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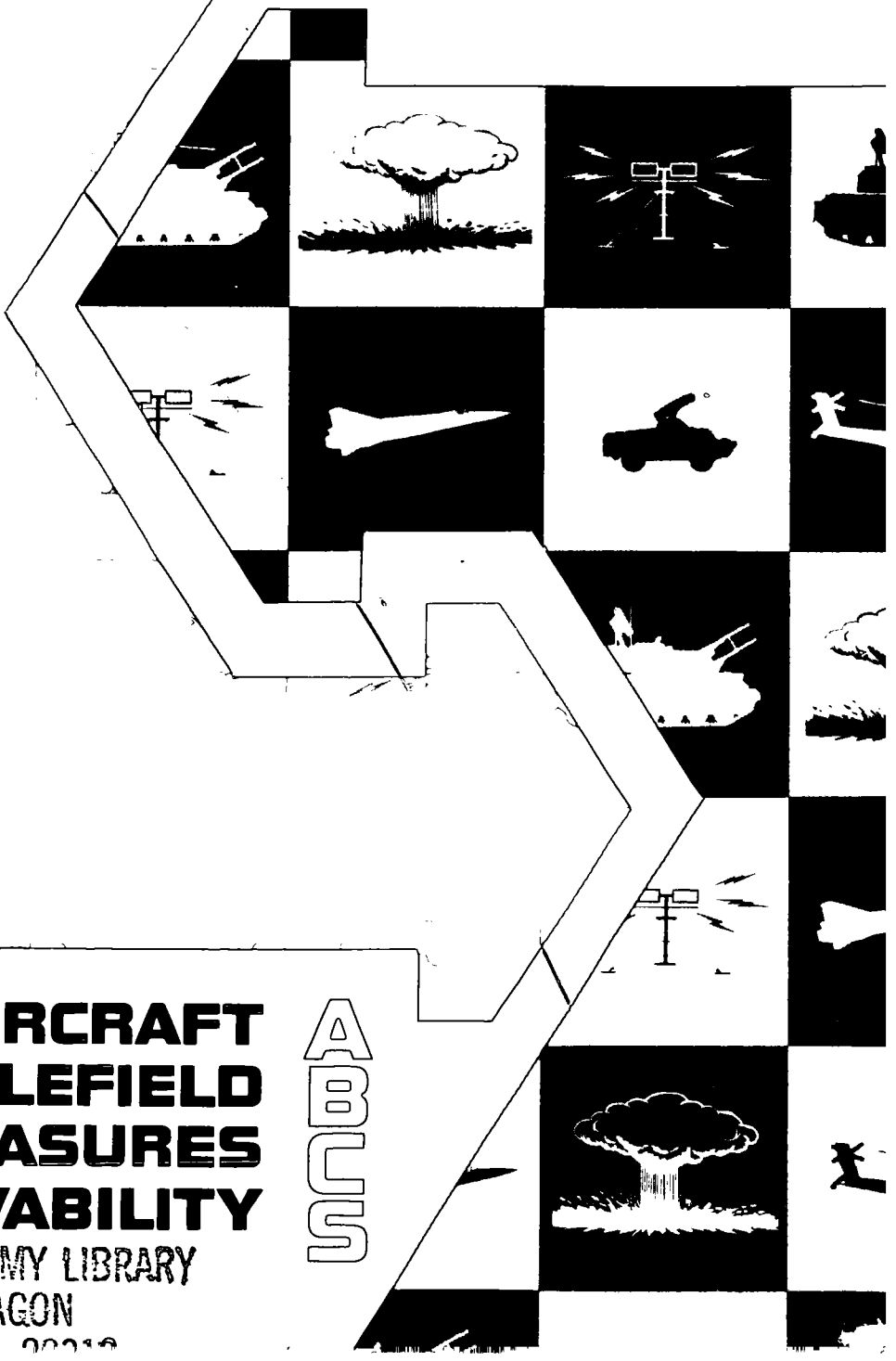

AIRCRAFT BATTLEFIELD COUNTERMEASURES AND SURVIVABILITY

ABCS

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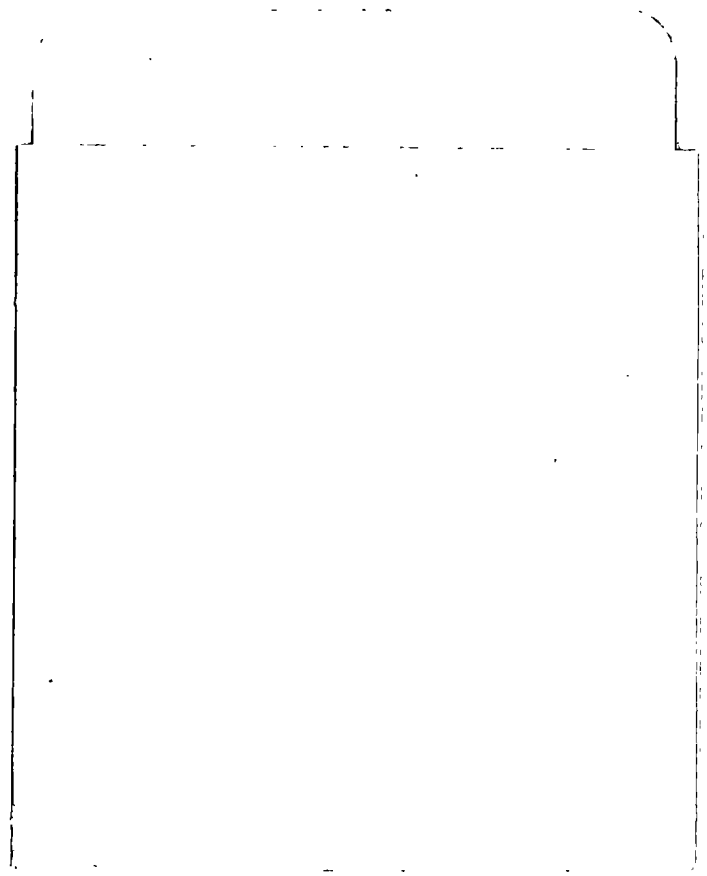

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FIELD MANUAL
NO. 1-101

Headquarters
Department of the Army
Washington, DC, 5 February 1982

AIRCRAFT BATTLEFIELD COUNTERMEASURES AND SURVIVABILITY (ABCS)

PREFACE

MODERN BATTLEFIELD CONCEPTS AND OPERATIONS

Advances in weapon systems and electronic technology significantly affect military concepts and operations. These advances place increasingly higher demands for coordinated efficiency on the modern battlefield. In view of the lethality of the high threat environment, current doctrine emphasizes winning the first battle as it might well be the last. Additionally, we must win while outnumbered. Therefore, battlefield operational concepts for the future are leaning toward greater mobility with more and smaller maneuver battalions. The orientation is toward organization around weapon systems and the combined arms team. Aviation units are an integral part of the combined arms team.

WEAPON SYSTEMS CONCEPTS

Long-range, high-velocity tank cannon and antiarmor missile systems now dominate the battlefield. Air defense weapon systems cover the air above the battlefield, affecting the tactics used by Army aircraft. Improved artillery and other indirect fire weapons are capable of massing large amounts of fire or destroying pinpoint targets in rapid succession. Tactical air support with a wide array of extremely accurate weaponry, increased payload, and on-station time provides a devastating punch to the battlefield. The attack helicopter gives the commander the capability of massing great amounts of firepower at the critical time and place. Advances of electronic warfare technology have added a new dimension of lethality to the battlefield. Night vision aids contribute to effective, round-the-clock, combat operations. Smaller, more efficient nuclear weaponry now makes its use less threatening to nearby friendly forces or communities, but more lethal in the immediate target area. This weaponry, with increased accuracy and mobility, affords the capability to project combat forces rapidly on the battlefield and to any place in the world.

*This manual supersedes FM 1-2, 7 July 1978.

This publication implements Stanag 2951, Nonelectronic Communications for Helicopters.

STATEMENT

The words "he," "him," "his," and "men," when used in this publication, represent both the masculine and feminine genders, unless otherwise specifically stated.

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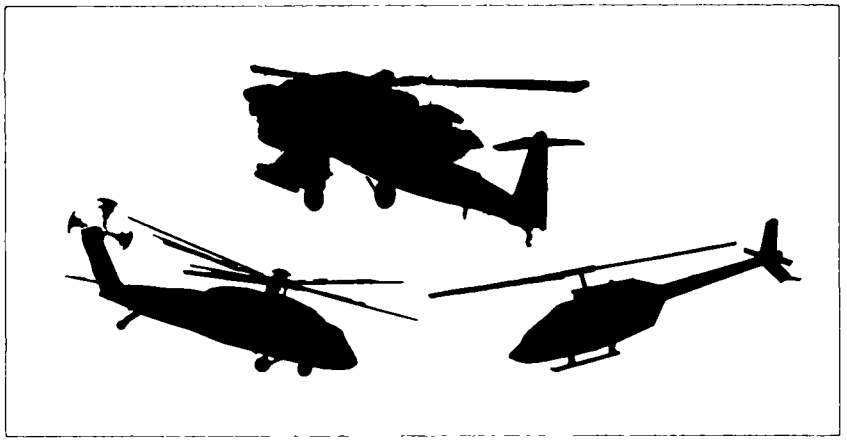
CHAPTER 1

GENERAL



PURPOSE

The purpose of this manual is to present countermeasures, techniques, procedures, and concepts that enhance the survivability of Army aviation units. This manual should be used as a guide for developing unit tactics and techniques to avoid detection and destruction by hostile forces. In addition, it should be used as an aid in preparing unit standing operating procedures (SOP) and training plans. Aviation unit personnel should use this manual to become familiar with aircraft survivability equipment (ASE) and techniques and how these can be integrated into training and combat operations to increase aviation unit staying power.

The intent of this manual is to make the aviator and commander aware of the threat and survival countermeasures applied to various combat situations. Combined arms employment is stressed as the key to survival throughout this manual. Tactics, techniques, and countermeasures presented in this manual are intended as a general guide. The complexity of the future air-land battle dictates that multiple solutions to demanding challenges will be required.

1-2. SCOPE

This manual presents the primary threat the Army aviator will find in the air-land battle of the next war. Also, a general description is provided of the mass and mixture of Threat weapons that normally will be used to engage aircraft and where and how these weapons are integrated into the enemy air defense (AD) plan. ASE that is currently available, under development, or in production is discussed with accompanying concepts of how it should be integrated into both active and passive countermeasures. Aviation unit commanders, as well as aviators, should become familiar with the techniques, procedures, and concepts presented in this manual. They should tailor them to their unit or mission needs in order to counter the threat, survive, and win the first battle.

Mission accomplishment and survivability of Army aviation units depend on the interaction of the combined arms team. More specifically, they are a function of training, hardware, and tactics. To the individual aviator, survival will include the mix and interaction of many variables.

ARMY AVIATION MISSION

To augment the capability of the Army to conduct prompt and sustained combat operations on land.

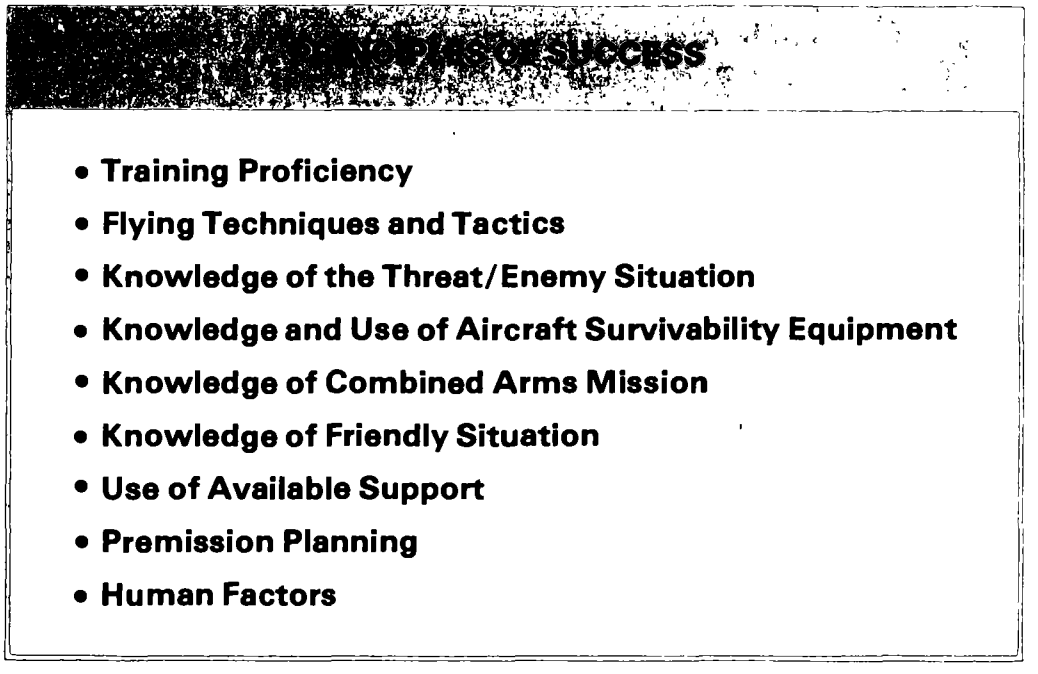
ARMY AVIATION OBJECTIVES

To provide the commander with the mobility, firepower, and staying power needed to win the first battle.

As a member of the combined arms team, to win while outnumbered.

Succeeding chapters will identify specific Threat weapon systems capabilities and their employment and tactics. We will then analyze these systems and discuss available countermeasures in conjunction with the combined arms team employment and tactics during sustained operations in the high threat environment.

The assistance of all aviation users was solicited to insure the applicability of the doctrine presented in this manual. Readers are encouraged to submit recommended changes and comments to improve the publication. Reasons, as well as substitute statements or paragraphs, should be provided for each recommended change. Comments should be keyed to the specific page, paragraph, and line of the manual. Comments/recommended changes should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, United States Army Aviation Center and Fort Rucker, ATTN: ATZQ-T, Fort Rucker, AL 36362, or you may call the Aviation Center HOTLINE 24-hour recording service: AUTOVON 558-6487; commercial—area code (205) 255-6487.



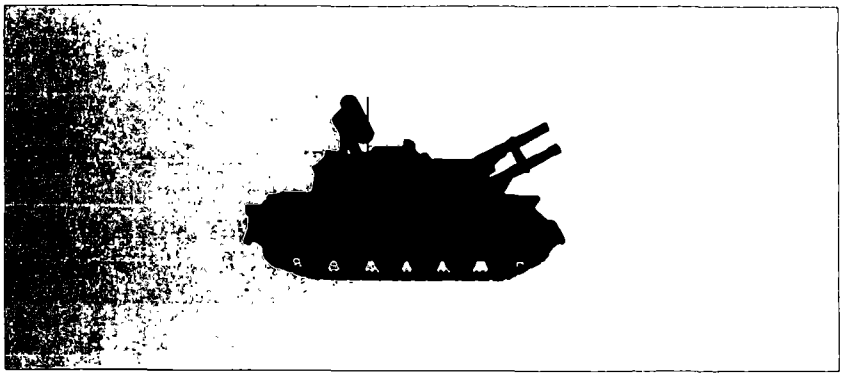
SUMMARY

In addition to modern weaponry and air-land battle operational concepts, several factors affect our ability to survive and win while outnumbered. Intelligence systems must be extremely responsive and accurate. Sufficient forces, firepower, and support must be massed at the critical time and place. The combined arms team must be employed and coordinated to achieve maximum efficiency for the given and changing situation. Last, but not least, the commanders, crews, and individual soldiers must have confidence through training proficiency to survive and inflict maximum casualties. No single weapon or service can hope to win by itself. Each element of the combined arms team has special capabilities contributing to the overall success of the mission.

Properly employed, Army aviation units can contribute significantly to the winning of the first battle.

CHAPTER 2

THE AIR DEFENSE THREAT



GENERAL

With the evolution of the helicopter on the modern battlefield, foreign armies have become well aware of the threat posed by even a small group of helicopters. The entire Threat combined arms team is trained to engage this type of target as well as fixed wing and high performance aircraft. In deploying air defense (AD), the enemy can be expected to follow four basic principles: *mass, mix, mobility,* and *integration.*

Mass. The principle of mass is achieved by positioning weapons and weapon systems within a tactical unit so that their combined fires can be brought to bear on a single target, increasing kill probability.

