelters provides effective protection. Wrapping small items in metal foil will provide a lesser degree of protection.
- Use shielded twisted pair cables where feasible. Twisted pair cables pick up significantly less EMP energy than do coaxial or unshielded cables.
- Close all openings with metal covers for an effective EMP shield. Command posts consisting of adjacent vans should avoid configurations where doors are permanently left open for convenient passage from one to another.
- Establish good, short, exterior grounds. Exterior grounds can be a source of current collection and thereby increase EMP pickup.
- Use a common ground for equipment. A common ground avoids creating inadvertent ground-loop antennas between van interconnections, individual grounds, and the earth.

RECONSTITUTION

An important aspect to sustaining operations after a nuclear attack is the process and procedures by which the surviving elements of the unit reconstitute themselves and the means used by leaders to sustain the unit's will to fight. While each unit will develop its own internal needs, there are certain principles that serve as guideposts in the planning and execution for reconstitution after an enemy nuclear attack. They are as follows:

- Planned distribution, location, mobility, and operation of hardened radios and electronic equipment; and varied and separate operating schedule.
- Echelonment of elements essential to mission accomplishment; for example, command group location, deputy commander positioning, TOC location, logistics center, mirror-imaging of functional capability, et cetera.

- Precise guidance in command SOPs to ensure subordinate, superior, and lateral passage of command and control in event of personnel and unit loss or isolation.

Clear, complete understanding of the commander's intent is vital to successful operations —defense, offense, and reconstitution —particularly when there has been a loss of key personnel and communications.

CHAPTER 4

PLANNING TRAINING FOR NUCLEAR COLLECTIVE TASKS

To win on the AirLand Battlefield, units will have to realistically train to achieve proficiency in the complexities of integrated warfare. This training should include BNW. As mentioned earlier, BNW is not a separate form of warfare. It is only an additional factor that should be considered along with other factors when waging war. Units should train on nuclear tasks to develop the individual, the leader, and the collective skills in survivability to fight and win AirLand battles. Using this integrated training will ensure the unit has the capabilities necessary to accomplish its primary mission.

The commander is responsible for ensuring that the unit receives all the training it needs to be effective. He can only accomplish this with the proper integrated training. There are critical nuclear collective and individual tasks that the commander must ensure are integrated into his unit's training and training exercises. LTC Smith, the task force commander in the scenario in Chapter 1, failed to train his unit in the nuclear tasks found in their ARTEP/MTP manuals. The purpose of this chapter is to assist commanders with how to incorporate nuclear tasks into their training.

NUCLEAR COLLECTIVE TRAINING TASKS

The critical nuclear collective training tasks for a battalion to ensure it can survive and continue to fight on the integrated battlefield are listed in the following paragraph. These tasks should be a part of all unit ARTEPs / MTPs. The problem is that these nuclear tasks are seldom trained on or evaluated. (NBC evaluations tend to concentrate on the chemical.) This creates an additional problem in that nobody knows how to conduct nuclear collective training tasks so as to meet the conditions or standards of the tasks. Commanders who use the excuse that there are too many other mission essential tasks to train on and time will not allow for integrating nuclear collective training tasks are doing a disservice to their units. The battalion chemical officer should be tasked to work closely with company-level commanders and the staff in integrating nuclear collective training tasks into training exercises and ARTEPs.

The critical nuclear tasks which all units should be proficient in are:

- Preparing for a nuclear attack.
- Responding to the initial effects of a nuclear attack.
- Responding to the residual effects of a nuclear attack.
- Preparing for a friendly nuclear attack.
- Crossing a radiologically contaminated area.
- Performing hasty radiological decontamination.

Proficiency in these tasks is absolutely essential for survival on the integrated battlefield. The task force in the scenario in Chapter 1 would have significantly improved its chances of remaining a viable fighting force and continued its mission had the unit prepared for the integrated battlefield.

Tasks 1 through 6 provide the minimum guidance on the tasks, conditions, and standards for performing the nuclear collective training tasks listed in the paragraph above. The S3 and subordinate commanders in conjunction with the chemical officer should use these tasks as the basis for planning and preparing integrated nuclear training for training exercises.

TASK 1

TASK: Prepare for a nuclear attack (03-3-C206) (FM 3-4).

CONDITION: Platoon receives notice that a nuclear attack is probable and that the platoon must implement actions to minimize casualties and damage.

STANDARD: The platoon hardens positions and equipment, and conducts periodic monitoring.

SUBTASKS:

1. The platoon leader issues a warning order to squads and subordinate elements and all platoon members understand the order.
2. The platoon begins defensive preparation for a nuclear attack.
   a. Places vehicles and equipment for best terrain shielding (hill masses, slopes, culverts, depressions).
   b. Turns off and disconnects nonessential electronic equipment IAW unit SOP.
   c. Ties down essential antennas.
   d. Takes down nonessential antenna leads IAW unit SOP or other guidance.
   e. Improves shelters with consideration for blast, thermal, and radiation effects.
   f. Zeros dosimeters.
   g. Secures loose, flammable, or explosive items and food or water containers to protect them from nuclear weapon effects.
   h. Takes cover in hardened shelters if available.
   i. Uses field expedient shelters.
3. Platoon takes additional actions consistent with the tactical situation.
   a. Conducts periodic monitoring.
   b. Reports all dose rate and dosimeter readings to the higher headquarters.

TASK 2

TASK: Respond to the initial effects of a nuclear attack (03-3-C223) (03-2-C329) (FM 3-3; (FM 3-4).

CONDITION: Element members observe a brilliant flash of light and a mushroom-shaped cloud.

STANDARD: The element takes actions to minimize exposure to the initial effects of a nuclear detonation in its area and continues its mission.

SUBTASKS:

+1. Element takes immediate protective action (O31-5O3-1O18-SMCT).

*+2. Leaders reorganize the unit.
   a. Reestablish chain of command.
   b. Reestablish communications.
   c. Send NBC 1 (Nuclear) report. (The figure on page 4-3 provides an example of the NBC *1* nuclear report.)
   d. Administer emergency first aid.
   e. Evacuate casualties.
   f. Evaluate facilities for protection.
   g. Implement continuous monitoring.
   h. Submit damage assessment to higher headquarters.
   i. Initiate area damage control plan as required.

3. Personnel extinguish all fires before they spread out of control.

*4. Vehicle commanders ensure weapon systems are operational.
   a. Field-strip.
   b. Clean.
   c. Inspect for serviceability.

+5. Soldiers right overturned vehicles.
   a. Check loss of coolant, fuel, and battery fluids.
   b. Perform operator's maintenance to restore moderately damaged vehicles to combat use.

6. All personnel improve cover (if applicable).
   a. Choose dense covering material.
   b. Cover in depth.
   c. Provide strong support.
   d. Cover as much of the opening as practical.

7. Element continues its mission IAW OPORD.

NOTES:
* Indicates a leader subtask.
+ Indicates a critical subtask.

NBC 1 report

LINE	ENTRY
B	NB062634
C	90 degree grid
D	201405 Z
E	N/A
F	N/A
G	AIRCRAFT
H	Surface
J	60 Sec
L	15 degrees
M	N/A

NOTE: Line B,D,H, and either C or F should always be reported; other line items may be used if the information is known.

Meaning of line items in nuclear report

A	Strike serial number.	PA	Coordinates of external contours of radioactive cloud.
B	Position of observer.	T	H + 1 date-time group.
C	Direction of attack from observer.	Q	Location of reading.
D	Date-time group for detonation.	R	Dose rate.
E	Illumination time.	S	Date-time group of reading.
F	Location of area attacked.	T	H + 1 date-time group.
G	Means of delivery.	U	1,000-cGyph contour line.
H	Type of burst.	V	300-cGyph contour line.
I	N/A	W	100-cGyph contour line.
J	Flash-to-bang time.	X	20-cGyph contour line.
K	Crater present or absent and diameter.	Y	Direction of left and right radial lines.
L	Cloud width at H + 5.	Z	Effective wind speed. Downwind distance of zone 1.
M	Stabilized cloud top or cloud bottom angle at H + 10, or cloud or bottom top height.	ZA	N/A
N	Estimated Yield.	ZB	N/A
O	Date-time group for contour lines.	ZI	Effective wind speed. Downwind distance of zone 1.
P	Radar purposes only.		

TASK 3

TASK: Respond to the residual effects of a nuclear attack (03-3-C222) (03-2-C328) (FM 3-4; FM 3-100).

CONDITION: The element is located within a predicted fallout area. The unit mission does not allow movement from the predicted fallout area.

STANDARD: The element takes actions to minimize exposure to residual radiation.

SUBTASKS:

+1. Element prepares for fallout.

a. Individuals wear protective masks or cover their noses and mouths with handkerchiefs or clean rags; roll sleeves down; and wear gloves.

b. Cover equipment, munitions, POL, food, and water containers or place them inside shelters or vehicles.

c. Use shelters, closed vehicles, or available shielding to protect personnel from fallout.

d. Maintain continuous monitoring using available survey instruments.

+2. Designated personnel monitor fallout.

a. Maintain total dose information, using available total dose rate instruments.

b. Ensure exposure is minimized while commander determines if relocation to a clean area is necessary or possible.

c. Calculate optimum time of exit.

d. Unit leader sends NBC 4 reports to higher headquarters as required, using secure means when possible.

*3. Commander develops a contingency plan.

a. Plan is based on guidance from higher headquarters, the mission, and previous radiation exposure.

b. Plans for rotation of individuals to minimize exposure.

c. Ensures that entry or exit procedures are followed to minimize vehicle contamination.

+4. Element continues mission.

NOTES:

* Indicates a leader subtask.
+ Indicates a critical subtask.