Mix. It is achieved by employment of gun and missile systems so that the limitations of one offset the other. Equipment diversity and redundancy are emphasized in AD target acquisition means to offset countermeasures that could be employed against them.

Mobility. Threat AD systems are highly mobile so as to provide an effective AD umbrella for Threat operations. Mobility also provides a means of survival for Threat AD systems.

Integration. It is achieved by incorporating AD systems forward into the scheme of maneuver and rearward through command and control systems to provide AD coverage in depth.

To survive and defeat such an array of AD systems require the efforts and capabilities of the entire combined arms team for suppression of the whole spectrum. For the aviation unit and individual aviator, a thorough knowledge of both US and Threat doctrine and tactics is mandatory.

Threat AD weapon systems presented in this chapter are typical of those that will confront Army aviation units on the battlefield today and in the near future. Their lethality is the most formidable ever faced in the history of military operations. Threat doctrine and tactics discussed are representative of the most formidable Threat countries. Army aviation countermeasures and survival techniques reflect current aviation employment doctrine with combined arms tactical application and survivability equipment now available or under development.

THE ANTIAIRCRAFT ARTILLERY (AAA) THREAT

The Soviet requirement for the AD of its mobile formations has been met by saturating the airspace from low to high altitude using integrated systems of AAA weapons and surface-to-air missiles (SAM). Soviet maneuver formations rely on vehicle-mounted SAMs and mobile guns to protect

THE SOVIETS SATURATE THE AIRSPACE FROM LOW TO HIGH

their fast-moving tank and motorized rifle units. These are augmented by interceptor aircraft and helicopters of frontal aviation, and coordination is assured by joint location of SAM and interceptor controllers, using centralized and common command facilities. AD troops have the following missions:

- Detection of enemy air activity and warning commanders of enemy aerial action.

- Destruction of enemy aircraft as far forward as possible with these objectives:

  — Preventing air strikes against combat troops and rear areas.

  — Preventing enemy aerial reconnaissance in those areas.

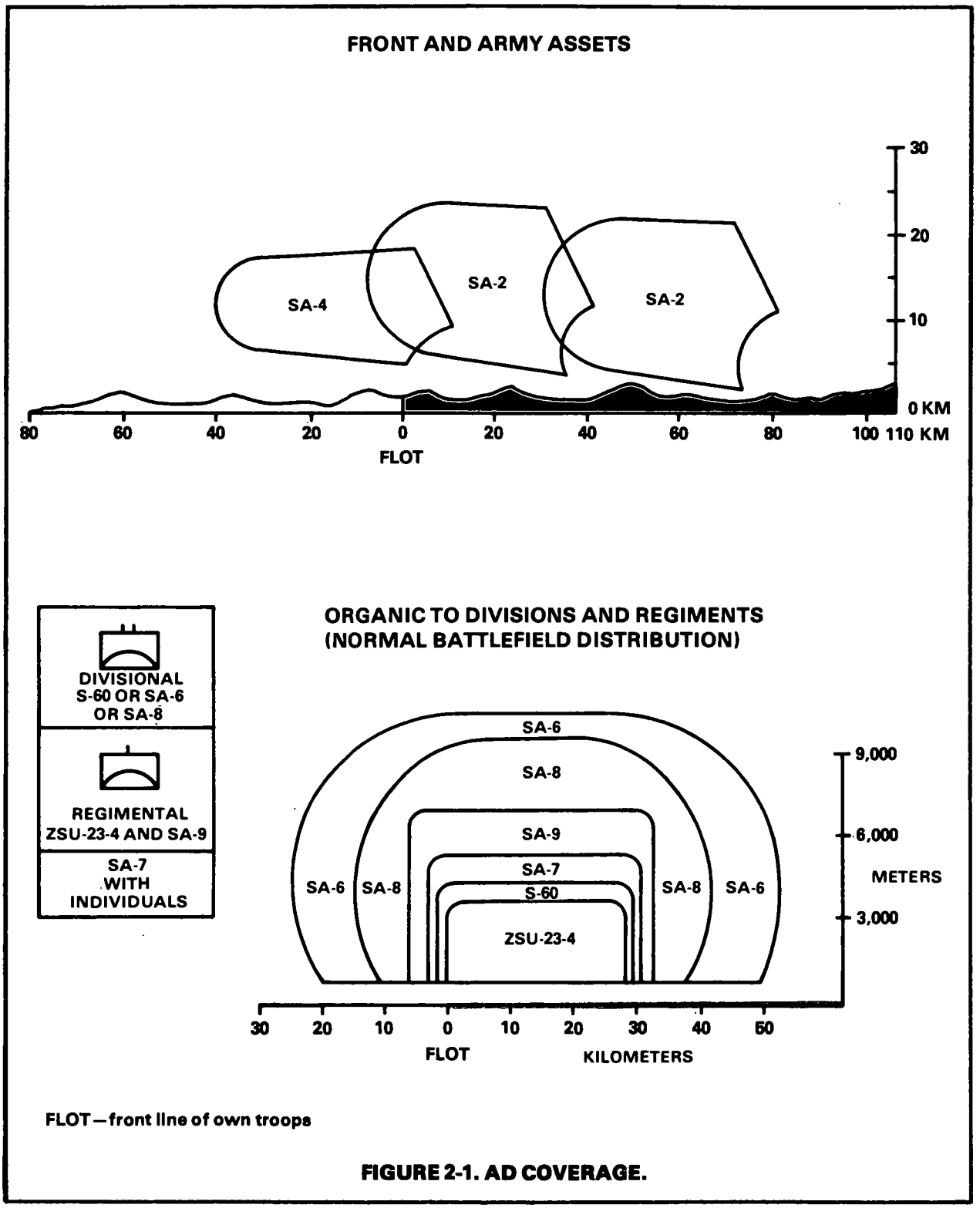
- Jamming of the enemy navigation, communication, and radar bombing systems.

- Engaging enemy airborne forces either en route or while they are being inserted (airborne, airmobile).

The overall effectiveness of AD of ground elements is largely based on the early neutralization of the enemy's attack aircraft. To that end, enemy air bases, command and control facilities, and attacking aircraft are engaged by a combination of Soviet aircraft, missiles, and AAA.

At front and army levels, AD emphasis is on zone coverage at low/medium and medium/high altitudes. SAMs are the primary systems with AAA supplementing the defense of critical targets.

The remainder of this chapter addresses both the AAA and AD missile threat and appropriate survivability and countermeasures.



FLOT—front line of own troops

FIGURE 2-1. AD COVERAGE.

Table 2-1 depicts most common Threat AAA systems. These systems represent a cross section of their capability, but are not all-inclusive.

TABLE 2-1. THE AAA THREAT.

WEAPON SYSTEM	MAXIMUM EFFECTIVE ANTI-AIRCRAFT RANGE AND CAPABILITY	ACQUISITION MEANS	ASSIGNED TO
*ZU-23 (23mm)	Range: 2,500 m	Optical	AAA units of the airborne division
**ZSU-23-4 (23mm)	Range: Optical—2,500 m Radar—3,000 m Elevation: -7° to +80°	Radar and optical	AAA battery of motorized rifle and tank regiments
*S-60 (57mm)	Range: Optical/ Mechanical—4,000 m Radar—6,000 m Elevation: -4° to +85°	Radar and optical mechanical computing sight	Antiaircraft regiment of some tank and motorized rifle divisions
**ZSU-X	Unknown	Unknown	Unknown

*System being phased out of Threat front-line units.
**System capable of firing on the move.
m—meters
mm—millimeters

Employment Tactics and Techniques. Threat Forces employ AAA to protect combat formation, installations, and troop movements from air attack. AAA weapons may occupy carefully selected positions in order to ambush helicopters operating in terrain flight modes. Threat AAA units are organic to regiments and divisions. Priority for protection is

assigned to motorized rifle or tank units, command posts (CP), and critical support activities.

The attack. In the attack formation of a motorized rifle division, reconnaissance units are used to find the limits of enemy defensive positions. The main body usually is organized in two echelons. The first echelon is responsible for accomplishing the primary mission—usually to penetrate or bypass enemy defensive positions and drive into rear areas, CPs, and trains areas. The second echelon is used to destroy bypassed enemy elements; to defeat counterattacks, air-mobile, or airborne attacks; or to replace units of the first echelon that have lost combat effectiveness. A small tank-heavy reserve follows to provide additional support or a counterattack capability if necessary. AAA is employed in all elements and rear areas. A typical battle disposition for a Threat motorized rifle division with AAA elements is shown in figure 2-2. Frontages for main attacks will be less.

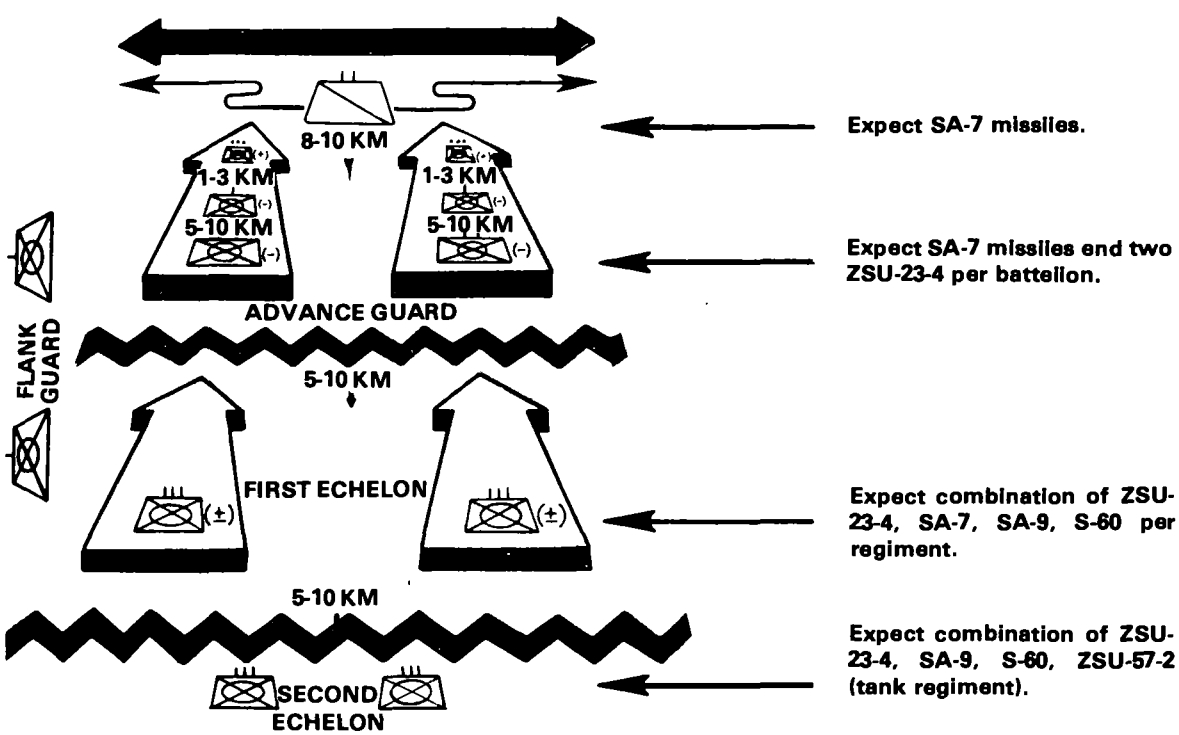


FIGURE 2-2. MOTORIZED RIFLE DIVISION MOVING TO CONTACT.

The defense. According to Soviet doctrine, defense is a temporary expedient. Offensive action is decisive. The Threat recognizes two types of defense—*hasty* and *deliberate.* The *hasty defense* is most often conducted by first echelon units during offensive action when the advance has been stopped. The *deliberate defense* is conducted when the offensive advance is halted for more than a few hours. A regiment in a hasty defense deploys in much the same manner as one advancing to contact. The deliberate defense is organized into a security zone and main defensive belt with AAA as depicted in figure 2-3.

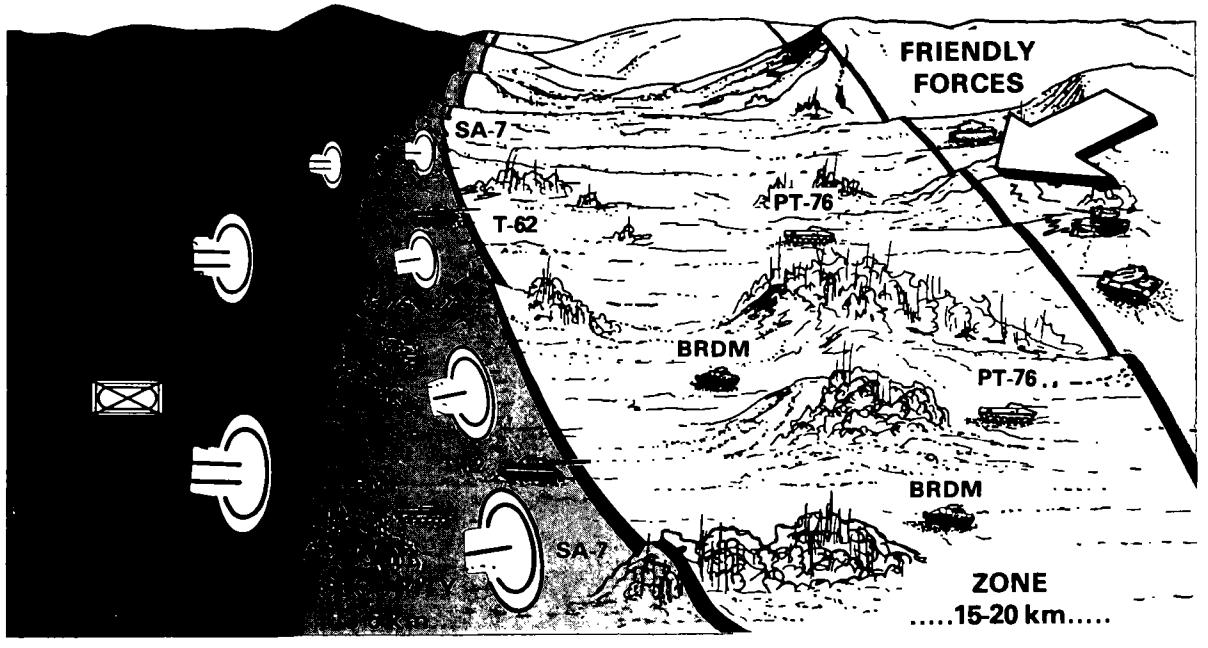


FIGURE 2-3. THREAT DEFENSE IN DEPTH.

Survivability and Countermeasures.

Active countermeasures.

Suppression. The principles of suppression by fire and smoke remain valid for Threat AAA operating in optical modes. Suppression by fire of Threat AAA capable of operating in multiple radar/optical modes (ZSU-23-4 and S-60)

includes the added benefit of possibly damaging the radar, forcing the weapon into a less range-effective optical mode. Smoke also can be employed to deny visual acquisition. Two things must be remembered about the use of smoke suppression: It does not affect the radar mode of ZSU-23-4 or the S-60; and it should be used as a temporary expedient to either maneuver to cover, deceive the Threat as to your true intentions, or buy time to destroy the weapon system or other Threat weapons by fire.

INDIRECT FIRE OFFERS SAFEST MEANS OF SUPPESSION

Indirect fire offers the safest means of suppression. When using indirect fire, effective standoff ranges can be employed as a complementary countermeasure. When employing the tube-launched, optically tracked, wire-guided (TOW) missiles against radar-acquiring AAA, standoff ranges and exposure times are critical.

Radar jammers. The AN/ALQ-136 radar jammer has been developed to provide aviators with the capability to jam Threat pulsed radar-guided weapons and weapon systems. The AN/ALQ-136 automatically analyzes incoming radar signals and determines which signals originate from Threat radar weapon systems. After the Threat radar is identified, appropriate electronic countermeasures (ECM) are applied automatically to counter the radar's range and angle measurement functions. The jammer is capable of simultaneously handling multiple threats. The signal analysis and activation of ECMs take place within a few seconds, providing the aviator with time to maneuver, mask, or attack the Threat radar weapon system.

CAUTION

The ZSU-23-4 and S-60 are capable of radar and optical engagement modes or combinations thereof.

It only takes seconds for a gunner to switch from the radar to an optical mode. The advantages of a radar jammer are twofold: Buy time and degrade the range effectiveness of the radar system. The jammer would be used in conjunction with the aircraft radar warning receiver (RWR).

Chaff. The M-130 chaff dispenser is an active radar jamming device. It consists of millions of tiny metal or metal-coated fiberglass strips cut to one-half wavelengths of specific radar frequencies. Chaff reflects the radio frequency (RF) energy transmitted by the radar system; and it causes false targets or clutters the radarscope of the Threat weapon system. Chaff can cause radar break-lock or it can confuse the operator with respect to the location of the actual target. Chaff then serves either as a decoy or jamming device. It is a temporary countermeasure used to deceive the enemy of your true intentions or to buy time to maneuver, mask, or complete engagement of enemy radar weapon systems. Chaff also would be employed in conjunction with the RWR. When chaff is employed at low altitudes (less than 100 feet above ground level (AGL)), convection currents and other wind conditions cause it to have a low fall rate, extending the time it hangs above the surface of the terrain. Chaff dispensing systems include artillery, 2.75-inch folding fin aerial rockets (FFAR), and M-130 mini-chaff dispenser system.

CHAFF SERVES AS A DECOY OR JAMMING DEVICE

Passive countermeasures.

Use terrain flight techniques. In order to avoid detection and to survive against Threat AAA, especially radar-acquiring systems, it is imperative that the aviator use terrain flight techniques in conjunction with available terrain relief. Terrain flight techniques are the most effective countermeasures against Threat AAA weapon systems. When using terrain masking techniques, insure the entire helicopter is masked, if possible, including the rotor system. The rotor system is a key source of radar acquisition by radar-acquiring systems and also produces a glint which may be a visual giveaway.

Employ standoff. Use standoff ranges in conjunction with terrain flight techniques to maximize your survivability. In order to effectively employ standoff, you must know where to expect enemy AAA to be located in Threat attack and defense formations. General guidelines have been provided in this chapter, but current battlefield intelligence reports will provide the best source of information during your premission planning process. The general

guideline for optimum standoff ranges against the ZSU-23-4 is that you should get no closer than 2,500 meters (m) at nap-of-the-earth (NOE) flight levels.

Minimize exposure time. For aircraft that are not operating out of effective engagement ranges of Threat AAA systems, exposure time is critical. Again, a general guideline for exposure time against the ZSU-23-4, at 2,500 meters, is not more than 10 seconds from unmask to remask.

MINIMIZE EXPOSURE TIME AND PRESENT THE SMALLEST TARGET TO THE THREAT

Minimize the aircraft signature. Present the smallest target to the Threat antiaircraft system. Be aware of your surrounding environment and select positions that afford the best background, cover, shadow, and color tones. Be aware of loose debris (vegetation, snow, or dust) in the area to avoid rotor-wash signature.

Use the aircraft RWR to maximum benefit. To use the AN/APR-39(V)1, AN/APR-39(V)2, or AN/APR-44(V)3 RWR to maximum benefit, the aviator must be aware of receiver indications and when to initiate countermeasures in conjunction with them. Proper training with the RWR will enable the aviator to recognize these indications. The tracking indication is the most critical for Army aircraft. Upon indication that the aircraft is being tracked, the best countermeasure is to seek cover and mask.

CAUTION

Be sure the rotor system is masked.

Due to the position of the RWR antenna, you may be receiving no warning indication but may still be tracked and engaged due to rotor system exposure. If the aircraft is unable to mask, fly away from the Threat weapon system upon indication of being tracked while descending as low as conditions permit. Aircraft being tracked while operating at altitude must take immediate evasive action to seek the cover of terrain.

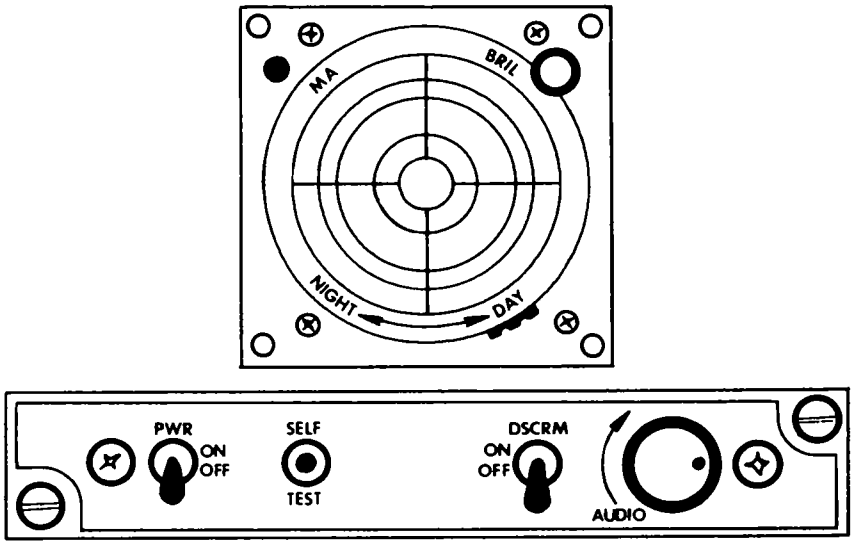


FIGURE 2-4. AN/APR-39 RADAR WARNING SETS.

Employ in mass. When engaging Threat AAA weapon systems, using RWR indications and minimizing exposure time can insure destruction of the most formidable weapon system. This will allow subsequent engagement of less range-effective Threat weapon systems. If range permits, engage Threat AAA first. Then, concentrate on Threat weapon systems that are at a range disadvantage.

Report weapon locations. When hostile antiaircraft weapons are located, they should be reported to your unit operations section or supported unit. This includes those weapons which are engaged and destroyed and information of these systems detected through RWR equipment. Reported information is introduced into the intelligence system and transmitted to all aviation units. When this information is processed with other reports, the AD posture and other data about the enemy can be determined. Knowledge of the location of hostile antiaircraft weapons is the first step to survival on the battlefield.

New Developments.

Advanced weapon systems. The lethality of modern and advanced attack helicopters is increased with the

HELLFIRE PROVIDES INCREASED STANDOFF, BETTER FIREPOWER AND REDUCED EXPOSURE TIME

introduction of the helicopter-launched, fire-and-forget (HELLFIRE) missile system and XM230E1 30-millimeter (mm) chain gun. The HELLFIRE is an advanced missile system with extended range capability using either airborne or ground laser designators as a guidance means for the missile once launched. This missile system provides increased standoff ranges, better and more lethal firepower, and significantly reduces exposure time. The XM230E1 30mm chain gun fires at a rate of 730 rounds (rd) per minute and has an effective range of 3,000 meters.

Mast-mounted sight. Recent test and operational flight evaluations have demonstrated that a mast-mounted sight, containing television (TV), forward-looking infrared radar (FLIR), and a laser designator/range finder, significantly improves aeroscout survivability by enabling aircrews to remain masked while observing the enemy at extended standoff ranges. The TV will be used for clear day detection, the FLIR for reduced visibility/night detection, and the laser for designation of targets for precision-guided munitions (PGM) (Copperhead, HELLFIRE, etc.). Plans are being made to field a near-term scout helicopter, equipped with the mast-mounted sight, in AH-1S attack helicopter units and in conjunction with field artillery aerial observer operations. Additionally, the near-term scout helicopter will have adequate avionics, visionics, and communications to operate NOE both day and night. The near-term scout also will be employed with the AH-64 advanced attack helicopter (AAH) until a new advanced scout helicopter (ASH) is fielded.

Radar jammers. The AN/ALQ-162 system is being developed to provide automatic detection, threat warning, and active jamming of hostile continuous wave (CW) type radar, surface-to-air and air-to-air missile systems. This will afford protection for US Army fixed wing and rotor wing aircraft. This system is a miniature, processor-controlled, time-gated active ECM equipment designed for use with a single transmit/receive antenna and consists of two major components—the receiver/transmitter module and power supply system. Features include programable full band tuning without hardware modification, stand-alone CW receiver capability, and end-to-end built-in test (BIT). The total system weight is approximately 35 pounds and requires approximately 450 watts of power to operate.

THE ARMORED COMBAT VEHICLE THREAT

Employment Tactics and Techniques. Soviet doctrine stresses that the offensive is the decisive form of combat. To achieve success, the Soviets stress high rates of advance (30 to 50 kilometers (km) per day (nonnuclear) and 50 to 80 kilometers per day when nuclear weapons are used by combined arms units).

To aid in achieving such high rates of advance, the Soviets have made a significant effort to equip their maneuver forces with the most up-to-date armored combat vehicles.

The proliferation of tanks, infantry fighting vehicles (IFV), armored personnel carriers (APC), and reconnaissance vehicles, coupled with the accuracy of their on-board weapon systems, makes the armored combat vehicle a very formidable threat to our aviation operations on and near the front line of own troops (FLOT).

TABLE 2-2. APPROXIMATE NUMBER OF THREAT ARMOR COMBAT VEHICLES IN A TANK AND MOTORIZED RIFLE DIVISION.

VEHICLE	MOTORIZED RIFLE DIVISION	TANK DIVISION	AIRBORNE DIVISION
BTR-60	334	96	-
BMP	124	164	-
BRDM	48	40	13
BMD	-	-	127
PT-76	-	-	-
MED TANKS	265	322	-
ASU-85	-	-	18

TABLE 2-3. THE ARMORED COMBAT VEHICLE THREAT.

COMBAT VEHICLE	WEAPONS	RANGE (METERS)	COMBAT VEHICLE	WEAPONS	RANGE (METERS)
BRDM-2	14.5mm HMG 7.62mm CBAX MG SAGGER ATGM (AT-3/C) or SWATTER ATGM (AT-2B) SPANDREL (AT-5)	2,000 1,000 3,000 3,500 4,000 (est)	T-55	7.62mm COAX MG 12.7mm AA MG 100mm Gun	1,000 1,000 1,500
BTR-60	7.62mm COAX MG 14.5mm HMG	1,000 2,000	T-62	7.62mm COAX MG 12.7mm AA MG 115mm Gun	1,000 1,000 1,600
BMP	7.62mm MG 73mm Gun SAGGER ATGM (AT-3/C) SPIGOT (AT-4)	1,000 800 3,000 2,000 (est)	T-64	7.62mm COAX MG 12.7mm AA MG or 14.5mm AA MG 125mm Gun	1,000 1,000 1,400 2,000(+)
BMD	7.62mm MG BOW MG 7.62mm COAX MG 73mm Gun SAGGER ATGM (AT-3/C) SPIGOT (AT-4)	1,000 1,000 800 3,000 2,000 (est)	T-72	7.62mm COAX MG 12.7mm AA MG 125mm Gun	1,000 1,000 2,000(+)
PT-76	7.62mm COAX MG 76mm Gun	1,000 650	T-80	7.62mm COAX MG 12.7mm or 14.5mm AA MG 125mm Gun	1,000 1,000/1,400 2,000(+)

The Soviets are well aware of the capabilities of our attack helicopters and the threat they pose to their armored formations. Threat tanks are rarely, if ever, employed singularly, and "air spotters" are incorporated in combat formations to detect airborne targets. Target data is relayed to the commander who designates priority targets. Within a matter of seconds, the airborne targets can be engaged by direct fire from one or several tanks. If the tanks use fragmentation rounds with time fuzes against friendly firing positions, the kill probability is increased.

Survivability and Countermeasures.

Active countermeasures. The most effective means of suppression is to use combined direct and indirect fires. Engaging the closest target while firing first, accurately, and in heavy volume will give you the advantage over the enemy. Using standoff, alternate firing positions and the techniques of fire and maneuver also will contribute to your success. When available, the use of artillery will cause the enemy to button up and possibly disable some vehicles. Also, the smoke and debris from impacting artillery rounds will obscure the vision of armored vehicle crews. Maximize the use of combined arms assets and tactical air support to gain fire superiority and defeat the enemy.

MAXIMIZE THE USE OF COMBINED ARMS ASSETS AND TACTICAL AIR SUPPORT TO GAIN FIRE SUPERIORITY AND DEFEAT THE ENEMY

Passive countermeasures.

Premission planning. While aviation operations in a high threat environment demand that aviators be flexible and prepared to react to many different situations, there is no substitute for a well-planned mission. One of the most important premission planning considerations is to plan terrain flight altitudes and routes that deny the enemy both optical and radar acquisition. A detailed discussion of premission planning factors is provided in chapter 8.

Employ standoff. Capitalize on your weapons by employing them at their maximum effective range. By doing so, you may not only place yourself beyond the range of the enemy's weapons but also present a smaller target.

Minimize exposure time. Keep the enemy guessing by employing fire and maneuver pop-up firing techniques and multiple firing positions. Use the maneuverability advantage of your helicopter and terrain for masking to reduce exposure time. Fixed wing aviators must rely on premission planning, selection of terrain flight routes which provide masking, and high airspeeds to reduce exposure time.

Aircraft signature and vulnerability reduction. In addition to the methods previously discussed by which an aviator can reduce his aircraft's signature, survivability is enhanced by technological developments. Low-reflective infrared (ir) paints reduce rotor/metal glint and camouflage paint patterns enable aircraft to blend with terrain, making visual acquisition more difficult. The infrared aircraft signature has been reduced with the introduction of hot metal and exhaust plume suppressor kits. These suppressor kits reduce vulnerability to heat-seeking missiles and night-visual acquisition. New generation helicopters also are being equipped with noise-reduction rotor systems to reduce the audible signature.

Aircraft vulnerability reduction. Survivability features on the UH-60 and AAH incorporate ballistic tolerant frames and critical components (23mm), redundant critical components (engine and hydraulic controls), fail-safe rotor systems, improved armored protection, and fail-safe lubrication systems.

THE SMALL ARMS THREAT

Threat small arms pose a significant problem to the aviator if for no other reason than that they are employed in vast numbers. In considering the small arms threat, it is important to note that effective ranges of employed weapon systems vary from 300 to 2,000 meters. Table 2-4 provides a list of the most common Threat small arms and machine gun systems and capabilities.

Table 2-4. THREAT SMALL ARMS WEAPON SYSTEMS.			
WEAPON NOMENCLATURE	**MAXIMUM EFFECTIVE ANTI-AIRCRAFT RANGE (METERS)**	**ACQUISITION MEANS**	**ASSIGNMENT**
AK 74 5.45mm	400	Optical	Individual soldier
AKM 7.62mm	300	Optical	Individual soldier
RPK 7.62mm LMG	800	Optical	Crew-served
PK 7.62mm LMG	1,000	Optical	Crew-served Vehicle-mounted
12.7mm MG	1,000	Optical	Vehicle-mounted
14.5mm MG	2,000	Optical	Vehicle-mounted

Employment Tactics and Techniques. AD begins with the individual soldier. In motorized rifle companies, a portion of the command is always designated to deliver massed fire on attacking aircraft. Small arms weapon systems and machine guns are employed by the individual soldier, mechanized wheel and track vehicles, and tanks. Each combat soldier is trained in antiaircraft firing techniques and visual identification of hostile aircraft. Emphasis is placed on constant visual reconnaissance, followed by rapid engagement, for aircraft operating at terrain flight altitudes.

A typical Threat motorized rifle battalion, reinforced by one tank company (from tank division), may have the following quantities of small arms available for use against aircraft.

Rifle, AKM 7.62mm ---------- 273

LMG, PK 7.62mm (BMP) ---------- 60

MG, COAX, 7.62mm (BMP, tank) ---------- 44

HMG, 12.7mm (tank) ---------- 10

A typical Threat tank battalion, reinforced by one motorized rifle company (from tank division), may have the following quantities of small arms available for use against aircraft:

Rifle, AKM 7.62mm	**118**
LMG, PK 7.62mm (BMP)	**20**
MG, COAX, 7.62mm (BMP, tank)	**41**
HMG, 12.7mm (tank)	**31**
HMG, 14.5mm (BRDM)	**2**

Survivability and Countermeasures.