The NBC 3 report is sent down the chain of command and is used by the battalion to determine where the expected contamination from fallout is located.

NBC 3 report (immediate warning or expected contamination)

LINE	NUCLEAR
A	A024
D	201405Z
F	LB187486 Est
H	Surface
N	50
PA	N/A
PB	N/A
Y	0272-0312
Z	019-025-05
ZA	N/A
ZI	010,0017 0028,007

NOTES:
1. If the effective windspeed is less than 8 KMPH, line Z of the NBC 3 (nuclear) consists of three digits for the radius of zone 1.
2. If the windspeed is less than 10 KMPH, line PA of the NBC 3 (chemical) is 010, which is the radius of the hazard area.
3. Line Z1 is used only for NUCWARN reports. When line Z1 is used, line Z is not used.

NBC 4 report (reconnaissance, monitoring, and survey results)

LINE	NUCLEAR
H	N/A
Q	LB123987
R	35
S	201535Z

NOTES:
1. Line items H, Q, R, and S may be repeated as often as necessary.
2. Radiation dose rates are measured in the open, with the instrument 1 meter above the ground.
3. In line R, descriptive words, such as "initial," "peak," "increasing," "decreasing," "special," "series," "verification," or "summary" may be added.
4. If readings are taken inside a vehicle or shelter, also give the transmission factor.

Protection requirements for friendly nuclear strike

Area	Negligible Risk to	Zone of Warning	Protection Requirement
DGZ to MSD 1	N/A	1	Evacuate all personnel.
MSD 1 to MSD 2	Warned protected personnel.	2	Personnel in buttoned-up tanks or foxholes with overhead cover.
MSD 2 to MSD 3	Warned exposed personnel.	3	Personnel prone on ground with all skin covered.
MSD 3 and beyond	Unwarned exposed personnel.	N/A	No protective measures except dazzle.

The NBC 4 report shows the reading obtained by continuous monitoring of radiation at the company and below level. The NBC 4 report is sent on a continuous basis to the battalion as long as readings which are at least twice background are received.

TASK 4

TASK: Prepare for a nuclear attack (03-3-C206) (FM 3-4).

CONDITION: The platoon receives notice that a nuclear attack is probable and that the platoon must implement actions to minimize casualties and damage.

STANDARD: The platoon hardens positions and equipment, and conducts periodic monitoring.

SUBTASKS:

*+1. The platoon leader issues warning order to squads and subordinate elements and all platoon members understand the order.

+2. The platoon begins defensive preparation for a nuclear attack (0311503-1018).

a. Places vehicles and equipment for best terrain shielding (hill masses, slopes, culverts, depressions).

b. Turns off and disconnects nonessential electronic equipment IAW unit SOP.

c. Ties down essential antennas.

d. Takes down nonessential antenna leads IAW unit SOP or other guidance.

e. Improves shelters with consideration for blast, thermal, and radiation effects.

f. Secures choose, flammable, or explosive items and food or water containers to protect them from nuclear weapon effects.

g. Personnel take cover in hardened shelters if available.

h. Personnel use field expedient shelters.

+3. The platoon takes additional actions consistent with the tactical situation. Continues periodic monitoring.

a. Reports all dose rate and dosimeter readings to the higher headquarters.

NOTES:
* Indicates a leader subtask.
\+ Indicates a critical subtask.

TASK 5

TASK: Cross a radiologically contaminated area (03-3-C208) (FM 3-3) (FM 3-4) (FM 3-100).

CONDITION: The platoon receives orders to prepare for crossing a radiologically contaminated area. Approximate boundaries of the area are known or marked.

STANDARD: The platoon crosses the contaminated area by the shortest, fastest route available without receiving radiation casualties or spreading contamination.

SUBTASKS:

+1. The platoon prepares for the crossing.

a. Identifies extra shielding requirements. (For example, vehicles use sandbags on the floor.)

b. Places externally stored equipment inside or covers it with available materiel.

c. Directs individuals who may be exposed to radioactive dust particles to wear a protective mask or to cover their noses and mouths with handkerchiefs or clean rags, roll sleeves down, and wear gloves.

d. Receives operational exposure guidance (OEG) from commander (turn back dose/turn back dose rate).

Significance of predicted fallout zones

Exposed, unprotected people may receive the following doses from fallout.	
Zone 1 - Immediate operational concern.	More than 150 cGy within 4 hours.
Zone 2 - Secondary hazard.	Less than 150 cGy within 4 hours. Less than 50 cGy within 24 hours.
Outside the predicted area	No more than 50 cGy in 24 hours. No more than 150 cGy for an indefinite period.

NBC 5 report (areas of actual contamination)

LINE	NUCLEAR
A	A0012
D	2009002
H	Surface
S	2010052
T	2015052
U	N/A
V	ND651455 ND810510 ND821459 ND651455
W	ND604718 ND991686 ND114420 ND595007

NOTE: This report is best sent as an overlay if time and the tactical situation permit.

e. Leaders ensure radio equipment operators check instruments.

f. Drivers, vehicle commanders, leaders, and radio equipment operators prepare for the crossing.

g. Starts continuous monitoring.

+2. Platoon crosses the area.

a. Avoids stirring up dust.

b. Keeps out of dust cloud by increasing the intervals and distances between vehicles.

c. Conducts movements as rapidly as possible (tracked vehicles should be buttoned up).

+3. Platoon performs hasty decontamination of personnel and equipment.

NOTES:
* Indicates a leader subtask.
\+ Indicates a critical subtask.

TASK 6

TASK: Perform radiological decontamination (03-3-C207) (FM 3-5).

CONDITION: The platoon is contaminated while crossing a radiologically contaminated area or from radiological fallout.

STANDARD: The platoon decontaminates personnel and equipment within the negligible risk level. Contamination level is below 0.33 cGy per hour.

SUBTASKS:

+1. The platoon leader directs individual sustainment decontamination procedures.

a. Procedures start within 15 minutes.

b. Personnel remove contamination and dispose of it.

c. Plans for detailed decontamination procedures.

d. Platoon performs detailed decontamination when time permits.

*+2. Platoon leader directs vehicle and equipment hasty decontamination procedures (03-5030.00-2007).

a. Procedures start within 30 minutes if mission permits.

b. Personnel remove contamination and dispose of it.

c. Plans for detailed decontamination procedures when mission permits.

d. Platoon performs detailed decontamination when time permits.

*+3. Decontamination team leader updates platoon radiation status.

a. Reads dosimeters.

b. Averages total dose readings.

c. Rounds off to nearest centigrade.

d. Reports results to higher headquarters.

e. Zeros all dosimeters using PP-1578/PD.

+4. Platoon resumes mission operations.

a. Continues their mission operations.

b. Continues to monitor the NBC situation.

c. Replenishes decontamination supplies.

NOTES:
* Indicates a leader subtask.
\+ Indicates a critical subtask.

TRAINING EXERCISES

Training exercises are essential team-building tools in preparing units and soldiers to fight and survive on the integrated battlefield. FM 25-4 describes in detail how to conduct training exercises and should be used along with this manual, FM 25-50, and unit ARTEP/MTP manuals when developing training exercises. The commander and his staff have many kinds of training exercises to assist them in developing, sustaining, and evaluating their unit's ability to perform its nuclear tasks.

The *map exercise (MAPEX)* allows the commander to train his subordinate commanders and staff to perform essential integrating and control functions based on his decisions under simulated wartime conditions. The commander can begin integrating nuclear collective tasks into his training exercises with the MAPEX. For example, the commander can create integrated tactical situations by utilizing either nuclear STRIKWARNS or NBC reports causing his subordinate commanders and staff to make decisions.

Situation 1: The battalion is in a forward assembly area waiting to conduct a counterattack when it receives an NBC 3 report which shows that it is in the downwind hazard area for residual radiation.

Situation 2: The battalion is in defensive positions when it receives a nuclear STRIKWARN which shows forward elements of the battalion are within minimum safe distance (MSD) zone 1 and the main body is within minimum safe distance zone 2.

In both cases the information presented must be analyzed and a decision made on whether units must be moved or, if not, what avoidance measures must be taken to prevent casualties or equipment damage.

The *tactical exercise without troops (TEWT)* is used by the commander to train his subordinate leaders and staff on actual terrain without the troops being present. Each of the situations provided below allow the commander to integrate nuclear collective tasks anywhere into the TEWT as part of normal operations.

Situation 1: The battalion has completed an attack across a radiologically contaminated area. The radiation hazard to personnel does not allow time for the radiation to decay to a minimum acceptable level. Time is available and the tactical situation will provide the opportunity for decontamination operations.

Situation 2: The battalion is moving from the forward assembly area to its primary positions in preparation for a deliberate attack and must cross a radiologically contaminated area to get there.

Situation 3: The battalion is to move into a position for a deliberate attack that is to be be preceded by a friendly nuclear strike. The nuclear STRIKWARN message shows the battalion will be in MSD zone 2.

As described in FM 25-4, "For a successful TEWT, the (subordinate) commander (or staff) must select the proper terrain and reconnoiter it." The situations above enhance the requirement to select the proper terrain through the requirement to consider BNW.

The *command post exercise (CPX)* is used by the commander to train his subordinate leaders and staff in combined arms integration. It also trains them to execute combat support (CS) and combat service support (CSS) activities and tactical emplacement and displacement of CPs. Using either the situations previously described in the MAPEX and TEWT or those presented below, the commander can integrate his nuclear collective tasks with his conventional collective tasks.

Situation 1: Fallout is now complete in the division area, but monitoring has not provided a sufficient picture of the radiation hazard. The division has directed each battalion to do a radiological reconnaissance of its area.