Active countermeasures. Suppression by direct and/or indirect fire is the most effective active countermeasure against small arms weapons. During combined arms team operations, direct and indirect fire will be integral to the scheme of maneuver. During Army aviation reconnaissance, logistics, surveillance, or covering force operations, combined arms team fire support may not be available from infantry, armor, or attack helicopter resources. However, indirect artillery fire support or tactical air support may be available to support missions of this nature. Chapter 8 contains premission planning considerations and procedures regarding the use of these fire support means.

Another method of suppression available against small arms weaponry is the use of smoke to deny visual acquisition. Smoke munitions are available for suppression by mortar, artillery, and attack helicopter weapon systems. The use of smoke requires knowledge and careful consideration for proper employment. Available smoke munitions and employment procedures are contained in chapter 8.

When using suppression as a countermeasure, the closest or most immediate threat should be suppressed first while maneuvering to a standoff range. Firing first—in heavy volume—and accurately will give you the advantage.

The objective of suppression is to cause the enemy to button up, take cover, limit his effective fire, deny visual acquisition, or destroy him and his weapon system.

Passive countermeasures.

Use terrain flight techniques. As all small arms are dependent on visual acquisition, it only makes sense that the most effective passive countermeasure is to avoid detection. Terrain flight, in conjunction with traveling, traveling overwatch, and bounding overwatch flight techniques, provides an effective means to deny visual acquisition while en route during a mission. Careful flight or map reconnaissance during the premission planning process will provide flight routes that offer the best terrain masking and provide the best pickup zones (PZ)/landing zones (LZ), primary/alternate/supplemental firing positions, and reconnaissance approaches.

Employ standoff. The use of standoff flight techniques when engaging the enemy or flying in the vicinity of known/suspected enemy positions is the next most important countermeasure against small arms weaponry. Avoiding detection through the use of terrain flight techniques allows you to gain surprise when engaging the enemy. Once the enemy has been located, or you have been located by the enemy, employing standoff allows you to prevent effective engagement by enemy small arms.

Minimize exposure time. Exposure time can be minimized by taking advantage of available terrain for masking the aircraft for attack helicopter operations when engaging the enemy, employ fire and maneuver using pop-up firing techniques and preselected multiple firing points. Fixed wing aircraft must use terrain flight, good route planning, and maximum possible speed to increase the probability of surprise and to reduce exposure time.

MASK THE AIRCRAFT USING AVAILABLE TERRAIN FEATURES

Minimize the aircraft signature. The aircraft signature can be minimized by the aviator's awareness of the surrounding environment. Use terrain folds and shadows to prevent glint caused by rotor, propeller, plexiglass, or metal. Also, use flight route, PZs/LZs, and reconnaissance/firing points that offer a terrain background to prevent skylining. Take advantage of color tones to blend in with the terrain. Night flight is an effective means of denying aircraft detection.

Be aware of loose debris, snow, and vegetation in the area to prevent rotor-wash signature. Also, be aware that under high temperature conditions, hovering may produce a heat signature, enabling Threat weapons to engage you if masked behind vegetation. Under these conditions, you must either be masked by terrain features or maintain some forward speed. The aircraft signature also is reduced by presenting the viewer with the smallest portion of the aircraft—the front.

Use available vulnerability reduction equipment. Wear ballistically hardened helmets, if available. Also use the tinted or clear visor to protect your eyes from plexiglass spray, should rounds enter the cockpit. Wear armored/ballistic tolerant vests if available and feasible.

Threat small arms are just the tip of the iceberg. Aviators also may expect to be engaged by Threat armor, artillery, AD weapons, or tactical aircraft.

ANTITANK GUIDED MISSILES (ATGM)

Employment Tactics and Techniques. The primary role of ATGMs is antitank, but they can be a threat to helicopters operating at NOE and contour flight levels.

Table 2-5 lists characteristics and capabilities of Threat ATGMs.

Survivability and Countermeasures.

Active countermeasures. ATGM systems are optically dependent guidance systems. Therefore, suppression on or near these systems can cause the guidance operator to lose track of the missile and miss the target. Remember, ATGM systems can be remoted away from the launcher. Use area fire weapons to suppress the operator—not the missile. Smoke can deny visual acquisition and guidance, thus effectively removing ATGM systems from the battlefield temporarily. Factors and considerations for the use of smoke are provided in chapter 8.

Table 2-5. ATGM CHARACTERISTICS AND CAPABILITIES.

WEAPON SYSTEM	RANGE (METERS)	GUIDANCE/ COMMAND LINK	ACQUISITION MEANS	LAUNCH PLATFORMS	ASSIGNMENT
*AT-2A SWATTER A	2,500	MCLOS/RF	Optical	BRDM HIP E HIND A/D HARE HOUND	Antitank battery of some motorized rifle regiments
*AT-2B SWATTER B	3,500	MCLOS/RF	Optical	BRDM-2 HIP E HIND A/D HARE HOUND	Antitank battery of some motorized rifle regiments
**AT-2C SWATTER C	3,500	SACLOS (infrared terminal homing)/RF	Optical	HIP E HIND A/D	HIND attack SQD HIP trans SQD
***AT-3 SAGGER	3,500	MCLOS/wire	Optical	MANPACK BRDM-2 BMP/BMD HOPLITE HIP F HIND A/D	Antitank battery of some motorized rifle regiments
***AT-3C SAGGER C	3,500	SACLOS/wire	Optical	BRDM -2 BMP/BMD HOPLITE HIP F HIND A/D	Antitank battalion of some motorized rifle divisions
AT-4 SPIGOT	2,000 (est)	SACLOS/wire	Optical	MANPACK BMP/BMD	Antitank platoon of some motorized rifle battalions
AT-5 SPANDREL	4,000 (est)	SACLOS/wire	Optical	BRDM-2	Antitank battalion of some motorized rifle divisions
AT-6 SPIRAL	7,000 (est)	SACLOS/RF (or laser?)	Optical	HIND E	HIND attack squadron
AT-7	Unknown	Unknown	Unknown	Unknown	Unknown

* Systems being replaced by AT-3 and AT-5.
** System being replaced by AT-6.
***Systems being replaced by AT-4 and AT-5.

Passive countermeasures. Terrain flight techniques can be effectively used by aviators to avoid detection and acquisition by Threat ATGM, radar, and infrared missile systems. Most ATGMs are wire guided and are difficult to guide through vegetation. Maneuver and masking can effectively degrade the capabilities of ATGMs as they are all line-of-sight weapons.

THE AIR DEFENSE MISSILE THREAT

Employment Tactics and Techniques. The SA-7 GRAIL is an infrared heat-seeking missile similar to the US Redeye missile. It is shoulder fixed and capable of contour flight level acquisition and lock-on. NOE flight level acquisition and lock-on are dependent on vegetation and terrain relief. The SA-7 is employed in all echelons of the Threat offense and defense. It is similar to the SA-9 GASKIN and represents the most immediate missile threat to Army aircraft.

The SA-9 GASKIN, like the SA-7, is an infrared heat-seeking missile. SA-9s are vehicle mounted (BRDM-2) and usually are employed in a platoon (four each) in the main body of first and second offensive/defensive Threat echelons. The SA-9 usually is employed in conjunction with ZSU-23-4 antiaircraft gun systems in a complementary role.

> NOTE
>
> SA-9 can be fired in salvo.

The SA-8 GECKO is a vehicle-mounted, command radar-guided missile system. Each vehicle carries four missiles and is equipped with an acquisition and tracking radar plus two guidance radars. It also contains an electro-optical tracker—probably television. The US counterpart is the Roland. The SA-8 system is found in the antiaircraft regiment of some motorized rifle and tank divisions. An SA-8 regiment has a total of twenty transporter erector launchers (TEL) organized into five batteries and of four TELs each. The SA-8 will be primarily deployed well forward with maneuver

regiments. It also is employed as AD for regimental/division CPs and in trains areas to the rear of the main battle area. The SA-8 eventually will replace the current S-60 AD system. The SA-8 can acquire and lock onto Army aircraft at low-level flight regimes and perhaps down to contour flight levels within its range capabilities depending on vegetation and terrain relief.

The SA-6 GAINFUL missile battery consists of a tracked-vehicle loader, four tracked-vehicle launchers with three missiles each and associated STRAIGHT FLUSH radar mounted on a separate tracked vehicle. The US counterpart is the Hawk missile. The SA-6 may be organic to SAM regiments at army level and also to some antiaircraft regiments in motorized rifle and tank divisions. The SA-6 can be employed forward, as necessary, to protect maneuver regiments, CPs, supply areas, and other installations from the low-altitude air threat. It has the capability to acquire and lock onto aircraft in low-level flight regimes and above.

The SA-3 GOA is a two-stage, solid-fuel, low-to-medium altitude, surface-to-air missile. Two ready missiles are transported in tandem on a modified truck or tracked vehicle from which they are loaded onto a ground-mounted, trainable launcher for firing. The SA-3 is an army area system used in a variety of roles ranging from battlefield support to barrier and terminal defense of rear area targets. It is not a threat to aircraft operating below 100 feet AGL.

THE SA-4 DOES NOT POSE A THREAT TO AIRCRAFT OPERATING AT NOE ALTITUDES

The SA-4 GANEF battery has one PAT HAND fire control radar-tracked vehicle, one tracked-vehicle loader, and three tracked-vehicle launchers with two missiles each. There is no US counterpart. The SA-4 is an army area AD missile system deployed well to the rear of division-level organizations. It is designed to protect large areas from the medium-to-high altitude air threat. In addition to providing high-altitude AD for an advancing army, the system's excellent mobility allows some batteries to support the army's forward maneuver elements, filling gaps between low-altitude SA-6 batteries. Thus, three SA-4 batteries might typically follow about 10 kilometers behind the army's forward forces, with the other six batteries moving in a belt 25 kilometers behind the front lines. The SA-4 does not pose a threat to aircraft operating at NOE altitudes.

The SA-2 GUIDELINE regiment consists of three battalions, each consisting of a single firing battery. Each battery has six launchers arranged in a star formation, a centrally located FAN SONG fire control radar, and a loading vehicle. Although the launchers are mobile, they normally are deployed in fixed sites. The US counterpart is the Nike Hercules. The SA-2 usually is found in SAM regiments at front and army levels with the mission of defending static assets such as supply and command installations in rear areas. It is designed to protect large areas from the medium-to-high altitude air threat. It is not a threat to aircraft operating below 1,000 feet AGL.

Table 2-6 lists the characteristics and capabilities of Threat AD missiles.

Survivability and Countermeasures.

Active countermeasures.

THREAT INFRARED MISSILE SYSTEMS DEPEND ON VISUAL ACQUISITION

Suppression of infrared missile systems. Current Threat infrared missile systems also are operator dependent for visual acquisition prior to firing. Suppression can cause the operator to take cover or degrade his sighting capabilities. However, because the SA-7 is man-portable and because the operator will probably take a rear angle shot at an aircraft to increase hit probability, you may not get a chance to suppress or even see the operator or missile. Therefore, during combined arms operations, Army aviation will be dependent on combined arms area suppression of man-portable systems for the most part. The SA-9 is vehicle mounted and will be much easier to identify and suppress. Smoke also can be effectively used to temporarily deny infrared missile operators visual acquisition and tracking of aircraft.

Suppression of radar dependent missile systems. Threat radar dependent missile systems are soft targets and, as such, are vulnerable to suppression by fire. If the radar(s) is damaged or destroyed, the missile system is ineffective. Time or variable time (VT) fuze action, in conjunction with high-explosive (HE) artillery munitions, would be particularly

Table 2-6. THREAT AD MISSILES.

WEAPON SYSTEM	RANGE (KILOMETERS) MAXIMUM/ MINIMUM	ALTITUDE (METERS) MAXIMUM/ MINIMUM	GUIDANCE PRINCIPLE	ASSOCIATED RADARS	ASSIGNMENT
SA-7A GRAIL	3.6	3,500/45	Passive infrared homing	NA (optical)	Platoon man-portable
SA-7B GRAIL	4.8	4,500/45	Passive infrared homing	NA (optical)	Platoon man-portable
SA-9 GASKIN	6.0/0.2	5,000 (est)/20	Passive infrared homing	NA (optical)	Regiment (teamed with ZSU-23-4)
SA-13	Unknown	Unknown	Unknown	Unknown	Unknown
SA-8 GECKO	12.5	6,000 (est)/50	Command	LAND ROLL	Division
SA-6 GAINFUL	30	13,000/ 100	Semiactive radar homing	LONG TRACK/ STRAIGHT FLUSH	Army, division
SA -11	20 (est)	15,000 (est)/25 (est)	Semiactive radar homing (est)	Unknown	Army, division
SA-3 GOA	25/6	15,000/100	Command	FLAT FACE/ LOW BLOW	Front/army
SA-4 GANEF	70	25,000/150	Command/homing	LONG TRACK/ PAT HAND	Front/army
SA-2 GUIDELINE	40-50	28,000/1,500	Command	FAN SONG	Front/army
SA-10	50 (est)	5,000 (est)/300 (est)	CW semiactive radar	Unknown	Unknown

effective against systems of this type. Chapter 8 contains factors and considerations for the use of field artillery suppression.

> **NOTE**
>
> **Radar dependent Threat missile systems are not affected by smoke.**

Passive countermeasures.

Use terrain flight techniques. Terrain flight techniques can be effectively used by aviators to avoid detection and acquisition by Threat radar and infrared missile systems. Against the SA-7, NOE flight in vegetated areas caused lock-on problems for the missile system. Masking can effectively degrade the capabilities of both the SA-7 and SA-9. The most effective survivability countermeasure against Threat radar dependent weapon systems is terrain flight techniques. This is because through the use of low-level, contour, and NOE flight, the aviator can avoid detection. For helicopters using terrain flight techniques, the only real radar-guided AD missile threats are the SA-6, SA-11, and SA-8. The SA-6 and SA-11 can be avoided by flying NOE. The SA-8 however could be a problem even at NOE flight levels, depending on range.

Employ standoff. Standoff can be effectively employed against Threat infrared missile systems. However, the SA-7 man-portable infrared missile system may be employed in unsuspected ambush sites. In any case, it is hard to detect. Therefore, standoff alone cannot be completely relied upon. Against Threat radar missile systems, employing aviation assets at standoff ranges, in conjunction with altitude limitations, is the most effective means of survival for Army aviation fixed wing assets. Generally, for helicopters, except in division/corps rear areas, standoff is not a factor against Threat radar missile systems. For the most part, helicopters will be employed forward well within range capabilities of Threat radar AD missile systems. The key to survival in this situation is to operate at altitudes under Threat radar systems capabilities.

STANDOFF IS NOT A FACTOR AGAINST THREAT RADAR MISSILE SYSTEMS

Use the aircraft RWR. The aircraft RWR indications must be monitored to determine when to mask or maneuver. Remember, upon indications of being tracked, time is running short for evasive action.

EXPOSURE TIMES MUST BE LESS THAN ACQUISITION OR ENGAGEMENT TIME CAPABILITIES OF THREAT MISSILE SYSTEMS

Minimize exposure time. If it is necessary to operate at altitudes and ranges within the capabilities of Threat AD missile systems, exposure times must be less than acquisition or engagement time capabilities of Threat missile systems. Therefore, the aviator must rely on aircraft RWR indications. In this manner, aviators can descend to safe altitudes or mask prior to missile firing. For helicopters using masking techniques, missile time of flight also can be figured into the problem because the missile cannot track a well masked target.

Reduce the aircraft signature. In general, reduction of the aircraft signature for helicopters operating at terrain flight levels can be achieved by being aware of the surrounding environment as previously discussed in this chapter. Against Threat ATGM, presenting the missile operator with the smallest target is effective. Against Threat infrared missile systems, the angle, heat cross section presented, and weather may be important factors. Against Threat radar missile systems, the radar cross section presented by the aircraft can be reduced.

Infrared missile system countermeasure equipment.

—*Infrared jammers.* Infrared jammers operate on the principle of inducing false signals into the Threat missile guidance system, thus degrading the Threat missile seeker section. Infrared jammers are designed for continuous operation; consequently, missile launch/approach detection is not required.

—*Flare dispensing system.* The M-130 is a general-purpose chaff/flare dispensing system which provides effective survival countermeasures for Army aircraft against radar-guided weapon systems and/or infrared seeking missile threats. Automatic activation of the system is on command from the aircraft missile launch/approach indicator sensings. The flares act as decoys, confusing the infrared missile seeker and drawing it off target.

—*Exhaust plume suppressors.* Army aircraft are being equipped with exhaust plume suppressors which reduce aircraft self-emitted infrared radiation from hot metal engine exhaust. The suppressors reduce the aircraft's infrared

signature and minimize the possibility of an aircraft being acquired or tracked by heat-seeking missiles.

—*Low-reflective infrared paint.* Reflected sunlight from the aircraft skin, propeller, or rotor systems provides a heat source for infrared missiles. The low-reflective infrared paint decreases reflected sunlight from aircraft and reduces the aircraft's infrared signature.

—*Missile launch/approach detector.* The missile launch/approach indicator is designed to warn the aviator of missiles launched at the aircraft. The system activates decoy (flare) systems and provides the aviator time to maneuver or mask the aircraft.

Radar missile systems.

—*Radar jammers.* Radar jammers effectively reduce the influence of radar missile systems on the battlefield. Threat radar-directed missiles—as we know them today—rely solely on radar for guidance. A radar jammer may operate in conjunction with RWR indications or independently in a transponder mode.

—*Chaff.* Chaff is a temporary countermeasure to deceive the enemy of the aircraft's true intention, allow time to maneuver to mask, or allow time to complete engagement of the missile systems. Chaff could be dispensed from the M-130, based on RWR indications and in conjunction with prescribed evasive maneuvers.

—*Radar cross-sectional reduction.* Radar cross-sectional reduction refers to making the target appear smaller or reducing the target image projected on the enemy radar screen. This could affect the radar's range capability or render it ineffective when chaff decoys are dispensed.

SPECIAL CONSIDERATIONS FOR FIXED WING MISSIONS

Tactical missions flown by Army fixed wing aircraft can be broken down into two general types—standoff and penetration. Special mission rotary wing aircraft also perform standoff missions. Some fixed wing techniques may also apply to rotary

wing aircraft operating at altitude. Although both missions entail distinct dangers, the penetration is far more difficult and probably of much higher priority. But, standoff will be used far more frequently.

Long-Range Standoff Missions. Standoff missions will be used for long-range surveillance, using side-looking airborne radar (SLAR) and target acquisition systems, and for signal intelligence collection. These missions normally will be flown at altitude at an approximate range of 30 kilometers behind the FLOT. The distance behind the line-of-contact or FLOT will improve aircraft survivability as the probability of encountering hostile aircraft is reduced (range factor) and through support by friendly electronic warfare (EW) elements.

THESE MISSIONS NORMALLY WILL BE FLOWN AT ALTITUDE AT AN APPROXIMATE RANGE OF 30 KILOMETERS BEHIND THE FLOT

Crew preparation includes filing of flight plans, obtaining communications data, and planning for evasion of Threat missiles, antiaircraft weapons, and interceptors. During preflight planning, the aviator must plot the locations and fire fans of all known missile positions which could engage the aircraft during its mission. Then, the aviator must plan methods of evading each missile should it be launched. Evasive maneuvers must be planned to take advantage of protective terrain in the area. EW support should be planned for use whenever the RWR indicates particularly threatening hostile AD activities.

In flying the mission, the aviator must stay alert, especially where the threat display is concerned. If a threat indication is received, immediately look in that direction and initiate evasive action. Here is where planning comes into play. Is this a radar that is already known or is it a new one? If it's a new one, report it immediately; if it's a known one, then simply note direction, time, and duration and include these in the postflight briefing. *Do not abort the mission at this point.* Watch the radarscope and indicator panel. If a missile readiness indication is received, then execute evasive action. Check the terrain below. If it is necessary to get down, always know where you are going to go. In North Vietnam, the enemy often used the trick of turning on missile radars to cause the Air Force to drop their ordnance and thus, in effect, abort the mission. If the final indication is received, then take evasive action; and, if possible, put some high terrain between the aircraft and missile site.

CAUTION

When flying in instrument meteorological conditions (IMC) or night missions, do not execute any inverted maneuvers or you will end up doing the enemy's job for him. Nose-over and descend rapidly.

Remember, the information sought is important—if it were not, the enemy wouldn't be wasting missiles. If the radar and missile sites are known—ones previously considered in planning—then fly out of the fan plotted and resume the mission. Don't forget to report the missile firing and inform air traffic control (ATC) of your change in route. Nothing was said about visually locating the missile at and after launch. In the standoff mission, you normally will be at the far end of the missile fan. This means that the launch site could be 20 to 30 nautical miles (NM) away; and, with the normal battlefield fires, it may be difficult or impossible to detect. Obviously, you are going to try to pick it up; and, if you can, so much the better. You can then determine what evasive action to take.

REPORT MISSILE FIRINGS

Penetration Missions. The fixed wing penetration mission is the other type the aviator will be concerned with; and it is, by far, the most difficult and dangerous. Unlike standoff missions, the aviator is now concerned with operations at and beyond the FLOT. He will be flying into a field of weaponry that ranges from pistol fire to the most sophisticated missile and airborne interceptor systems in the Threat inventory.

Even with the dangers presented by a penetration mission, there is a distinct probability that such a mission must and will be flown. The ground commander must have current intelligence in a fluid battlefield situation. This intelligence must not only be current but also specific and accurate as well—intelligence that will show the vulnerabilities of the Threat. Therefore, in spite of everything, the aviator must be prepared to go in and get the information. The success

of the mission and whether or not he comes back depend on how well he is prepared.

Fly as low as possible using contour flight to take advantage of available cover and concealment afforded by the terrain, thus eliminating a great deal of the Threat's ability to visually observe or detect the aircraft by radar. Be prepared to make use of every evasive action at your disposal. *Never set up a pattern; always use different routes and target approaches!*

PLAN YOUR MISSION ROUTE TO AVOID AS MUCH OF THE ENEMY'S AIR DEFENSE AS POSSIBLE

If the target area to be covered is too large for one low pass, use more than one aircraft, with all making one—and ONLY ONE—pass at the same time over the target. Keep the number of aircraft to a minimum; the more aircraft used, the more easily detected. After passing the target, return immediately to terrain flight altitude.

If a penetration mission can be accomplished by visual means with panoramic camera backup, then the mission can be flown at terrain flight levels throughout the flight because the "pan" camera can produce good results at the lowest altitudes. Use of the infrared sensor and frame camera requires the aviator to pop up and pass over the target at a higher and more vulnerable altitude.

Always be completely knowledgeable of the friendly situation and available support. All this information is a prerequisite for planning and conducting a successful penetration mission.

A mid-intensity or high-intensity battle dictates that suppression of Threat AD weapons be maximized. Therefore, artillery, tactical air support, and EW support must be obtained from all available sources to insure mission accomplishment.

Request preplanned artillery and tactical air support to suppress enemy strongpoints and known antiaircraft positions along the mission route. Consider the use of smoke to screen operations. Perhaps an air-delivered chaff corridor can be used to get to the target area. Arrange to have artillery or tactical air on call for suppression or cover as needed. It is wise to anticipate delays or even nonavailability of requested

suppressive support due to higher priority requirements. Have an alternate course of action ready.

Request the jamming of radars and enemy AD communications through the G2 tactical surveillance officer. Pick out radars that are most dangerous to your mission profile and request assistance.

PLAN YOUR MISSION TO TAKE ADVANTAGE OF EW SUPPORT

Find out when other operations will be conducted using EW support and, when feasible, plan the mission so that this EW support serves the needs as well. When a mission can be flown in conjunction with other operations, do so; this will dissipate the enemy's effort. If a tactical air strike is planned, this should divert some enemy AD capability. Time the flight to take advantage of this distraction.

The mission will be flown using contour flight, so plan it that way from takeoff until return. Find an identification point that is in friendly territory and easily identifiable; use it as a coordination point to start the mission. Pick readily identifiable checkpoints 2 to 5 minutes apart. These are a must to keep oriented, on course, and provided with a coordination point for fire support. Maintain flight-following with ATC and report crossing each checkpoint. Terrain masking will limit the use of on-board radios except high frequency (HF); if HF is available, use it. If not, use a prearranged relay aircraft or an airborne controller. Remember to use communications security (COMSEC) and be brief, so the enemy will not be provided data to track you. The use of all these measures will minimize crew and aircraft vulnerability throughout the mission.

Find out if other aircraft will be in the area. If so, can you use them in support of your mission? Can they cover you if you get into trouble? And, can they pick you up if you need to eject?

At this point, you are ready to start the mission. Conduct a thorough preflight check of the aircraft survivability equipment (ASE) in addition to the aircraft and systems. Review the mission notes for information on how to

call for suppressive fires and jamming support. Look over the map, noting checkpoints, time, and distance marks. If you miss the checkpoints or time, you might fly into your own fire support. If you do, you need not worry about the hostile AD threat.

STAY LOW AND USE ALL YOUR NAVIGATION AIDS

As you take off, remember the capabilities of enemy warning radar and stay low to avoid detection. Fly to the identification point and cross it at the planned time. Turn the identification, friend or foe (radar) (IFF) off when crossing the FLOT to prevent threat interrogation of the transponder.

Stay low and use all aids to navigation from the instrument navigation system (INS) to dead reckoning—remember, there is no climbing to get the bearings! Keep track of the time at checkpoint; if early, lift any prearranged fire support a little early—do not loiter. Don't forget the warning receiver; keep an eye on it. If a threat indication is received dead ahead, then change direction; if it is off to one side, look for terrain to mask the aircraft. Is the indicated threat one that was expected from a known radar or missile location? If so, use preplanned suppressive fires. *Watch out for wires!* Even in peacetime, aviators are vividly aware of the wire hazard during contour and low-level flights. In combat, the Threat can be expected to supplement existing telephone lines and power lines by stringing cables across likely avenues of flight.

Keep the photo and infrared systems ready for operation. Conduct the flight as a visual reconnaissance mission, noting any activity along the way. Report significant sightings immediately; take notes on all activities and include them in the postflight debriefing. When possible, use photo and infrared systems to record the activity. If you are unsure of what was seen, note what you can—do not go back!

When approaching your target, wait until the last second before climbing to target altitude. Then climb only to the minimum altitude necessary to obtain target coverage. If tactical air support against ADs in the target areas is

available, make your target run after they have initiated their attack and before they leave the area.

Remain at contour flight to the next target to stay below radar coverage. After completion of all targets requiring multiple aircraft, separate. Go to other pinpoint targets or return to base.

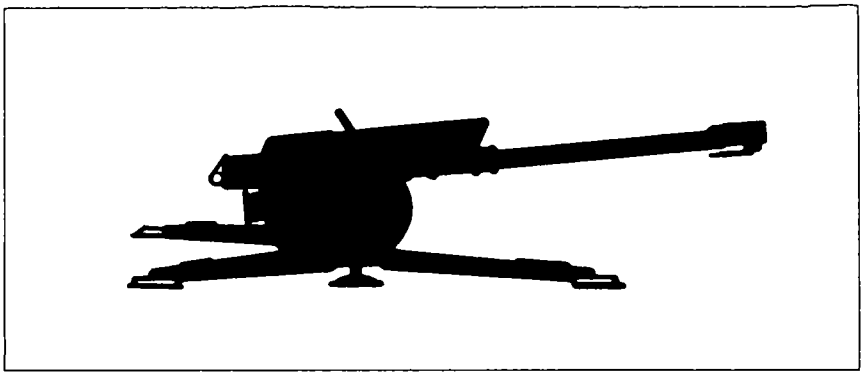
If you run into trouble, draw fire, or take hits, should you abort or continue? As always, the aviator makes the decision. You should carefully weigh the consequences of either course of action. If you have passed the enemy's strongest resistance and are in no immediate danger of losing your aircraft, continue the mission.

If you missed your target, continue to the next target. Remember, the more you can cover on each mission, the less the requirement for further missions. After considering all this, if you determine that significant damage has been suffered by aircraft or crew, you have no recourse but to abort. In doing so, you should immediately advise ATC and request assistance. Then use the most direct route to a safe area as planned and keep ATC advised of your progress. Turn on the IFF when approaching friendly airspace.

As emphasized throughout each countermeasure section of this chapter, terrain flight techniques coupled with combined arms suppression of the AD threat are the two basic and most important countermeasures for aviation unit survival in the high threat AD environment. The necessity for use of ASE, for the most part by helicopters, will depend on how well these two basic countermeasures have been applied. For fixed wing and standoff target acquisition system (SOTAS) operations, ASE is more important for survival. Although the use of these countermeasures appears simple on paper, their application and success in the final analysis will reflect the utilization of the "Principles of Success" as outlined in chapter 1.

CHAPTER 3

THE ARTILLERY THREAT



GENERAL

Since World War II, Threat Forces have relied increasingly on massed quantities of artillery. Threat artillery support is characterized by area saturation in massive barrages known as the artillery offense. The concept employs severe and intense bombardment by a multiple assortment of artillery mortars, howitzers, guns, rockets, and missiles to defeat the enemy with minimal use of foot and mechanized troops. The maneuver of combat forces follows the effective suppression of enemy defenses, particularly when weapons of mass destruction are used. Threat Forces are equipped with a variety of excellent artillery weapons capable of firing conventional, nuclear, biological, and chemical rounds.

Given the Threat doctrine, artillery area saturation could well be the most formidable threat to US Army aviation units operating in terrain flight modes.

EMPLOYMENT TACTICS AND TECHNIQUES

The command and organizational structure which insures flexibility in concentrating artillery fire in the direction of the main attack is established by temporary mission-oriented groupings. The formation of artillery into army, divisional, and regimental artillery groups permits maximum exploitation of artillery by maneuver commanders and provides continuous artillery support with the retention of the required degree of centralized control. Artillery groups usually consist of at least two battalions and may be composed of similar or mixed type units to include mortars, field guns, howitzers, and multiple rocket launchers. The command and staff elements of the artillery groups are drawn from personnel available in the artillery of the maneuver force. The formation of artillery groups, as discussed, is shown in figure 3-1.

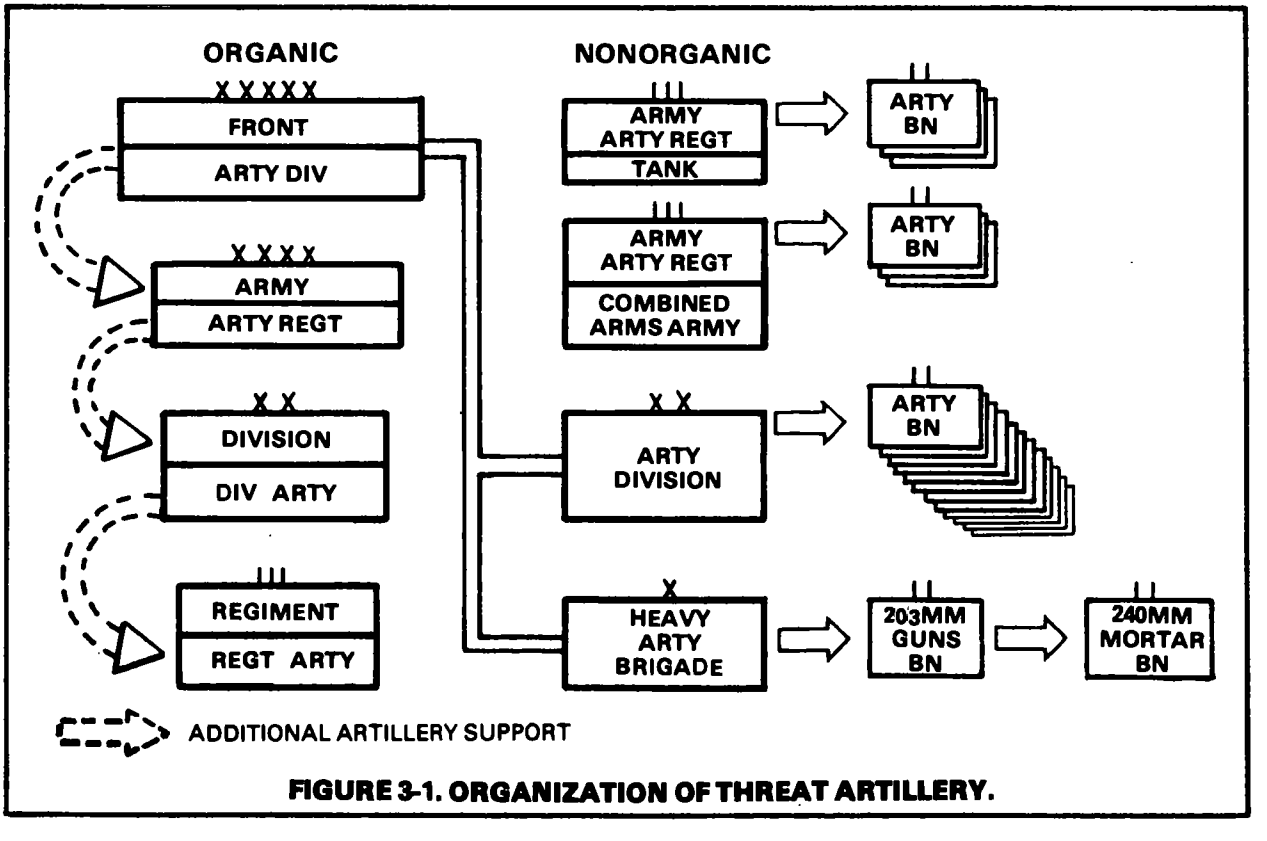


FIGURE 3-1. ORGANIZATION OF THREAT ARTILLERY.