Situation 2: The battalion has been hit by numerous nuclear blasts. The battalion commander wants to know the status of all his units, but his radios are inoperative from HEMP.

CPXs can also be used by the commander to have his subordinate commanders and staff train on the procedures for passing and utilizing NBC reports or nuclear STRIKWARNS and/or for coordinating logistic or medical support.

The *situational training exercise (STX)* is a mission related exercise designed to repetitively train units to the standard preferred method for carrying out one collective task or a closely related group of tasks. An STX may be designed on the thin slice principle with CS elements represented with only a portion of their personnel. Preliminary training for the STX should be progressive in nature, starting with drills and brought to a high level of proficiency with MAPEXs, TEWTs, and CPXs. The final objective of the STX is to prepare units for larger scale exercises, such as field training exercises (FTXs). FM 25-3 provides additional guidance on conducting STXs.

The *field training exercise* (FTX) is the only exercise that fully integrates the total force in a realistic combat environment. FTXs involve combat, CS, and CSS units to include battle staff, survivability, and combined arms training. FTXs encompass battle drills, crew drills, STXs, and other types of training to reinforce individual and collective task integration.

Provided in the following paragraphs are examples of scenarios for one FTX and two STXs to show how to integrate nuclear training into these exercises. The exercises are also designed to show how the TF in the scenario in Chapter 1 could have trained in BNW and enhanced its chances of survivability and mission continuation success.

Exercise	Title
FTX	Conduct Offensive Operations
STX-A	Conduct A Tactical Road March
STX-B	Occupy An Assembly

The FTX and STXs are only limited examples of how to integrate nuclear training into exercises and are not designed to be all inclusive. Commanders should include nuclear collective tasks into exercises wherever possible to ensure maximum training benefit.

BATTALION TASK FORCE FIELD TRAINING EXERCISE

Conduct Offensive Operations

1. **Objective.** This FTX is designed to train the battalion TF in the conduct of offensive operations. It provides the battalion commander, subordinate commanders, and staff leaders practice in planning, coordinating, and controlling combat operations. This FTX is designed as a free-play, integrated exercise which provides a flexible training vehicle for training critical wartime tasks. The specific sequence of events will vary with the commander's training objectives. The battalion commander should modify the sequence of events through his selection of primary and supporting events to meet his specific training objectives. This FTX will require the TF to develop proficiency in conducting a tactical road march, occupying a forward assembly area, conducting a deliberate attack, and occupying and defending a position.

2. **Interface.** This FTX is supported by the following:
   - STX A—Conduct a tactical road march.
   - STX B—Occupy a forward assembly area.
   - STX C—Conduct a deliberate attack.
   - STX D—Occupy and defend a position.

3. **Training Enhancers.**

   a. Preliminary training. This FTX is a high-cost, high-overhead exercise which will be conducted in the field under simulated combat conditions. Since this is a high-cost exercise, extensive planning and preparation are required to ensure the exercise training objectives are met. The TF will conduct MAPEXs, TEWTs, and CPXs based on an integrated scenario that is the same or very similar to the integrated scenario chosen for the FTX. During these exercises, to the extent possible, the controllers and evaluators should be the same personnel that will be employed during the FTX.

   b. Tips for training.

      (1) Nuclear collective tasks must be integrated throughout the exercise.

      (2) Threat action should be based on current threat doctrine.

      (3) Normal attachments and direct support elements should participate in exercises.

      (4) Trained personnel should act as radiation casualties.

      (5) The conduct of the exercise should be continuous, with administrative breaks limited to ensuring that required safety and damage control is maintained.

4. **General Situation.** The battalion TF has been given the mission to conduct a deliberate attack in support of a division attack on enemy forces occupying a key objective along the division axis of advance. The TF will operate under the threat of NBC attack, hostile air, indirect fire, and electronic warfare.

5. **Special Situation.**

   a. The battalion TF commander has just issued the following FRAGO:
   The battalion is to conduct a deliberate attack on enemy forces located in the vicinity of the town of Aberg, at grid MC 16981542. The TF will cross the LD at 0700, 1 May 19 ____, to destroy the enemy strongpoint in the town of Aberg, where the TF will establish defensive positions to prepare for a possible enemy counterattack.

   b. The TF commander alerts his companies and gives them route of march, start points, checkpoints, and release points for movement to the forward assembly area. The battalion S3 briefs subordinate commanders on the situation. He informs them that their units must cross a radiologically contaminated area and reminds them that the enemy will employ chemical and nuclear weapons at any time.

6. **Support Requirements.**

a. Evaluators. This FTX will be conducted under the control of the TF commander who will be the primary trainer and evaluator. Evaluators should be assigned down to the squad or section level to assist the battalion commander in evaluating the FTX. Each evaluator must be familiar with the requirements in the nuclear collective tasks. He should be supported by the evaluation plan which will guide his actions during the exercise and support the TF commander's overall evaluation plan.

b. Radiation casualties. Those soldiers selected to serve as casualties should be trained in how to act as radiation casualties.

c. Maneuver area. A training area with the minimum dimensions of 15 x 30 kilometers is desirable for this exercise.

d. Consolidated support requirements. This section will include vehicle and communications requirements, personnel support requirements, or any other requirements to support the FTX.

7. **T&EO Sequence.** The figure below shows the battalion-level T&EO and time allocations that may be used to evaluate this FTX. Refer to company- and platoon-level MTPs for the T&EO that supports the selected scenario.

SITUATIONAL TRAINING EXERCISE A

Conduct a Tactical Road March

1. **Objective.** This situational training exercise is designed to provide the TF practice in the conduct of a tactical road march. It also provides the commander and staff practice in planning, coordinating, and controlling combat operations.

2. **Interface.** The STX supports the TF FTX for offensive operations.

FTX T&EO sequence

Event	Task	Time Allocated
1	Conduct a tactical road march.	4 Hours
2	Cross a radiologically contaminated area.	2 Hours
	Conduct after-action review.	2 Hours
3	Occupy a forward assembly area.	3 Hours
	Conduct after-action review.	2 Hours
4	Respond to the initial effects of radiation.	3 Hours
	Conduct after-action review.	2 Hours
5	Conduct a deliberate attack.	6 Hours
	Conduct after-action review.	2 Hours
6	Occupy and defend a position.	4 Hours
	Conduct after-action review.	2 Hours
7	Prepare for a friendly nuclear strike.	2 Hours
	Conduct after-action review.	2 Hours
	Total	36 Hours

3. **Training.**

a. Leader training for the STX may be accomplished by any of the following methods:

(1) A MAPEX combined with a sandtable exercise. The map and sandtable should replicate the actual terrain. Critical points, such as start points, routes, and areas for AARs, can tentatively be selected during this exercise. Route selection should be contingent on finding a route which minimizes exposure time through a radiologically contaminated area.

(2) A TEWT over the area where the STX is to be conducted. During this exercise, the STX scenario can be rehearsed with squad or section leaders. Also the selection of tentative critical points or routes can be reconnoitered and adjusted.

b. Tips for leader training.

(1) Familiarize yourself with the doctrine pertaining to tactical road marches (FM 5-36).

(2) Review the unit's SOP and ensure that subordinate leaders and staff are familiar with its procedures.

(3) Familiarize yourself with the procedures for crossing a radiologically contaminated area and include the procedures for hasty radiological decontamination.

4. **Training Enhancers.**

a. As the TF demonstrates its proficiency in the STX task, the commander can consider the following options:

(1) With OPFOR interdiction.

(2) During nighttime.

(3) Cross-country movement.

b. The TF must meet those standards listed in the T&EO as conditions become more realistic.

5. **General Situation.** The TF is moving from the brigade rear to a forward assembly area in preparation for a deliberate attack. The TF must cross a radiologically contaminated area to get to the forward assembly area.

6. **Special Situation.**

a. The TF commander has just issued the following FRAGO:

The TF will move to a forward assembly area in the vicinity of Wrightsville, grid MC 12641230. SP for the first unit is 1000 hours. An overlay with company assembly areas and a radiological contamination area is provided.

b. Subordinate commanders begin the planning process for the tactical road march-. The exercise ends when they have completed the road march to include crossing the contaminated area. An after-action review will be conducted prior to occupying the forward assembly area.

7. **Support Requirements.**

a. Evaluators. This STX will be conducted under the control of the TF commander who will be the primary trainer and evaluator. Evaluators should be assigned down to the squad or section level to assist the battalion commander in evaluating the STX. Each evaluator must be familiar with the requirements in the nuclear collective tasks. Each evaluator should be supported by the evaluation plan which will guide his actions during the exercise and support the TF commander's overall evaluation plan.

b. Consolidated support requirements. This section will include vehicle and communications requirements, personnel support requirements, or any other requirements to support the FTX.

8. **T&EO Sequence.** The figure on page 4-12 shows the company level T&EO and time allocations that may be used to evaluate the STX. Refer to battalion- and platoon-level MTPs for T&EO that supports the selected scenario.

SITUATIONAL TRAINING EXERCISE B

Occupy an Assembly Area

1. **Objective.** This situational training exercise is designed to provide TF elements practice in establishing a defensive perimeter as part of the TF perimeter. It also provides subordinate commanders and other key personnel with realistic training in planning, establishing, and directing unit fires in the defense.

STX A T&EO sequence

Event	Task	Time Allocated
1	Conduct mission analysis.	1 Hour
2	Issue a FRAGO.	30 Minutes
3	Prepare to move.	1 Hour
4	Conduct a tactical road march.	4 Hours
5	Cross a radiologically contaminated area.	2 Hours
6	Conduct after-action review.	2 Hours
	Total	10.5 Hours

2. **Interface.** The STX supports the TF FTX for offensive operations.

3. **Training.**

a. Leader training for the STX may be accomplished by any of the following methods:

(1) A MAPEX combined with a sandtable exercise. The map and sandtable should replicate the actual terrain. Critical points, such as key terrain, avenues of approach, and areas for AARs, can tentatively be selected during this exercise. Position selection should be contingent on placing personnel and equipment so as to minimize exposure to the effects of nuclear weapons.

(2) A TEWT over the area where the STX is to be conducted. During this exercise, the STX scenario can be rehearsed with squad or section leaders. Also the selection of tentative critical points and positions can be reconnoitered and adjusted.

b. Tips for leader training.

(1) Familiarize yourself with the doctrine pertaining to occupation of an assembly area (FM 17-15 Test).

(2) Review the unit's SOP and ensure that subordinate leaders and staffs are familiar with its procedures.

(3) Familiarize yourself with the procedures for mitigating the effects of nuclear weapons and how to respond to the initial effects of nuclear weapons.

4. **Training Enhancers.**

a. As the TF demonstrates its proficiency in the STX task, the commander can consider the following options:

(1) With OPFOR interdiction.

(2) During nighttime.

(3) Using nuclear and chemical weapons together.

b. The TF must meet those standards listed in the T&EO as conditions become more realistic.

5. **General Situation.** The TF has moved from the brigade rear and is now moving into its forward assembly area in preparation for a deliberate attack. One hour after the final TF element closes, the enemy fires a nuclear round northeast of Wrightsville requiring the TF elements to respond to the nuclear round's initial effects.

6. **Special Situation.**

a. The TF commander has just issued the following FRAGO:

Units will coordinate with TF headquarters and adjacent units to ensure complete defensive coverage of the TF forward assembly area. Units should be prepared for nuclear attacks by the enemy and position personnel and equipment accordingly.

b. Subordinate commanders and their key leaders will organize the assembly area, assign defensive sectors for each element, and position observation posts. An after-action review should be conducted after each unit has occupied its forward assembly area

STX B T&EO sequence

Event	Task	Time Allocated
1	Quartering party prepares assembly area.	1 Hour
2	Quartering party guides main element.	1 Hour
3	Occupy assembly area.	3 Hours
4	Coordinatre with higher headquarters and adjacent units.	1 Hour
5	Develop defensive plan.	1 Hour
6	Conduct after-action review.	2 Hours
7	Respond to the initial effects of radiation.	3 Hours
8	Conduct after-action review.	2 Hours
	Total	14 Hours

and after the nuclear attack, prior to conducting the deliberate attack.

7. **Support Requirements.**

a. Evaluators. This STX will be conducted under the control of the TF commander who will be the primary trainer and evaluator. Evaluators should be assigned down to the squad or section level to assist the battalion commander in evaluating the STX. Each evaluator must be familiar with the requirements in the nuclear collective tasks. He should be supported by the evaluation plan which will guide his actions during the exercise and support the TF commander's overall evaluation plan.

b. Consolidated support requirements. This section will include vehicle and communications requirements, personnel support requirements, or any other requirements to support the FTX.

8. **T&EO Sequence.** The figure above shows the company-level T&EOs and time allocations that may be used to evaluate the STX. Refer to battalion and platoon level MTPs for T&EOs that support the selected scenario.

PLANNING AND PREPARING NUCLEAR TRAINING

Planning for nuclear warfare training should be done by experienced personnel who have knowledge of AirLand Battlefield operations as well as the technical aspects of nuclear warfare. To be effective, the situations must provide commanders, staffs, and units with an opportunity for realistic training and experience in offensive and defensive tactical employment of nuclear weapons. At the battalion level, nuclear training should concentrate on defensive operations and the protection of the unit and soldiers from the effects of nuclear weapons. However, the commander and staff should not neglect a basic understanding of US nuclear weapon employment guidance so that they can be prepared to exploit the effect of these weapons on the enemy. FM 100-30 provides guidance on offensive nuclear operations. The situations must be logical and should resemble those which one could encounter on the AirLand Battlefield.

Planning for nuclear training in an FTX, CPX, or ARTEP is no different from planning for other forms of combat. The mission is determined; the aggressor's capabilities are analyzed and balanced against the means available; and then a plan is developed to accomplish the mission. The commander must give his overall guidance on what he expects during a training exercise. If the commander does not emphasize integrated training, it most likely will not be done. The S3 in coordination with the chemical officer and other staff officers then prepares the overall detailed plan covering all phases of the exercise. The chemical officer must be in the planning process from the beginning so that nuclear training can be effectively integrated into the training exercise. When planning the integration of nuclear training into exercises, the S3 and his staff must consider all aspects of personnel and administration; intelligence; operations and training logistics; and umpiring necessary to conduct this type training. It must be done early on in the planning cycle and must involve the entire staff, not just the chemical officer.

Umpiring of battalion-level exercise will normally be performed by personnel from the brigade training and operations section. Guidance for umpiring and evaluating nuclear training is found in FM 25-50. It is necessary that an evaluator knowledgeable in the standards of the nuclear tasks 1 to 6 be at each company in the battalion and also at the battalion headquarters. He will evaluate and provide training guidance as the sequence of events for nuclear training takes place. The nuclear warning and reporting system is most critical for survival of a unit during integrated warfare. Proper evaluation and training of each company in a battalion on the preparation and dissemination of NNBC 1 and NBC 4 reports will be important tasks of each umpire. The commander and staff should ensure that umpires are proficient to evaluate and train the required nuclear tasks.

Nuclear training during an FTX or ARTEP will begin by the initiation of a nuclear event that causes the battalion to react accordingly and is based on the standards listed in tasks 1 to 6. The nuclear event should be integrated into the mission essential task list (METL) prepared by the S3 for the entire exercise. Nuclear events should be preceded by intelligence indicators that should notify the battalion of the possibility of a nuclear strike. The nuclear event can be initiated by the chemical officer using one of the following methods:

- *NBC Warning and Reporting System.* The use of the NBC warning and reporting system to initiate a nuclear event is the easiest method. It is fairly accurate for evaluating battalion-level responses to company-level input. The chemical officer or other umpire at one of the companies issues an NBC 1 nuclear report to one of the soldiers in the company and evaluates the actions taken. Umpires at other companies in the battalion record the reaction of the unit.
- *M142 Nuclear Burst Simulator* (DODIC-L605). The M142 nuclear burst simulator provides realistic training for soldiers on reacting to the effect of a nuclear strike. The M142 consists of a 55-gallon drum with a gunpowder container, 50 meters of connecting wire, an instruction book, and a sound device. When detonated, the M142 forms a dark gray mushroom cloud and makes a loud sonic noise. This device is requisitioned through the brigade ammunition officer and provides an excellent means of initiating a nuclear event and evaluating task 2.
- *AN/TDQ-TI(V) TDQ-1 Radiation Simulator* (NSN 6930-01-060-1627). The AN/TDQ-TI(V) simulates the effect of both initial and residual radiation. This device can be obtained from the training and support center (TASC) or at major Army training centers. This device consists of specially adapted IM-174 radiaometers, antennas for transmitting electronic signals to simulate radiation, and “hot spot” transmitters. The transmitter can be adjusted to simulate the full-scale range of the IM-174. Because of this, units that are closer to the simulated nuclear strike or within the fallout pattern will receive a higher reading on their IM-174.

RADIOLOGICAL AVOIDANCE TECHNIQUES

The information below provides the commander and his staff an easy method for determining possible radiological hazards to their unit and a means of avoiding them.

SIMPLIFIED FALLOUT PREDICTION

The simplified fallout prediction system provides small unit commanders an immediate estimate of the fallout hazards. A current effective downwind message, nuclear burst information (NBC 1 or NBC 2 nuclear report), and a simplified fallout predictor (M5A2 or field expedient) are needed to prepare a simplified fallout prediction. It is superseded on receipt of the NBC 3 nuclear report from higher headquarters. To use the simplified fallout prediction system, a unit should—

- Train on the system.
- Establish communications with the battalion to maintain current wind data.

- Have the necessary forms and overlays ready for use. These include NBC 1 nuclear report formats, effective downwind message formats, and the M5A2 fallout predictor. Iff the M5A2 fallout predictor is not available, a field-constructed predictor can be used.

The steps used in preparing a simplified fallout prediction are as follows:

- Information required: NBC 2 and effective downwind message.
- Record DTG, direction, and GZ on M5A2.
- Take zone 1 from the predictor, draw arc on M5A2 and label.
- Zone 2 = 2 x zone 1, draw an arc and label.
- Draw tangents from cloud radius to end of zone 1.
- Darken perimeter.
- Draw time of arrival arcs and label.
- Orient azimuth on predictor with grid north.

If windspeed is less than 8 KMPH for a given yield group as indicated on the effective downwind message, zones 1 and 2 will be two concentric circles.

RADIOLOGICAL MONITORING

Radiological monitoring is done to determine the presence and intensity of the residual radiation hazard. It is possible for a unit to be outside of zones 1 and 2 as indicated by the simplified fallout prediction and still receive radiation. Since nuclear weapons may be employed at any time on the battlefield, all units monitor for radiation upon initial deployment. Monitoring provides early warning and useful radiological information to units at all levels. There are two types of area monitoring which commander's must assure their units are trained in. They are periodic monitoring and continuous monitoring.

Periodic monitoring is frequent checks of the unit area for radiation. Periodic monitoring (readings once every hour) is done—

- When intelligence indicates a threat of nuclear war.
- When nuclear war has been initiated.
- When continuous monitoring falls below 1 cGy/hr. Periodic monitoring assures the commander that the unit area is not contaminated. It warns the unit if contamination arrives.