Army Artillery Group (AAG). Front artillery assets normally are allocated among committed armies, proportional to the importance of the assigned tasks. Once an army commander receives front artillery assets, he decides, based on the concept of operation, what artillery will be suballocated to his first echelon divisions. The division executing the major army mission gets the most artillery. The remaining artillery battalions may be formed into an AAG. However, the AAG is formed infrequently; and, if formed, will assume the primary counterfire mission for the army.

THE DIVISION EXECUTING THE MAJOR ARMY MISSION GETS THE MOST ARTILLERY

Division Artillery Group (DAG). The same decision-making process is repeated by the division commander resulting in the formation of a DAG and several regimental artillery groups. If required, because of span of control, number of battalions available, and assigned mission, the division may organize more than one DAG. The DAG may vary in size from two to four battalions and it is employed in general support of the division. The DAG assists the army with the counterfire (counterbattery) mission or, if capable, may itself perform this mission.

Regimental Artillery Group (RAG). Regimental artillery groups are formed by the division commander from organic, attached, and reinforcing nondivisional artillery battalions assigned to provide support to each first echelon maneuver regiment. Normally, RAGs are composed of two to four artillery battalions and are temporarily assigned the numerical designation of the supported regiment. The RAG destroys targets which hinder the advance of the attacking force.

Battalion Support. In addition to the artillery support available from artillery groups, first echelon maneuver battalions may be allotted up to a battalion of artillery in an attached or support status for use in both direct and indirect fire. Motorized rifle battalions also have a significant organic capability in the mortar battery. Displacement of the mortar battery will be coordinated with the displacement of other artillery weapons and as authorized by the maneuver battalion commander.

Table 3-1 shows the caliber assignment, quantities, and normal offensive and defensive deployment distances behind the front line of own troops (FLOT)

Table 3-1. THE ARTILLERY THREAT.

WEAPON	MOTORIZED RIFLE BATTALION	TANK REGIMENT	MOTORIZED RIFLE REGIMENT	TANK/MOTORIZED RIFLE DIVISION	ARTILLERY REGIMENT OF COMBINED ARMS	HEAVY ARTILLERY BRIGADE OF TANK FRONTS	ARTILLERY DIVISION OF FRONTS	RANGE (INDIRECT FIRE) (METERS)	RANGE (DIRECT FIRE) (METERS)	NORMAL DISTANCE BEHIND FLOT (KILOMETERS)	
										OFFENSE	DEFENSE
M1943 120mm Mortar	6		18	18/54				5,700	NA	.5 to 1.5	.5 to 1.5
*D30 122mm Howitzer		18		90/90				15,300	800	.5 to 4	2.5 to 5
M1974 SP 112mm Howitzer			18					24,000	1,070	.75 to 6	6 to 10
BM 21 122mm Multiple Rocket Launcher				18				20,500	NA	.5 to 6	2.5 to 10
D20 152mm Gun/Howitzer					18		54	18,500	850	.5 to 6	2.5 to 10
M-1973 SP 152mm Gun/ Howitzer								18,500	850	.5 to 6	2.5 to 10
M46 130mm Gun					36		72	27,000	1,170	.5 to 4	2.5 to 5
1931(B-4) 203mm Howitzer						18-36		**30.000	NA	.75 to 6	6 to 10
240mm Mortar						18		9,700	NA	1 to 3	4 to 6
FROG 7 Free-Rocket Over Ground				4 lchrs				70,000	NA	8	15

*The self-propelled (SP) version may be substituted for the towed version.
**43,000 with rocket-assisted projectile.

Target damage criteria. Threat artillery fire missions can be categorized in terms of the degree of damage and desired results. Criteria for target damage (personnel casualties, mobility, or firepower kills) include the following:

- *Harrassment*— ten-percent damage to keep enemy heads down (reduces effectiveness of enemy aimed fire).

- *Neutralization*— twenty-percent to thirty-percent damage (temporarily reduces the enemy's capability to fight).

- *Annihilation*— fifty-percent to sixty-percent damage (completely destroys capability to fight until reconstituted).

- *Others*— demolition, interdiction, and screening fires.

Methods of fire. The following definitions of various methods of fire are adapted from the Soviet Dictionary of Basic Military Terms. (Abbreviations are derived from the Russian terminology for the method of fire.)

AS A RULE, FIRE ASSAULTS BEGIN WITH SALVO FIRE FROM MORE THAN ONE WEAPON

Fire assault (*ON*)—method of conducting artillery fire for the purpose of neutralizing or annihilating enemy personnel, weapons, and combat materiel, envisaging a high density of fire during a short interval of time. As a rule, fire assaults begin with salvo fire from more than one weapon, with a subsequent transition to deliberate fire, reckoned on the basis of expending the assigned amount of ammunition in a predetermined period of time. It is used during the preparation and possibly at other times.

Fire concentration (*SO*)—method of conducting fire against a single target or group of targets in a single area. When artillery is used alone, several batteries or battalions may be employed against the target area. This method is calculated by target area and may be planned or unplanned.

Successive fire concentration (*PSO*)—a type of artillery fire used in support of advancing troops, consisting of

successive neutralization, by artillery fire, of enemy weapons, personnel, tanks, and other combat materiel, along the front and on the flanks of advancing motorized rifle and tank units. Successive fire concentration is conducted against targets located separately or in strong points and arbitrarily grouped into sectors for neutralization. Such sectors are projected on the basis of previously reconnoitered targets—the presence of which, in the given sector, is known.

Controlling fire—fire by single rounds or bursts at will, conducted during the intervals between fire assaults against the same target, but with considerable less density. The purpose of controlling fire is to keep the target from returning to action or escaping.

Barrage fire (*ZO*)—a type of artillery fire consisting of laying a fire barrage (frontal or flank) on a preselected line (or lines) in order to interdict movement by enemy, infantry, or tanks. Barrage fire is arranged beforehand and conducted at a definite rate for a certain period of time.

Defensive rolling barrage (*PZO*)—a type of artillery fire consisting of successive shifts of a powerful curtain of fire from one preselected observed line to another during an enemy tank attack.

Standing barrage (*NZO*)—high density artillery fire (frontal or flank) used on preselected lines to obstruct movement of the enemy through them.

Offensive rolling barrage—a method consisting of successive shifts of high density fire, from one firing line to another, ahead of the combat formations of advancing troops. A rolling barrage may be single or double.

DIRECT FIRE FROM CANNON ARTILLERY IS USED IN BOTH OFFENSE AND DEFENSE

Direct fire—a type of gun laying performed by sighting at the target. Direct fire is delivered from open firing positions and from tanks against stationary or moving targets. Direct fire is delivered at short range and distinguished by the high accuracy and speed with which the assigned fire mission can be accomplished. The employment of cannon artillery in the direct fire role is normal in both the offense and defense.

Overlapping fire—high density fire directed at artillery and mortar positions at the end of the preparatory fire and at the beginning of the fire support period; it is designed to allow the attacking units to seize forward defense positions.

Firing norms. Some norms which the Soviets have established for ammunition expenditure, expected area coverage, and effect on target are illustrated in the following paragraphs.

Fire coverage—Soviets calculate fire coverage in hectares. A hectare is 10,000 square meters; 100 hectares equal 1 square kilometer.

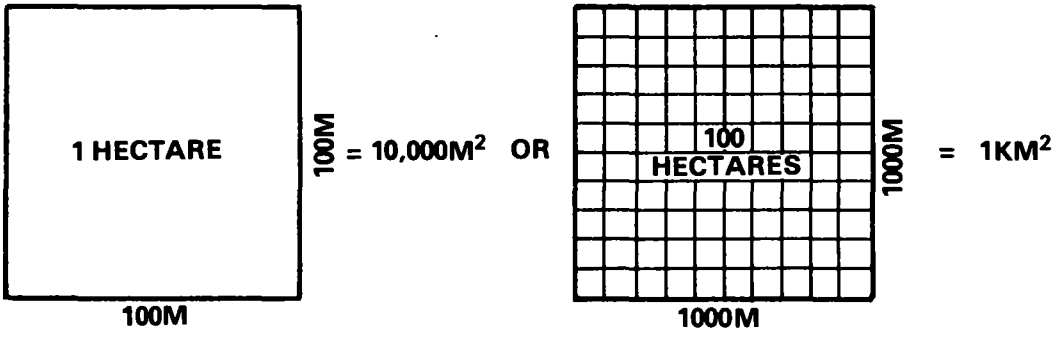


FIGURE 3-2. FIRE COVERAGE.

Fire concentration (SO)—a fire concentration may be conducted against a single target or group of targets located in the same area. If several batteries are employed, the target can be broken down into subareas for each battery, or fires can be superimposed to achieve high densities of fire for short times. For unobserved fire planning purposes, the Soviets consider area targets to be at least a designated minimum size, depending on range to the target and weapon dispersion factors. See table 3-2 on next page.

Table 3-2. 122MM HOWITZER BATTERY (AREA TARGETS).

METHOD OF FIRE AND FIRING UNIT	MINIMUM TARGET SIZE	
	RANGE (UP TO 6 KM)	RANGE (OVER 6 KM)
NEUTRALIZATION BY A BATTERY OF 122MM HOWITZERS (6 GUNS)	100 m x 150 m (1.5 hectares)	100 m x 200 m (2 hectares)

Even though an actual target may be smaller in size than the minimum area for a particular artillery unit to cover, it will be attacked with the ammunition required for the designated minimum area to insure coverage.

Each artillery weapon is assumed to be able to neutralize an area, given in hectares, which depends on the time allotted and type of target. Representative coverage for a 120mm mortar battery and a 122mm howitzer battalion is shown in table 3-3 below.

Table 3-3. 120MM MORTAR BATTERY AND 122MM HOWITZER BATTALION (TARGET COVERAGE).

TYPE TARGET	ASSAULT LENGTH (MINUTES)	AREA COVERAGE (HECTARES)	
		120MM MORTAR BATTERY (6 TUBES)	122MM HOWITZER BATTALION (18 TUBES)
Tanks and APC	10 min	1-2	5-6
Exposed Personnel and Weapons	3-4 min	15	18
Personnel and Weapons Under Cover	5 min	1	3-4
	10 min	1-2	5-6
	15 min	2	7-8
	20 min	2-3	9

Successive concentration of fire (PSO)—used in support of the attack and for fire support in depth. Targets are grouped in lines with each line somewhat deeper within the defensive position. Fire is delivered on a line for at least 5 minutes and then shifted, on order, to a subsequent line. The objective is neutralization of the target based on a prescribed expenditure of rounds per hectare per minute. For a 122mm howitzer, the expenditure is three rounds per hectare per minute. Table 3-4 below gives the ammunition expenditure rate for various weapons.

Table 3-4. AMMUNITION EXPENDITURE RATES, ROUNDS PER HECTARE PER MINUTE, FOR PSO.

TYPE WEAPON	GUNS AND HOWITZERS				MORTARS	
CALIBER	100mm	122mm	130mm	152mm	120mm	160mm
ROUNDS PER HECTARE PER MINUTE	3	3	3	2	3	2

—The rate of fire in a PSO may be reduced because a PSO normally follows intensive preparatory fires.

—A battery normally has a minimum target area as in fire concentration (SO).

—Rocket launchers are used only against the most important targets and fire single salvos.

—In PSO fire, a 122mm howitzer battery, for example, can cover an average of 4 hectares. Table 3-5 below shows the average coverage in hectares for the 122mm howitzer and other weapons.

Table 3-5. COVERAGE IN HECTARES, PSO FIRES.

	GUNS		HOWITZERS			MORTARS	
CALIBER	100mm	130mm	152mm	122mm	152mm	120mm	160mm
HECTARES	3	3	3-6	4	6	2	2-3

Barrage fires. An offensive rolling barrage may be fired to a depth of about 4 to 5 kilometers. Fires are delivered on main and intermediate lines in succession, using a combination of PSO and barrage fires. For main lines, the fire is for a minimum of 5 minutes; for intermediate lines, 1 to 2 minutes. The assigned line sectors for offensive barrage fires are shown in table 3-6.

Table 3-6. ASSIGNED SECTORS FOR OFFENSIVE BARRAGE FIRES.

TYPE WEAPON	METERS PER WEAPON	METERS PER BATTERY	METERS PER BATTALION
100mm and 130mm Guns	20-25	150	450
HOWITZER AND GUN/ HOWITZER	35	200	600-650

During the course of the attack, barrage fires of the ZO type are planned to interdict movement by enemy infantry or tanks. Fire is for short periods on preplanned lines. Coverage is assumed to be 50 meters per weapon or 900 meters per battalion. Multiple rocket launcher fire is superimposed on other fires at important points.

SUPPORT OF OFFENSIVE OPERATIONS

The desired characteristics of the use of artillery in offensive operations are listed below:

- Continuous reconnaissance by ground, air, and instrumental capabilities.

- Concentrated artillery support in the direction of the main attack.

- Coordination of massed conventional artillery fires, nuclear missile attacks, and air strikes.

• Acquisition of targets for artillery, tactical air support, and nuclear fire means.

• Strong antitank reserves at regiment and higher levels.

• Continuous close coordination between all combat levels.

FIRE SUPPORT DURING THE ATTACK IS CONTINUOUS

Fire support during the attack must be continuous. Thus, after the preparatory and initial fires in support of the attack, artillery units supporting the first echelon battalions and regiments begin to displace. This displacement is preplanned to accommodate the advance of the assault forces. For example, the displacement of part of the supporting artillery will begin when the assault force reaches a preselected line. Continuous support is provided by displacing artillery by bounds, attempting to retain two thirds of the artillery in position and in range to support the assault force.

Included in the plan for the battle are the concept and tasking for fire support of the commitment of the second echelon. Designated artillery units must be displaced to accomplish these missions.

Depending on the nature of the enemy defenses, conditions of available forces, terrain, nuclear or chemical situation, and availability of artillery, Soviet planners prefer to achieve certain density norms for artillery. In the breakthrough of well-prepared enemy defenses, for example, relatively high numbers of guns per kilometer of frontage are desirable even under conditions of high nuclear threat.

Deployment Norms. Based on the fire support plan, supporting artillery is deployed into positions to provide preparatory fires and the initial fire support of the attack. Table 3-7 shows tactical deployment norms for Soviet artillery.

Table 3-7. TACTICAL DEPLOYMENT NORMS (OFFENSE).

DISTANCES	MORTARS (120mm)	GUNS AND HOWITZERS	MULTIPLE ROCKET LAUNCHERS
BETWEEN WEAPONS	15-60 m	20-40 m	15-50 m
BETWEEN BATTERIES		400-2,000 m (normally up to 1,000 m)	1,000-2,000 m
FROM THE FLOT	500-1,500 m	3-6 km (DAG) 1-4 km (RAG)	3-6 km (DAG)

Figure 3-3 provides an illustrative layout of an artillery battery firing position. This example presupposes friendly forces in contact forward of the artillery positions. In a hasty attack, artillery units would deploy into less elaborate positions, possibly preplanned and reconnoitered, in order to provide fire support rapidly.

While there will be variations based on caliber, artillery battalions are expected to leave firing positions in about 12 minutes. They displace at a rate of about 20 kilometers per hour (km/hr) during daylight and about 15 kilometers per hour at night. The time to occupy a new position may vary from about 20 to 25 minutes during daylight and up to 30 minutes at night.