Continuous monitoring is the surveillance for radiation in the unit area or position. Continuous monitoring is done—

- When a nuclear detonation is seen, heard, or reported.
- During all recon operations.
- When periodic monitoring records 1 cGy/hr or higher.
- When the unit is moving.
- When ordered by the unit commander. Both periodic monitoring and continuous monitoring can be performed using the direct or indirect technique.

The direct technique is the simplest and most precise of the monitoring techniques. A radiacmeter is used to get an unshielded dose rate. Determine the unshielded (outside) dose rate by standing with the IM-174 held waist high and rotating your body 360 degrees. The highest reading observed is recorded as the dose rate. Take this reading in the open at least 10 meters away from buildings or other large structures or objects that may shield out a portion of the radiation. Direct monitoring is used—

- While monitoring for the initial detection or arrival of fallout.
- When in low dose rate areas.
- When determining unshielded (outside) ground dose rates for transmission or correlation factors (CF).
- When verifying the contamination status of a new position.
- While moving through a contaminated area on foot. Direct readings are used when conditions and operational exposure guidance permits.

The indirect technique is done inside shelters or vehicles. This allows the unit to measure radiation levels and still keep exposure to a minimum. Indirect is the preferred technique when operating in a contaminated area. It is used whenever dose rates are high enough to be read inside the shielded location.

When the indirect technique is used, most of the readings are taken inside the vehicle or shelter. However, at least one outside reading is necessary to determine the CF. Both the inside and outside readings must be taken within 3 minutes of each other. Both must also be taken after fallout is complete. Take both readings before determining the CF.

Calculate the CF using the following formula:

$$\text{Correlation factor (CF)} = \frac{\text{Outside dose (OD) rate}}{\text{Inside dose (ID) rate}}$$

NOTE: CFs are always greater than 1. CFs are rounded to the nearest hundredth.

Examples of correlation factors for various vehicles, buildings, and structures are shown in the figure below. These CFs are for planning purposes only. The actual CF for a given shelter should be calculated using the formula above.

An example of the proper procedures used to perform radiological monitoring can be referenced from the scenario in Chapter 1. SGT Downs' Ml tank crew received an initial dose of 5 cGy. There is no way he could have monitored this dose rate unless he was performing periodic monitoring at the time of the nuclear detonation. SGT Downs' crew was 2,700 meters from ground zero. Instead of continuing to stand outside of the Ml tank, SGT Downs should have ordered his crew back inside the tank. He should have then had one of his crew begin continuous monitoring on the outside at least 10 meters away from the tank. Upon noting a reading of 1 centigray per hour on the IM-174 radiacmeter, the monitor returns to the Ml tank and notifies SGT Downs of the arrival of fallout. He in turn notifies the commander. Since SGT Downs' company is not located in zone 1 or 2, it is possible that it will not receive significant residual radiation. However, simplified fallout predictions are only an estimate and upper-level wind patterns could cause a shift in the fallout pattern:

Correlation factors for residual radiation (CF)

Shielding	Location of Survey Meter	Correlation Factor
M1 Tank		20
M60 Tank	Turret, rear top.	25
	Turret, front.	53
	Chassis, near driver.	23
M2 IFV		9 .1
M3 CFV		9 .1
M113 APC	Directly in front of driver on front wall.	3 .6
	Near first squad member on left facing forward.	3 .6
Multistory Building Top Floor		100
Lower Floor		10
Frame House First Floor		2
Basement		10
Underground Shelter (3-ft earth cover)		5,000
Foxholes		10

Transmission factors for residual radiation

Transmission Factor (TF) = Inside dose (ID) rate / Outside dose (OD) rate		
M1 tank 0.04	M3 CFV 0.2	M109 howitzer 0.2
M60 tank 0.04	M113 APC 0.3	Foxholes 0.1
M2 IFV 0.2		

NOTE: The above transmission factors are for planning purposes only. The actual transmission factor for a given shelter should be calculated using this formula.

Because some radiation is shielded, the dose rate inside SGT Downs' Ml tank is lower than the outside dose rate at that location. The degree of shielding depends on the type of vehicle or the construction of the shelter. A transmission factor is a measure of the degree of shielding afforded by a vehicle or structure. An example of how to calculate the transmission factors for vehicles and structures is shown above.

SGT Downs should continue to monitor inside the M1 tank until a peak dose rate is received and the dose rate begins to decline. SGT Downs, inside, should report the outside and peak dose rate to his company headquarters who in turn should send NBC 4 reports to the battalion.

RADIOLOGICAL SURVEY

Nuclear surveys are conducted to find the extent and intensity of contamination. Radiological monitoring and recon provide general information about contamination for immediate operations. Surveys provide detailed information on which future operations are based. Since surveys are resource intensive, they are conducted only when the intensity of contamination must be known. If no operations are planned in the area, surveys are not required. Surveys are not conducted unless directed by higher headquarters. There are two types of surveys, ground and aerial. Ground surveys can be done under unit control using unit equipment. They are more accurate than aerial surveys. Aerial surveys are conducted for large areas and are faster and more flexible than ground surveys. For most battalion task forces, aerial assets cannot be tied up for radiological surveys. Ground surveys will be the most feasible to perform, therefore, units should concentrate their training on this method.

Ground radiological surveys are normally performed by personnel mounted in wheeled or tracked vehicles since they reduce doses received by personnel. They will be used whenever Dossible. All echelons can perform ground surveys within their areas of responsibility, using regularly assigned personnel and equipment. The techniques used to conduct ground surveys include the route technique, the point technique, and the preselected dose-rate technique.

Most ground surveys are performed using the route technique. In using this technique, dose-rate readings are taken inside the vehicle at selected intervals between checkpoints along a route. The control team uses a CF to determine ground dose rates. In using the point technique, the ground dose rate is determined at a selected point. The reading is obtained by dismounting from the vehicle and taking a direct ground dose-rate reading or by taking the dose-rate reading inside the vehicle. For accuracy, the first method is preferred. If the dose rate is taken inside the vehicle, the ground dose rate will be determined by the control party using a CF. When taking readings while dismounted, monitors should move at least 10 meters from the vehicle to take the readings. This prevents undue shielding of the radiation field by the vehicle. Most dose-rate readings taken during a ground survey by mounted personnel using the route technique are taken inside the vehicle. These readings are later converted to ground dose rates using a CF.

Correlation factor data is required to convert the reported readings taken inside the vehicle to ground dose rates existing outside the vehicle. Data for the vehicle CF was provided earlier. It consists of a set of two readings taken at the same location within 3 minutes of each other. One reading is taken inside the vehicle. All subsequent inside readings must be taken with the meter in this same position. The other reading is taken immediately at the same location as a normal ground monitoring reading (the vehicle is pulled away at least 10 meters). Accuracy of the CF data is very important.

CHAPTER 5

MEDICAL ASPECTS OF BATTLEFIELD NUCLEAR WARFARE

This chapter provides guidance to commanders and staffs on the medical effects of BNW on the soldier. The problems of flash, blast, thermal, nuclear radiation, and acute combat stress reaction were provided earlier in the manual. Specific medical problems associated with BNW are similar to those caused during conventional warfare except that these injuries are complicated by exposure to ionizing radiation. However, most injuries will be more severe and will affect more of the unit. Commanders and staffs should be familiar with these injuries and the treatment and triage of those most severely injured.

MEDICAL PROBLEMS

With small-yield tactical nuclear weapons there will be comparatively large numbers of casualties due to initial radiation, possibly combined with the effects of blast. Burn injuries will become more common as the weapon yield increases. The types of injuries most associated during BNW are:

- *Flash injury*. Injury from the intense light from a nuclear fireball is likely to take the form of temporary "flash blindness." The duration of this will depend on the length of exposure and the preexisting light. It is unlikely to last more than a few minutes. No treatment is required other than reassurance. Retinal burns, leading in severe cases to permanent blindness, are more likely to be found in undisciplined, poorly trained soldiers. No treatment is possible.
- *Blast injury*. There are two main types of injury. Primary blast injuries are ruptured eardrums and air containing organs in the body; for example, lungs and guts. Secondary blast injuries are lacerations and puncture wounds from flying debris. Identical injuries may also be obtained by the individual being thrown into an object.
- *Thermal injury*. Nuclear weapons will cause a far larger number of burn casualties than are normally encountered on a conventional battlefield. These burn casualties will constitute the most serious medical problem because of the large manpower and logistic requirements associated with adequate treatment.
- *Radiation injury*. Casualties produced by ionizing radiation alone or in conjunction with other injuries or disease will result from nuclear warfare. When combined with other injuries, radiation injury will complicate the treatment of injured soldiers and may increase the number of casualties. Radiation injury can occur as a result of single nuclear attack. The effect on soldiers will depend on how prepared the unit is for the attack. Because radiation injury may have a latent period where there is an apparent (but only temporary) recovery, commanders and soldiers must account for this and not estimate their combat efficiency by how they feel at the moment. The figure on the next page presents an initial medical assessment of radiation injuries organized into four injury groups (IGs). Additionally, it lists medical treatment and return-to-duty classes. Explanations of IG-I to IG-IV are discussed below.

— Initial symptoms. Low doses (IG-I) of radiation are not life threatening and will produce limited combat ineffectiveness, usually for only brief periods. Severe (IG-11) to lethal doses of radiation, up to 500 cGy, are initially disabling for transient periods. Most soldiers should be able to perform limited work and buddy aid between these attacks and during the long, latent period. For doses greater than 500 cGy (IG-III and IG-IV), the initial symptoms can be quite severe and, though disabling, do not immediately threaten life. Casualties require extensive prolonged medical treatment if they are to have any significant chance of survival.

Medical support of radiation injury

INJURY					
Group	Type	Dose (cGy)	Medical Support	Return to Duty	Recommended Duty
IG-I	RADIATION	Below 150	Symptomatic treatment.	Immediately.	Return to unit.
	COMBINED		Symptomatic treatment. Maintain breathing and blood flow. Early surgery. Slow healing.	Hours to days.	Based on conventional injury.
IG-II	RADIATION	150 to 500	Symptomatic treatment. Controlled isolation. Control infection, bleeding, and fever. Evacuation (routine).	Hours to weeks.	Light duty. Minimize further radiation exposure.
	COMBINED		Same as radiation injury. Surgery before immune system depressed. Delayed healing/intensive medical support. Evacuation established by conventional precedence.	1-12 months.	Light duty. Minimize further radiation exposure. Based on conventional injury.
IG-III	RADIATION	500 to 1,500	Supportive care. Controlled isolation. Control infection, bleeding, fever, ulceration, and diarrhea.	Death.	No further radiation exposure. Return to CONUS.
	COMBINED		Evacuation (routine). Intensive and lengthy medical support. Same as radiation injury.	Unknown.	Unknown.
IG-IV	RADIATION	Above 1,500	Supportive care. Evacuation (routine).	Death.	
	COMBINED		Same as radiation inju .		

— Reduced resistance to injury and disease. As radiation injury is increased, general health deteriorates and the damaged immune system loses its ability to protect the body. Radiation injury and the harsh combat environment combine to produce a reduced state of health in the soldiers. This weakened condition leads to a significant increase in the number of disease and infection casualties.

— Delayed healing and medical complications. Soldiers injured after severe radiation exposure (IG-II and IG-III) will face increased mortality and a lengthened course of recovery. If the injury to the immune system has been severe, patients probably will not be able to resist infections. After radiation exposure, wound healing will be delayed and the duration of medical treatment and mortality will be increased compared to a similar wound without radiation exposure. Severely exposed soldiers should be assigned work that minimizes the risk of further injury until the immune system has recovered.

- *Acute combat reaction.* Some of the characteristics associated with a soldier's psychological reaction to BNW were discussed in Chapter 2. Acute combat reaction can be characterized by its abrupt onset, brief duration (minutes to hours), high potential for life threatening behaviors, and the ease at which the symptom can be reversed.

SYMPTOMS AND TREATMENT OF NUCLEAR CASUALTIES

The treatment of soldiers injured from the immediate effects of flash, blast, and thermal caused by a nuclear detonation is no different than that which is prescribed for injuries caused on the conventional battlefield although the severity of the injuries may increase. The treatment of personnel with lacerations, broken bones, and burns at the unit level should be performed as prescribed in FM 21-11 and FM 8-320.

If the unit has mass casualties as the result of a nuclear attack, proper management of soldier evacuation and triage will be essential. Triage should be the first priority of a commander and his staff in the treatment of nuclear weapon casualties. A mass casualty situation exists when there are more personnel injured in the unit than personnel qualified to treat them. Triage is any sorting process regardless of the number of casualties (even a few) in a conventional or any other situation. Triage is performed to ensure the maximum benefit is provided to the largest number of casualties in a timely fashion and to conserve medical resources at the same time. This process is based on the injuries and symptoms the casualty exhibits to include radiation dose information if it is available. The figure below provides the triage priorities for both radiation injury and combined injury patients.

Mass casualty treatment priorities

RADIATION DOSAGE AND DEGRADATION OF TREATMENT PRIORITY				
Serial	Starting Priority	Final Priority		
		Less than 150 cGy	150-550 cGy	Over 550 cGy
1	Radiation Only	Duty or T3	T3**	T4
2	T1	T1	T1 or T4*	T4
3	T2	T2	T2 or T4*	T4
4	T3	T3	T3**	T4
5	T4	T4	T4	T4

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

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

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

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

* In the case of full or partial-thickness burns covering more than 18 percent of the body surface of trauma which would either result in significant infection or be categorized as severe but not immediately life threatening, such as a fractured femur. This is a clinical decision and not necessarily subjectively reproducible.

** Includes the probable requirements for antibiotics and transfusion at a later time. This classification does not suggest that the patient is not in need of treatment, but rather that he does not need immediate specialized care.

Acute combat stress will present a challenge for the commander and his staff to control and treat. The figure below provides signs and symptoms of this reaction, from early to late in the disorder. Early aspects of this type stress are common to all men facing battle, especially when nuclear weapons are used. One early sign is a notable reluctance of a soldier to leave a secure setting. This was evident when SGT Downs, the tank commander, noticed one of his soldiers sitting on the turret of his Ml tank in a daze a couple minutes after a nuclear detonation. This soldier was experiencing acute combat stress to the point that he could not comprehend or react to orders. A soldier who reacts like this will often be one of the last in a line of soldiers proceeding toward danger and will always look back toward the area of safety. He may unnecessarily check and recheck his equipment, displaying body movement representing a displacement of his anxiety. The soldier may also show a marked difficulty in understanding instructions and carrying out even simple tasks.

As an acute combat reaction worsens, the affected soldier may not take cover during an assault, or he may remain hidden in a bunker and be unable to care for a buddy in trouble. In its most severe form, affected individuals may show an "overflow" of undirected motor activity which may mimic tics or seizures. Conversely, hyperarousal can also lead to a "freezing" of motor function, which may resemble paralysis.

An acute combat reaction can develop, and resolve, in a matter of minutes. As recovery from this entity can be very rapid, the soldier may show a dramatic transition from gross panic one minute to rational thought and behavior a few minutes later.

Acute combat reaction

SIGNS AND SYMPTOMS

- **Reluctance to leave a secure setting.**
- **Adventitial body movements.**
- **Difficulty comprehending and following instructions.**
- **Sympathetic nervous system hyperarousal.**
- **Life-threatening behaviors.**
- **Possible "overflow" of motor activity.**
- **Possible paralysis.**
- **Overwhelming fear.**

Environmental

- **Fatigue, hunger, cold, heat, and sleep deprivation.**
- **Intensity of the battle.**
- **Disorientation.**
- **Surprise!**

Interpersonal

- **Lack of unit cohesion and esprit.**
- **Lack of leadership.**
- **Confusion.**
- **Support assignment versus front line.**

Personal

- **Age.**
- **Inexperience.**
- **Lack of commitment to battle.**
- **Witnessing death for the first time.**

Treatment

- **Control breathing and pulse rate.**
- **Allow victim to tell what happened once, at most twice.**
- **Reorientation.**
- **Reestablish command structure.**
- **Reestablish priorities.**
- **Incorporate buddy into treatment.**
- **Consider rest and replenishment.**
- **Expect return to duty within 48 hours.**
- **Do not place victim with physically wounded patients.**

HANDLING AND TREATMENT OF RADIOACTIVELY CONTAMINATED CASUALTIES

Soldiers who have been in fallout areas may have varying amounts of radioactive contamination on their skin and clothing. The contamination will be in the form of fission products which have become absorbed on the surfaces of dirt or dust particles of varying sizes. The soldier himself will not be radioactive, but he will suffer radiation injury (beta burns) from the contamination unless it is removed early. In addition, as the soldier is handled, much of the contamination will be scattered about, contaminating other people and the surroundings. The objective of proper decontamination is to control the removal of this hazardous material from soldiers, restricting it to defined areas. This will allow proper handling of contaminated equipment and clothing and will reduce the hazard to other personnel.

It is important to bear in mind the distinction between contaminated soldiers and radiation-injured soldiers. Soldiers who have received substantial doses of radiation and who subsequently exhibit symptoms of the acute radiation syndrome are radiation-injured soldiers. Mere exposure to radiation does not result in a contaminated casualty. Radiologically contaminated soldiers occur when substances emitting radiation are deposited on or become attached to the soldier or his clothing.

The presence of fallout contamination on a soldier represents by far a greater hazard to the soldier himself than it does to the personnel caring for him. The duration of the exposure, the quantity of contact contamination, and the distance between the source and those exposed, all combine to maximize the danger to the soldiers while minimizing that to those around. Further, if the battalion aid station which receives the contaminated soldiers is itself in a fallout area, the high gamma environment and its threat to all patients and medical personnel would far outweigh any hazards from handling contaminated patients.

Fear that the gathering of large numbers of heavily contaminated soldiers in or around a battalion aid station is hazardous is unfounded. The only hazard from radioactive contamination which can cause injury at any distance in air is gamma radiation. It would be very difficult to get enough soldiers crowded together to constitute a significant gamma hazard. If all the radioactive contamination from many heavily contaminated soldiers was collected in one small area of a few square meters, a minor hazard could result. But, the soldiers themselves will not present a gamma hazard.

The major hazard associated with handling contaminated soldiers is the possibility of beta burns caused by transfer of the radioactive material from the soldiers to the unprotected skin surfaces of other personnel. Though this hazard is not a lethal one, it could result in the incapacitation of medical personnel from the burns if the material is not removed from their skin.

In order to handle the radiologically contaminated soldier properly, it is first necessary to detect contaminated soldiers. The only way to detect radioactive contamination is by proper monitoring with radiac instruments. Since the levels of radiation to be dealt with are rather low and the governing hazard is beta radiation, a Geiger-Muller counter, such as the AN/PDR-27, should be used to monitor incoming soldiers for contamination. As a general rule, if the reading is twice current background radiation or higher, the patient should be considered contaminated.