Fire Planning in the Offense. The fire planning process includes target acquisition, organization for combat, assignment of tactical missions, determination of ammunition requirements, and formulation of a detailed fire plan. The fire plan is coordinated and approved at the highest level of participating units and includes input from subordinate units.

Planners are guided by the following principles:

- Nuclear fires, chemical strikes, conventional fires, and tactical air support are included in single, coordinated plan.

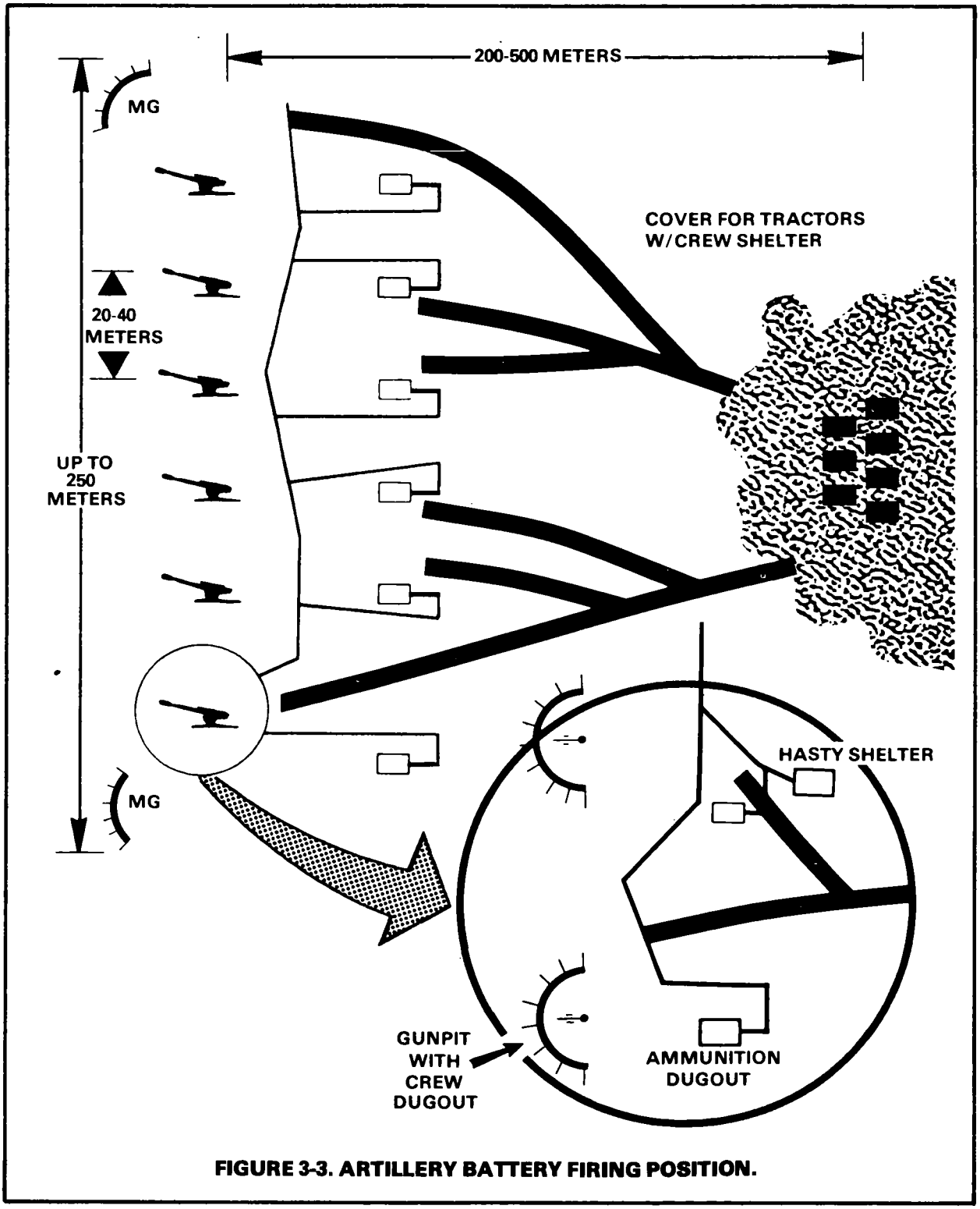


FIGURE 3-3. ARTILLERY BATTERY FIRING POSITION.

• Fire preparations precede major offensive actions, whether or not nuclear weapons are to be used.

• All artillery, except mortars, may be employed in a direct fire role at regimental and lower levels.

• Fires of tanks and antitank artillery may be used during preparations.

Target priorities for planning offensive fires include—

• Nuclear-capable artillery and rockets and their control systems.

• Command posts (CP), observation posts (OP), communications, and radar stations.

• Enemy defensive strongpoints, especially antitank guided missile (ATGM) positions.

• Conventional artillery and air defense (AD) units.

• Reserves and service support units.

The fires of all artillery units within a division are incorporated into the army or front fire support plan, and the artillery unit commander at each level coordinates fires under his control. He determines new requirements and missions and, together with the chief of rocket troops and artillery (CRTA) or chief of artillery (depending on the level), makes suggestions to the combined arms commander concerning adjustments in tactical organization as the situation develops.

The division CRTA submits requests and recommendations for the employment of nuclear fires. The fires of nuclear weapons organic to the division and/or nuclear strikes allocated to the division from army level are closely integrated with air strikes, conventional fires, and the overall scheme of maneuver.

Signals are specified for requesting and shifting nonnuclear fire to successive lines and objectives. The CRTA

indicates exactly where it is necessary to establish artillery OPs, endeavoring to place them together with the OPs of the maneuver commanders.

The basis for division artillery fire planning is established during the reconnaissance of the area of anticipated action by the division commander, his CRTA, and other staff members. During such reconnaissance, the organization for combat and means of coordination may be refined. The artillery representative receives instructions from the maneuver commander which form the basis for determining—

- Targets to be fired on by artillery.
- Priority of each target.
- Sequence in which targets will be attacked.
- Time for attack of each target.

An overriding factor in fire planning is the availability of nuclear support. Doctrine emphasizes the employment of nuclear fire in conjunction with conventional fire support in all types of military operations, particularly in the area of main effort.

Nuclear weapons provide the capability for support of ground forces through the depth of and beyond the tactical zone of operations.

Targets designated for destruction by nuclear weapons must meet the requirements below.

- Destruction of the targets must be essential to the success of the overall offensive plan.
- Employment of the weapons must not present problems of control.
- Employment must not jeopardize operational security.

Illustrative Fire Plan.

Table 3-8 contains extracts from an illustrative fire plan for a 122mm howitzer battalion supporting the attack of a motorized rifle battalion. The attack is made from positions in contact.

THE ILLUSTRATIVE FIRE PLAN HAS TWO MAJOR PARTS - THE PREPARATORY FIRES AND SUPPRESSIVE FIRES

Note particularly that the plan has two major parts—preparatory fires and fires in support of the attack. The preparatory fires last 35 minutes and are divided into three periods of fire assaults of 13, 10, and 12 minutes.

There is overlapping fire of 8 minutes, executed by only one battery. As indicated by its duration (H minus 7 to H plus 1), this "overlaps" the transition from preparatory fire to support fire.

Fires in support of the attack consist of preplanned successive fire concentrations (PSO) delivered on three lines to a depth of 2.5 kilometers. The first line (WOLF) includes the platoon strongpoints on the forward edge of the defense, designated as Sector 11. When the assaulting forces reach a safety line about 200 meters from line WOLF, fires are lifted on call to the deeper line (RAT).

In addition to PSO fires, other on-call fires are preplanned; these consist of fire concentrations (SO), fire at individual targets, and barrage fires.

Barrage fires (ZO) are planned on lines where it is anticipated that enemy counterattacks might be launched. These may coincide with the lines of successive fire concentrations.

The firing during the preparation phase is based on a time schedule shown in the fire plan and supplemented with radio, telephone, and visual signals. In addition, signals are prescribed in the illustrative plan to call for fire, to cease fire, and to shift fire.

Table 3-8. ILLUSTRATIVE FIRE PLAN (122MM HOWITZER BATTALION).

	TIME	METHOD OF FIRE AND TARGETS	SIGNALS	FIRST BATTERY	SECOND BATTERY	THIRD BATTERY
PREPARATORY FIRES	H-40 TO H-27 (13 MIN)	FIRE ASSAULT: Artillery and mortar batteries, CPs, radar, and platoon strongpoints of companies in first echelon of defense.	Green flares SNOWSTORM/2121 (Radio/telephone)	Target 60 90 rds Sector 11 120 rds	Target 18 140 rds Sector 11 90 rds	Target 40 80 rds Sector 11 120 rds
	H-27 TO H-17 (10 MIN)	FIRE ASSAULT: Platoon strongpoints within deeper defensive positions, destruction of targets by direct fire, and controlling fires against artillery and mortar batteries.	Star flares HAIL/3131 (Radio/telephone)	Sector 16 120 rds Target 69 14 rds	Sector 16 165 rds	Sector 16 165 rds
	H-17 TO H-5 (12 MIN)	FIRE ASSAULT: Platoon strongpoints within companies of first echelon defense.	Yellow flares RAIN/4141 (Radio/telephone)	Sector 11 120 rds	Sector 11 150 rds	Sector 11 150 rds
	H-7 TO H+1	OVERLAPPING FIRE: First battery fires at artillery and mortar batteries. (Overlaps H-hour transition from preparatory to supporting fires.)	Yellow flares RAIN/4141 (Radio/telephone)	Target 60 60 rds	TOTAL ROUNDS PREPARATORY 1584	
SUPPRESSIVE FIRES	H-HR TO H+5	SUCCESSIVE FIRE CONCENTRATIONS (PSO): On Line 1 (WOLF)(Sector 11)	Line 1 (WOLF) Green flares HURRICANE/5555 (Radio/telephone)	Overlapping fires as above	45 rds	45 rds
	ON CALL	5-minute fires on Line 2 (RAT) (Sector 21)	Line 2 (RAT) Star flares THUNDER/6666 (Radio/telephone)	50 rds	50 rds	50 rds
	ON CALL	5-minute fires on Line 3 (TIGER) (Sector 16)	Line 3 (TIGER) Yellow flares TYPHOON/7777 (Radio/telephone)	32 rds	32 rds	32 rds
	ON CALL	FIRE CONCENTRATIONS (SO): Individual targets BARRAGE FIRES (ZO) **NOTE:** SO and ZO fires are contingency plans and will be used depending on progress of attack.	Readiness to open fire on targets 20, 25, 32, 33, 69, and 71 Targets A and B	TOTAL ROUNDS PLANNED SUPPORTING 1152		

ACTION	VISUAL	RADIO/TELEPHONE
Call for Fire	Green Flares	Hurricane
Cease Fire	Red Flares	Stop
Shift Fire	Three-Star Flare	Storm

The fire plan provided in table 3-8 also can be used to illustrate another aspect of artillery support—ammunition requirements and supply. Planning for ammunition consumption is based on the unit of fire. The unit of fire is a fixed number of rounds per weapon or weapon system used for planning and accounting purposes. It is not an authorized allowance or daily expenditure rate. For example, the unit of fire for the 122mm howitzer is 80 rounds. For each type operation—meeting engagement, attack of a hasty defense, etc.—planning factors for ammunition expenditure are established in terms of units of fire. If nuclear or chemical weapons are employed, the requirements for conventional artillery in all three phases may be reduced.

Preparatory fires are carried out under centralized control against the entire depth of the enemy's first defensive zone. Duration of the preparation depends on whether nuclear weapons are employed and in what quantity, on the organization and strength of the enemy's defense, and on the availability of friendly artillery. The preparation is designed to disrupt enemy troop control and neutralize all forward enemy strongpoints, OPs, and heavily defended areas. Prime targets are known and suspected enemy nuclear delivery systems. Conventional fires may be employed to prevent enemy troops from attempting to restore defensive positions in an area previously hit by nuclear fire.

Fires in support of the attack are planned and conducted in order to neutralize enemy artillery and other weapons, prevent the enemy from restoring effective troop control, break up counterattacks, destroy nuclear weapons systems, and to hinder enemy maneuvers. Concentrations are planned on the basis of the schemes of maneuver and fired accordingly; targets of opportunity are engaged when discovered. During this phase, artillery control may be

partially decentralized for immediate response to commanders of maneuver units.

Fires in the depth of the enemy's defense are provided by surface-to-surface missiles, air strikes, and long-range artillery accompanying the attacking troops to maintain the attack momentum, prevent counterattacks, and destroy enemy forces attempting to withdraw.

Fire Support of the Pursuit. In the pursuit that may follow an attack, long-range artillery, moving forward by bounds, hinders the enemy's retreat by delivering interdiction fire on crossroads and communications routes and disrupts the approach of hostile reserves. The more mobile artillery units available to the tactical commanders (e.g., self-propelled weapons, multiple rocket launchers, and mortars) normally are attached to parallel pursuit detachments. Control of forward artillery is decentralized to a great degree to meet the requirements of a fluid situation. Nuclear strikes are employed on the retreating enemy force when appropriate targets are detected. Tactical air support is increasingly important during the highly mobile phases of the pursuit when the artillery does not have sufficient time to emplace.

SUPPORT OF DEFENSIVE OPERATIONS

Use of Artillery. Fires in the defense consist of the preparation of fire strikes by all available delivery means, to include—

Long-range artillery against the likely approaches to the defense positions.

Creating zones of continuous fire in front of the FLOT.

Concentrating fires on avenues of approach.

Close coordination is stressed among nuclear, chemical, and conventional artillery and aircraft delivery means. The intelligence effort concentrates on determining enemy formations, location of nuclear delivery means, and attack positions so that artillery can attack accordingly.

As in the offense, fire and maneuver the defense consists of shifting and concentrating fires. It is used to bring a high volume of fire against the enemy's most important grouping of attack forces, against targets in his rear, and for covering friendly flanks with fire. An essential part of the fire maneuver is the ability to shift fires as the enemy maneuvers.

ARTILLERY COMBAT ORGANIZATION IS SIMILAR IN DEFENSE AND OFFENSE

Organization for Combat. The organization for combat of artillery in the defense is similar to the offense. Artillery groups are located so that they may execute their primary mission and yet be capable of massing fires in support of forward defense positions, particularly against armored attacks.

Fire Planning in Defense. Fire planning must support the defensive mission of the force. In the following general sequence, the defensive plan is intended to achieve—

- Destruction or neutralization of enemy nuclear and non-nuclear means. (Counterpreparation and counterbattery fires are within this scope.)
- Neutralization of enemy command and control facilities.
- Neutralization of enemy march columns and troop concentrations.
- Interference with the deployment of the attacking enemy.
- Support of friendly units, to include the covering force in forward positions.
- Neutralization of the enemy in front of the forward defenses.
- Neutralization of the enemy units that have penetrated the defenses through extensive use of on-call fires and direct fire artillery.
- Delivery of fires in support of counterattacks and counteroffensives.

• Covering, by fire, the gaps and flanks in friendly sectors, engineer obstacles, and natural obstructions.

• Contamination of terrain and obstacles.

• Firing of smoke rounds against enemy OPs.

• Battlefield illumination during night attacks.

Deployments in Defense. Artillery weapons are deployed in concealed and dispersed positions in order to employ flanking fires, interlocking fires, and surprise fires at very close ranges with great intensity. To confuse the enemy about the deployment and fire plans for friendly artillery, roving batteries and guns are employed. Each battery also prepares primary, alternate, and night firing positions.

SURVIVABILITY AND COUNTERMEASURES

There are several inherent weaknesses common to Threat artillery that can be exploited by Army aviation units to enhance survivability. In addition, Army aviation has some inherent characteristics that, if used, can contribute to survivability.