Incoming soldiers should be monitored at any time there is any reason to believe that contaminated soldiers are arriving at the battalion or brigade aid station. (Possible indications: reports from company messages from another headquarters, sighting of a nuclear burst or cloud.) Otherwise, soldiers may be "spot checked" every 15 minutes or every five or six soldiers. This monitoring need not be carried out at a great distance from the aid station. It can be accomplished within or just outside the treatment area. The only requirement is that it be done if at all possible prior to admission of the soldier to the aid station. Once it has been confirmed that the soldier is contaminated, decontamination is easily accomplished. The simple removal of all outer clothing and a brief washing of the exposed skin surfaces will achieve a high degree of decontamination without subjecting the soldier to the trauma of vigorous bathing and showering. The radiological contamination of the patient should not be allowed to interfere with immediate lifesaving treatment or the best possible medical care.

In summary, when planning for medical support following enemy nuclear attack, every effort must be made to conserve and achieve the best possible use of available medical personnel, Each individual should be trained to apply first aid to himself (self aid) and to others (buddy aid). Each physically capable individual is responsible for carrying out required decontamination of himself and his equipment from fallout as soon as possible. Trained medical personnel are used primarily to provide emergency medical care or, if time and resources permit, more detailed treatment. Nonmedical personnel provide for search and rescue of the injured and wounded, immediate first aid, and decontamination. Nonmedical vehicles will likely be required to supplement the movement of patients to the initial medical treatment facility.

APPENDIX

NUCLEAR DEFENSE CHECKLIST

The following matrices provide a quick and easily referenced guide for the battalion commander and staff. Nuclear tasks or events are provided along with who is responsible for the task and whether guidance, training, or support should be given.

Responsibilities Matrix for the Nuclear Defense Checklist

EVENT/TASK	BN CDR	CO/BTRY CDR	PLT LDR/ SGT	S2	S3	S4	BN CML OFF
COMMAND AND CONTROL FOR BNW	1A	1B/2B	2C	3A	2A		3A
FRIENDLY NUCLEAR SRIKWARN	1A	1B/2B	2C		2A		
COLLECTING, EVALUATING, AND USING RADIOLOGICAL INTELLIGENCE	1A	1B/2B	2C	3A	3A		2A
NUCLEAR BURST REPORTING	1A	1B/2B	2C		3A		2A
SIMPLIFIED METHOD OF FALLOUT PREDICTION	1A	1B/2B	2C		3A		2A
AREA RADIOLOGICAL MONITORING	1A	1B/2B	2C		2A		
AERIAL AND GROUND SURVEYS	1A	1B/2B	2C		3A	3A	2A
TRANSMITTING FALLOUT CONTAMINATION PLOTS	1A	1B/2B	2C				2A
OPERATING IN A FALLOUT AREA	1A	1B/2B	2C		2A		
MARKING AREAS CONTAMINATED WITH RESIDUAL RADIATION	1A	1B/2B	2C				2A
RADIATION EXPOSURE GUIDANCE	1A	1B/2B	2C		3A		2A
MONITORING PERSONNEL AND EQUIPMENT FOR RADIOLOGICAL CONTAMINATION	1A	1B/2B	2C		2A		
RADIOLOGICAL DECONTAMINATION	1A	1B/2B	2C		2A		3A

Responsibilities:

1 Provides guidance A Battalion level

2 Performs training B Company/battery/troop level

3 Provides support C Platoon level

COMMAND AND CONTROL		
	When	Principal Trainer(s)
Did unit employ command and control measures that maintained command and control in spite of interruptions in electronic communications?	B,D,A	Bn cdr, S3, co cdr, plt ldr, sqd ldr
Has the unit determined the effect of nuclear weapons on the operational situation?	B,D,A	Bn cdr, S3, co cdr
Was the commander kept informed on the radiation status of his units?	B,D,A	Bn cdr, co cdr
Did the commander give operational exposure guidance (OEG) to his units?	B,D,A	Bn cdr, co cdr, cml off
Did the commander identify, apply, or recommend collateral damage (CD) and troop safety constraints?	B	Bn cdr, S3, S2, cml off
Did the SOP and the OPLAN include the commander's nuclear guidance?	B	Bn cdr, S3, cml off
FRIENDLY NUCLEAR STRIKWARN		
Did units act on friendly nuclear STRIKWARN?	B,D,A	Bn cdr, co cdr
• Were minimum acceptable safety distances announced?	B	S3
• Did the battalion commander or the S3 make a decision on safety requirements for friendly troops?	B	Bn cdr, S3
• Were provisions made for warning personnel of the strike?	B	S3, co cdr
• Was the warning message encoded to prevent enemy detection of the strike?	B	S3
• Was the warning received in time for personnel to take prescribed protective measures?	B	Bn cdr, S3, co cdr
• Were properly formatted STRIKWARN messages received by all units in the battalion?	B	S3, cml off
• Was receipt of the warning message acknowledged by all units?	B	Co cdr
• What actions did personnel take upon receipt of the nuclear STRIKWARN?	B	Co cdr
• What is the psychological effect on personnel from the STRIKWARN and what measures were taken to reduce these effects?	B	Co cdr
• What specific measures were taken to ensure minimum "personnel in the open" activity?	B, D	Co cdr
• What specific measures were taken to provide troop protection from thermal radiation?	B, D	Plt ldr
How was troop vulnerability versus optimum tactical troop disposition resolved?	B	Bn cdr, co cdr
How did unit leaders analyze their own vulnerability to the friendly nuclear strike?	B	Bn cdr, co cdr

B Before attack
D During attack
A After attack

FRIENDLY NUCLEAR STRIKWARN (CONTINUED)		
	When	Principal Trainer(s)
Were voluntary withdrawals made to provide adequate troop safety from nuclear attacks of close-in enemy targets?	B	Bn cdr, co cdr
Were all available communication means used to disseminate the friendly nuclear STRIKWARN to all units in the most expeditious manner?	B	S3, co cdr
Were all personnel informed of when strike would occur or was a signal established to alert personnel in sufficient time prior to the strike to take action?	B	Bn cdr, S3, co cdr
Were adjustments made to operation plans if required?	B	Bn cdr, S3
COLLECTING, EVALUATING, AND USING RADIOLOGICAL INTELLIGENCE		
Are all the personnel in the S2 area of responsibility familiar with intelligence data required by the NBC center at brigade and division levels?	B,D,A	S2, cml off
Do all patrols, advanced parties, and reconnaissance missions include a radiological monitor?	B, D, A	Co cdr, plt ldr
Is the battalion cml off included in operational planning and briefings?	B, D, A	S3, S2
Does the battalion cml off maintain liaison with subordinate unit NBC NCO? How?	B, D, A	Cml off
How does the cml off respond to problems of subordinate unit NBC NCOs pertaining to NBC intel?	B, D, A	Cml off
Is the cml off receiving effective downwind messages (EDM) every 6 hours? Are EDMs forwarded to subordinate units?	B	S3, cml off
Are radiological monitors trained to compute allowable stay times?	B	Co cdr, plt ldr
Do tactical units conduct radiological surveys as situation dictates?	D, A	S3, cml off, co cdr
How is radiological contamination information furnished to tactical units?	D, A	S3, cml off
Is the S3 maintaining a map of the radiological situation?	B, D, A	S3, cml off
NUCLEAR BURST REPORTING		
Was the NBC 1 nuclear report properly prepared and processed?	A	Cml off
• Was the report sent through company HQ to the battalion cml off?	A	Plt ldr
• Did the battalion cml off forward report (consolidated if required) to brigade HQ?	A	Cml off
• Were the reports (after first use) sent by flash precedence after weapons first use with subsequent reports sent immediate precedence?	A	Cml off
Did the unit commander designate specific individuals for the collection of nuclear burst data?	A	Co cdr

B Before attack
D During attack
A After attack

SIMPLIFIED METHOD OF FALLOUT PREDICTION		
	When	Principal Trainer(s)
• Did the cml off prepare a simplified fallout prediction to determine which subordinate units might be in the contaminated area?	D, A	Cml off
• Did the battalion warn units which were located in the downwind hazard area?	D, A	S3, cml off
• Did the battalion tell units in zone 1 of fallout area to dig in and protect themselves until after fallout arrived at their location?	D, A	S3, cml off
AREA RADIOLOGICAL MONITORING		
Im-93A/UD dosimeters		
• Were they issued at the time of the nuclear attack?	B, D, A	Co cdr
• Are operators familiar with transmission factors?	B, D, A	Co cdr
• Can operators in foxholes, shelters, or vehicles determine outside dose rates using transmission factors?	B, D, A	Co cdr
Continuous Monitoring		
• Are operators familiar with procedures for conducting continuous monitoring?	B, D, A	Co cdr
• If readings were taken with a foxhole, shelter, or vehicle, at what location were they taken?	B, D, A	Co cdr
• How many instruments were used and was the number adequate for the area being surveyed?	B, D, A	Co cdr
Periodic monitoring		
• Are operators familiar with procedures for conducting periodic monitoring?	B, D, A	Co cdr
• At what intervals were readings taken?	D, A	Plt ldr
• How many instruments were used and was the number adequate for the area being surveyed?	D, A	Co cdr
Reporting of monitoring information		
• Did operators report to platoon, did platoon report to company, and did company report to battalion?	D, A	Plt ldr
• Was each level familiar with all information required for reporting?	B, D, A	Bn cdr, co cdr
• Was information passed at each level in a timely manner?	A	Co cdr

B Before attack
D During attack
A After attack

AERIAL AND GROUND SURVEYS		
	When	Principal Trainer(s)
Did the unit perform a ground survey to determine the areas contaminated with radiological fallout?	D, A	Co cdr, plt ldr
Were procedures as described in FM 3-3 used as the basis for performing ground and aerial surveys?	D, A	Co cdr
Does each subordinate unit have personnel trained in survey and monitoring procedures?	B	Co cdr
If available, did the commander request an aerial survey to determine areas of contamination?	A	Bn cdr, co cdr
Were results of ground or aerial survey forwarded through chain of command using the NBC 4 reporting format?	A	Co cdr, S3
Does each subordinate unit have the required equipment to perform ground radiological surveys? Is the equipment maintained and operating properly?	B, D, A	Co cdr, S4, cml off
Did the commander analyze the results of the survey and use it to make decisions on protecting his unit from the radiological hazards?	A	Bn cdr, co cdr
TRANSMITTING FALLOUT CONTAMINATION PLOTS		
Did the cml off send information of fallout contamination to the brigade HQ?	A	S3, cml off
Was the commander aware of which of his units were in the fallout area? Was guidance provided to units who were in zones 1 and 2 of the fallout area?	A	Bn cdr, co cdr
How was contamination information sent to higher HQ? Overlay? Messenger?	A	S3, cml off
Were areas of contamination plotted on S3 situation map and used as basis for making operational plans and for maneuvering units?	A	Bn cdr, S3, cml off
OPERATING IN A FALLOUT AREA		
Did the unit make total dose estimates while operating in a fallout area?	D, A	Co cdr
• How were dose estimates made for entry into contaminated areas at times sooner than H + 24 hours? After H + 24 hours?	A	Co cdr
• Were dose rate and total dose nomograms used for making estimates?	A	Co cdr
Were dose estimates made to determine if a contaminated area could be crossed?	A	Co cdr
How were dose estimates made?	A	Co cdr
Was the rule "The average dose rate along the route is approximately one-half the highest dose rate encountered" used?	A	Co cdr

B Before attack
D During attack
A After attack

OPERATING IN A FALLOUT AREA (CONTINUED)		
	When	Principal Trainer(s)
After the average dose rate was determined, what procedures were used to estimate the total dose rate that would be received in crossing?	A	Co cdr
What action did the commander take after the total dose in crossing a contaminated area had been estimated?	A	Co cdr
Was the M1 radiac calculator or total dose nomogram used in making dose rate and total dose rate calculations?	A	Co cdr
MARKING AREAS CONTAMINATED WITH RESIDUAL RADIATION		
Did the bn cml off maintain a situation map that portrayed current contaminated areas?	A	S3, cml off
Did subordinate units receive contamination information?	A	Co cdr
Was radiological contamination marking signs placed on main access roads leading into the contaminated areas? Was the correct information entered on the sign as follows: • Dose rate. • Date and time of dose rate readings. • Time and date of burst.	A	Co cdr
Did the bn ensure that all subordinate units were aware of contaminated areas?	A	Bn cdr, S3
If the commander decided to cross the contaminated area to perform a critical mission, did he ensure that the unit take the proper precautions as described in FM 3-3?	A	Co cdr
RADIATION EXPOSURE GUIDANCE		
What type of dosimeters were used?	A	Co cdr, S4
What is the allocation of dosimeters?	A	Plt ldr
Did each unit have two tactical dosimeters per platoon? Who were they given to in the platoons? Was this allocation adequate to give a reasonable estimate for the platoon?	B	Co cdr, plt ldr
How often were the tactical dosimeters used?	A	Plt ldr
Were tactical dosimeters read daily or after each operation?	B,D,A	Co cdr, plt ldr
Were the average readings of the platoon reported to the company? Did the company report to battalion?	A	Co cdr, plt ldr
Did the battalion post the readings on a radiation dose chart? Which staff officer is responsible for posting them? Is the chart posted expeditiously?	A	Bn cdr, S3
Were platoons placed in radiation exposure categories using the criteria in the reference dose tables?	A	Bn cdr, cml off

B Before attack
D During attack
A After attack

RADIATION EXPOSURE GUIDANCE (CONTINUED)		
	When	Principal Trainer(s)
Was the information used to establish an operation exposure guide (OEG)? Did the commander state the degree of risk for future operations?	A	Bn cdr
Did the battalion determine the percentage of platoons in each category of exposure and forward the information to higher headquarters?	A	Bn cdr, S3, cml off
MONITORING PERSONNEL AND EQUIPMENT FOR RADIOLOGICAL CONTAMINATION		
Were personnel monitoring stations established rapidly after the area was known to be contaminated?	A	Co cdr, plt ldr
Was monitoring of personnel done using the AN/PDR-27 radiacmeter and was it done in a contamination-free area?	A	Co cdr, plt ldr
Were personnel monitored when leaving the contaminated area?	A	Co cdr, plt ldr
Were systematic and proper monitoring procedures used as described in FM 3-3?	A	Co cdr, plt ldr
Were personnel and equipment monitored for alpha, beta, and gamma contamination? Were radiacmeters monitored for contamination?	A	Co cdr, plt ldr
DECONTAMINATION		
Are units familiar with unit decontamination procedures IAW FM 3-5?	A	Co cdr
Do personnel contaminated by radiological fallout shake their outer garments to remove loose contamination?	A	Co cdr
Do personnel contaminated by radiological fallout use brooms, brushes, or other means to remove loose contamination?	A	Co cdr
Does the cml off provide guidance and assistance in decontamination?	A	cml off
Does each unit understand how to perform personnel decontamination?	A	Co cdr
Does the unit understand how to perform a hasty decontamination by washing with hot soap and water?	A	Co cdr
Does the unit have procedures established for a clothing exchange?	A	Co cdr
Does the unit understand how to drain radiologically contaminated water?	A	Co cdr
Does the unit understand how to decontaminate food and water? Is the chemical officer providing guidance and assistance?	A	Co cdr, cml off
Does the battalion know where to go and what kinds of assistance are available outside the battalion?	A	Bn cdr, cml off

A After attack

GLOSSARY

Acronyms and Abbreviations

AARs after action reviews
ADA air defense artillery
APC armored personnel carrier
ARTEP Army training and evaluation program

bn battalion
BNW battlefield nuclear warfare
BOC battalion operation center (AD)

CD collateral damage
C-E communications electronic
cdr commander
CF correlation factor
CFV cavalry fighting vehicle
cGy centigray
cml off chemical officer
co company
CP command post
CPX command post exercise
CS combat support
CSS combat service support
CVC combat vehicle crewman

DGZ desired ground zero
dist distance
DTG date-time group

EDM effective downwind messages
EMP electromagnetic pulse

FARP forward area refueling point
FLOT forward line of own troops
FM field manual; frequency modulated
FRAGO fragmentary order
FTX field training exercise
ft foot
GZ ground zero

HEMP high altitude electromagnetic pulse
HHC headquarters and headquarters company
HMMVW high mobility multipurpose wheeled vehicle
HQ headquarters
Hz hertz

IAW in accordance with
ID inside dose
IFV infantry fighting vehicle
inf infantry
IG injury group

kHz kilohertz
KIA killed in action
km kilometer
kt kiloton
KMPH kilometers per hour

LD line of departure
ldr leader

m meter
MAPEX map exercise
mech mechanized
METL mission essential task list
MHz megahertz
MSD minimum safe distance
MRE meals, ready-to-eat
MTP mission training plan
MOPP mission oriented protective posture

NCO noncommissioned officer
NBC nuclear, biological, chemical
NUCWARN nuclear warning

OD outside dose
OEG operational exposure guidance

OH observation helicopter
OPCON operational control
OPFOR opposing forces
OPORD operation order
OPLAN operation plan

PDDE power driven decontamination equipment
plt platoon
PMCS preventive maintenance checks and services
POL petroleum, oils, and lubricants
psi pounds per square inch

rad radiation absorbed dose
req request
RES radiation exposure status

S2 intelligence officer
S3 operations officer
SHF super high frequency
SOP standing operating procedure
SP start point
sqd squad
STANAG Standardization Agreement
STRIKWARN nuclear strike warning
STX situational training exercise

TASC Training Aids and Support Center
T&EO training and evaluation outline
TEWT tactical exercise without troops
TF task force
TOC tactical operations center
TREE transient radiation effect on electronics

UHF ultra high frequency

REFERENCES

REQUIRED PUBLICATIONS

Required publications are sources that users must read in order to understand or to comply with this publication.

Field Manuals (FMs)

3-3. *Contamination Avoidance.*

25-4. *How to Conduct Training in Units.*

25-50. *Corps and Division Nuclear Training.*

Soldiers Training Publication (STP)

STP 21-1-SMCT. *Soldiers Manual of Common Tasks.*

RELATED PUBLICATIONS

Related publications are sources of additional information. They are not required in order to understand this publication.

Army Regulations (ARs)

310-25. *Dictionary of United States Army Terms.*

310-50. *Authorized Abbreviations, Brevity Codes, and Acronyms.*

Field Manuals (FMs)

1-102. *Army Aviation in an NBC Environment.*

3-4. *NBC Protection.*

3-5. *Decontamination Procedures.*

3-100. *NBC Operations.*

5-36. *Route Reconnaissance and Classification.*

5-101. *Mobility.*

5-103. *Survivability.*

8-9. *NATO Handbook on the Medical Aspects of NBC Defensive Operations.*

21-11. *First-Aid for Soldiers.*

25-3. *Training in Units.*

26-2. *Management of Stress in Army Operations.*

90-2. *Battlefield Deception.*

90-14. *Rear Battle.*

100-2-1. *The Soviet Army: Operations and Tactics.*

101-31-1. *Nuclear Weapons Employment Doctrine and Procedures.*

Standardization Agreements (STANAGs)

2083. *(Edition 5) Commander's Guide on Nuclear Radiation Exposure of Groups (U).*

2111. *Target Analysis-Nuclear Weapons.*

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