Active Countermeasures. Threat artillery, in some instances, is towed. Therefore, it does not provide good overhead cover for section personnel. Threat OPs may or may not employ overhead cover. The nerve center for employment of indirect artillery fires is the fire direction center (FDC). It, too, is usually a vulnerable soft target. For the most part, we will have to rely on suppression of Threat artillery systems by our own combined arms team and counterbattery artillery fires. Electronic counter-countermeasures (ECCM) also may be available to aid in suppression of Threat artillery. However, aviators cannot ignore the lethality of Threat artillery as a potent means of firepower on the battlefield. Historically, artillery has been the greatest killer on the battlefield. Suppression by fire can neutralize exposed Threat artillery crews, FDCs, and observers. Exposed Threat artillery components would be particularly vulnerable to artillery fire using high explosive (HE) projectiles with variable time (VT)

fuzing. Chapter 8 provides considerations and procedures for the use of artillery/mortar fire. Attack helicopter 2.75-inch folding-fin aerial rockets (FFAR) employed in direct or indirect fire modes also would be effective. If available, tactical air support also would be very effective. (See chapter 8 for procedures.)

Threat artillery ground OPs are collocated with the supported unit near the FLOT in positions that facilitate good fields of observation for the adjustment of artillery fires. OPs can be neutralized by fire suppression or by screening their vision with smoke. However, well-camouflaged and well-constructed OPs may be difficult to detect and suppress by fire.

Passive Countermeasures.

MOST THREAT ARTILLERY HAVE BEEN DESIGNED WITH A RELATIVELY LOW TRAJECTORY

Use terrain to your advantage. Because Threat artillery doctrine emphasizes the use of artillery direct fire in breakthrough and fire support operations, most Threat artillery weapons have been designed with a relatively low trajectory. Therefore, terrain masking offers the best passive countermeasure for helicopters operating in terrain flight modes. Good terrain analysis prior to and during combat missions will enable aviators to stay clear of likely artillery targets such as prominent terrain features, troop assembly areas, likely avenues of approach, massed infantry and armor units, friendly artillery units, trains areas, and CPs. To use terrain advantageously:

- Maximize dispersal of aviation assets on the ground and in flight to minimize losses.

- Select primary and alternate reconnaissance and firing positions and landing zones (LZ) to enable flexibility and protection from area artillery saturation.

- Insure premission planning includes detailed signals and procedures for execution of alternate landing and position changes.

- Use terrain flight techniques to avoid detection.

Exploit mobility. Threat artillery fires are planned and controlled at higher echelons of command and are less decentralized than US artillery. In addition, Threat artillery doctrine emphasizes the employment of massive preplanned and on-call artillery support. Therefore, Threat inflexibility prevents them from shifting fires or obtaining artillery suppression of targets of opportunity—a weakness we can exploit by helicopter mobility.

Use all available intelligence data. The use of all available intelligence data in conjunction with a thorough map reconnaissance can aid aviators and aviation operations personnel in planning operations which avoid Threat artillery and other fires which may interfere with the successful completion of the aviation mission.

Report intelligence information promptly. By reporting Threat artillery locations and type units, you can provide information that contributes to the identification and neutralization of Threat artillery.

NEW DEVELOPMENTS

Suppression. A rocket management system for the 2.75-inch FFAR is under development. A control panel for the system will provide the means to select and fire, while in flight, any one of several types of external rocket stores. The control panel permits aviators to set range and select the fuse setting best suited to the type target being engaged to include settings which permit penetration of tree canopies or fortifications protecting selected targets. Suppression of area targets also will be improved with the introduction of the XM261 multi-purpose submunition (MPSM) warhead. This warhead will deploy nine full-caliber submunitions to significantly increase the antipersonnel and antimateriel lethality per rocket with armor penetration capability.

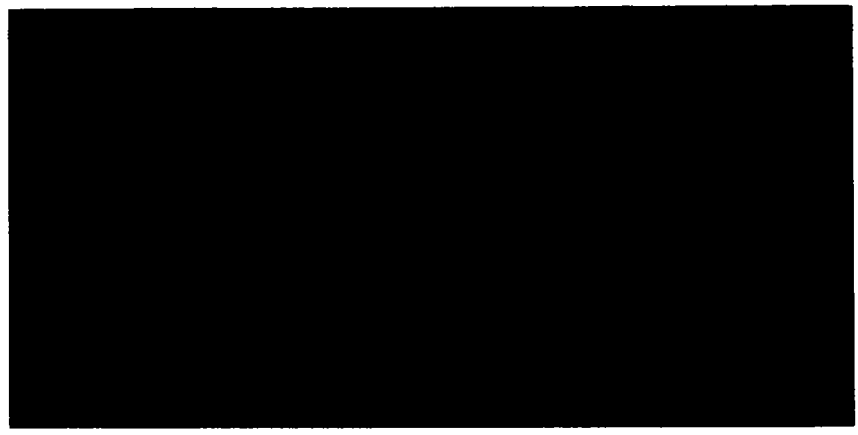
Optical Warning Laser Detector (OWL/D). The OWL/D provides aircrews with warning if their aircraft is being tracked by passive direct view daylight optics and passive electro-optical devices associated with Threat AD weapons.

Vulnerability Reduction. Aircraft vulnerability is being reduced with the introduction of ballistic tolerant frames and critical components (23mm), redundant critical components (engine and hydraulic controls), fail-safe rotor systems, improved armor protection, and fail-safe lubrication systems.

In order to perform their mission on the modern battlefield, Army aviation units and aviators will have to take into account the effects that Threat artillery may have on the mission and plan accordingly to minimize the threat. In accomplishing this end, the aviator will have to use available intelligence resources; plan flight routes, positions, PZs, and LZs to avoid likely artillery targets; remain flexible in executing the mission; use available suppression; and be an effective member of the intelligence reporting system. Threat artillery may not have top priority during the aviation mission, but it will be an awesome threat which will have to be suppressed by the combined arms team in order to accomplish the mission. Army aviation mobility plus the firepower of the combined arms team are the keys to success.

CHAPTER 4

THE TACTICAL AIR THREAT



GENERAL

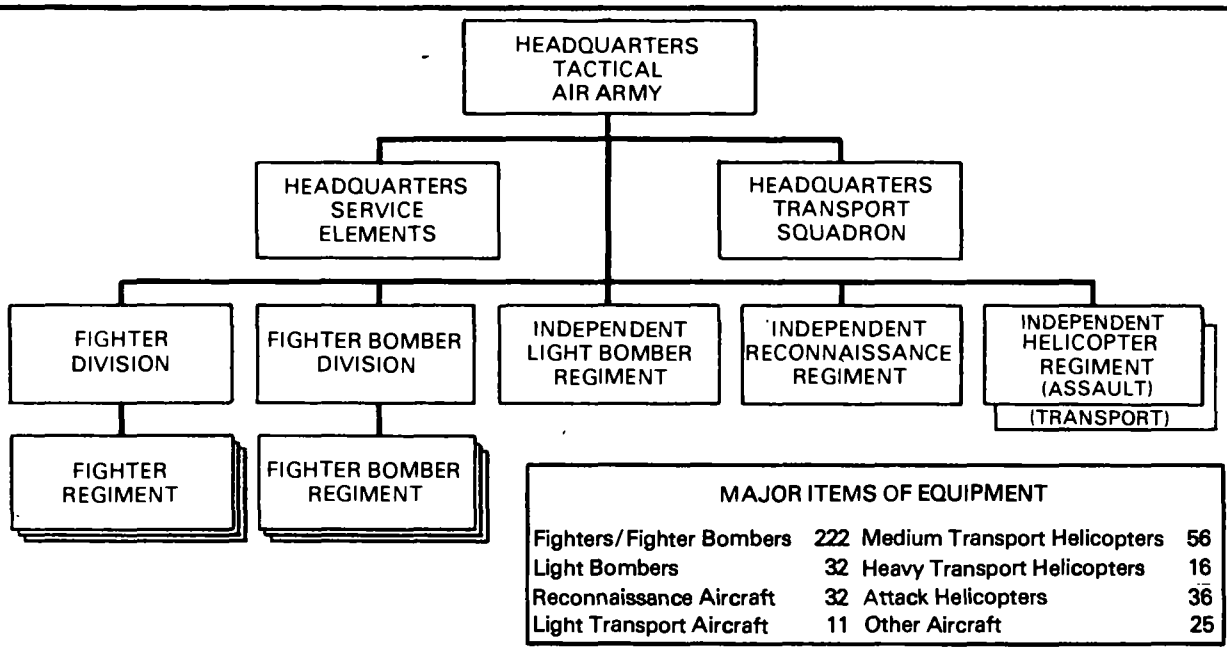
The helicopter has taken its place among the organization of Threat combined arms operations following the US success with troop transport and attack versions in the Vietnam conflict.

With increased mobility and sophisticated weaponry on the modern battlefield, Threat Forces have placed increasing emphasis on the role of tactical aviation in support of ground forces. This increase of Threat tactical aviation support presents a serious survivability problem to Army aviation unit assets operating on the battlefield. The actions we take when encountering Threat aircraft will be clearly defensive. Survival will depend on our ability to avoid detection and take evasive action. Engagement of hostile aircraft by Army aviation units will be only as a matter of self-defense.

THE HIGH PERFORMANCE AIR THREAT

The high performance threat consists of a variety of fighter and/or bomber aircraft generally represented by models in the FITTER, FENCER, FLOGGER, and FISHBED categories. Although their primary roles are not within the purview of fighter/helicopter engagements, they represent a significant threat by virtue of their firepower capabilities.

Employment Tactics and Techniques. Threat tactical air forces are organized into tactical air armies at front level. Frontal aviation constitutes the bulk of the Threat air force. Its roles are the tactical support of the land forces mainly by close air support, interdiction missions, electronic warfare (EW), and reconnaissance as well as counterair operations against hostile air forces on the ground and in the air. Soviet frontal aviation assets are assigned to and controlled by the front commander in the form of a tactical air army. A hypothetical tactical air army is organized and equipped as depicted in figure 4-1 and includes its own EW and communications support.



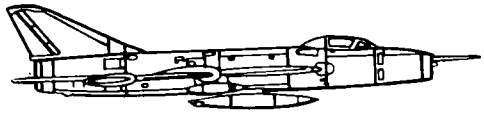
There is no fixed organization or size for a tactical air army. That shown is hypothetical. Fighter and bomber regiments have 37 aircraft as the normal table of equipment. A division may be composed of three or more, or less than three, regiments.

FIGURE 4-1. THREAT AIR ARMY.

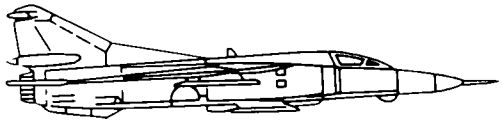
OFFENSE: Threat Forces recognize that, initially, part of their air effort will be required to obtain local air superiority. Fighter units of the air army have the dual mission of providing air defense (AD) and close support for ground units. Attack and bomber units are used to achieve the following:

- **Engage targets beyond the range of artillery.**
- **Reinforce artillery fires on selected targets.**
- **Provide immediate suppression of targets of opportunity.**

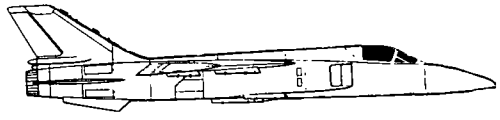
Aircraft concentrate on enemy forward defenses immediately prior to infantry and tank assaults. The air attack supplementing the artillery fire is of short duration. Specifically, detailed artillery batteries neutralize enemy ADs during the air attack.



Su-7B FITTER A
ATTACK



MiG-23/27 FLOGGER-D
FIGHTER/GROUND ATTACK



Su-24 FENCER A
FIGHTER BOMBER

MiG-21 FISHBED
FIGHTER

Once the attack is launched, bombers attack enemy rear area installations; attack aircraft execute strikes against targets whose destruction or neutralization assists ground assault units; and fighters protect the bombers, attack aircraft, and ground units from enemy air attack.

FIGURE 4-2. DEPLOYMENT OF THREAT AIR.

DEFENSE: In support of the defense, threat air forces carry out the following specific missions:

- ▲ Destruction of nuclear or chemical capable weapons
- ▲ Air strikes in close support of forces in contact
- ▲ Attacks on concentrated forces
- ▲ Attack of penetrations
- ▲ Support of counterattacks
- ▲ Reconnaissance
- ▲ Counterair
- ▲ Destruction of air bases

Threat Forces use the tactic known as "fire storm" in the defense to break the enemy attack. Close coordination between air forces and land forces is emphasized and achieved through constant combined arms training exercises. During hostile offensive actions, supersonic jets, flying in pairs, survey the enemy forces and define their positions. Threat reconnaissance aircraft report by radio to the commander of the air force storm group. MiG-21 fighters are immediately called into action to attack the main enemy assault effort. Bombs, rockets, and strafing fire hit the targets. The fighter bombers approach from all directions. Such an attack is designed to break up the antiaircraft defense forces and increase Threat air attack effectiveness and survivability. At the same time, fighters make rounds over the battlefield in V-formation, providing air cover for the assault aircraft. The last stage of the Threat air force attack is the storm of Su-7 aircraft, carrying large bombs to provide area defensive coverage. Threat ground forces respond with surface-to-surface rockets, rocket artillery, guns/howitzers, and all armor-piercing means. "Fire storm" is conducted by all forces from all means. Antiarmor trenches and minefields are blown up on signal from the CP if the enemy attack has not been broken before reaching the forward edge of the defense.

If the enemy attack is broken, an immediate counterattack is launched by armor-heavy, second-echelon forces with air forces in support.

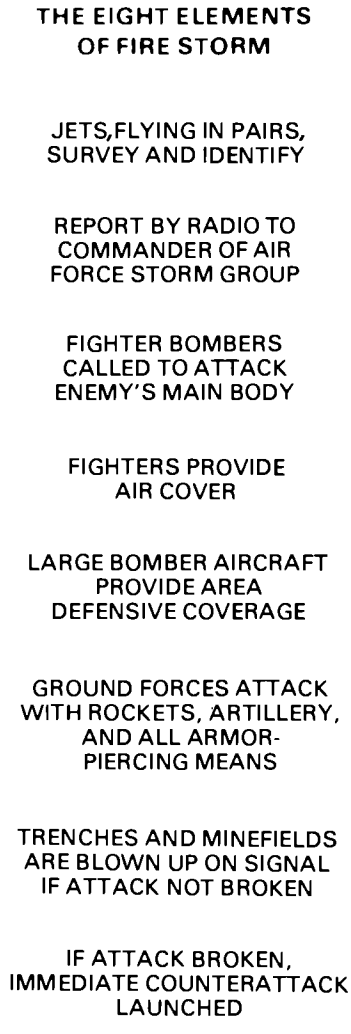


FIGURE 4-3. THREAT DEFENSIVE MISSION.

Survivability and Countermeasures. As can be seen from Threat tactical air employment organization and tactics, high performance aircraft will be a significant factor on the high threat battlefield. They will not only be near the main battle area but also deep in rear areas near supply trains and installations. Therefore, we must be prepared at all times to meet this threat and survive. In fact, Army aviation static locations will be most vulnerable to Threat tactical aircraft. The mobility of Army aviation, particularly helicopters, presents a greater problem to Threat tactical aircraft.

Active countermeasures. Threat tactical doctrine currently does not stress high performance aircraft flight operations below 150 meters (approximately 500 feet above ground level (AGL)). This is partly due to current US organizational numbers and range in AD weapons, weather, and altitude limitations; but principally because tactical aircraft maneuverability effectiveness increases with altitude. Threat tactical aircraft flying in a low altitude envelope can be extremely vulnerable to suppression. The best suppressive countermeasure against high performance aircraft is opposing high performance aircraft.

For combined arms and air assault operations, friendly tactical air support usually will be preplanned by the task force commander through organic S3/G3 (Air) channels in connection with the tactical air control party (TACP) located at the respective maneuver headquarters. For planning, advisory, and control purposes, the US Air Force provides a TACP at brigade and battalion levels.

In addition to preplanned tactical air support, the TACP is responsible to the task force commander for immediate tactical air support. When requesting immediate tactical air support during combined arms operations, the supported maneuver battalion/brigade S3 (Air) must be contacted. When requesting tactical air support, the following must be included in the request:

- Target description and situation.
- Target location.
- Desired results.
- Latest allowable time for the tactical air strike.

Suppression also can be provided by small arms and air defense artillery (ADA) organic or assigned to ground maneuver forces. In order to lure attacking Threat high performance aircraft into friendly Hawk /Chaparral/Vulcan coverage envelopes and then request assistance, you must know—and have preplanned—the mission in light of this possibility. Chapter 8 provides considerations and procedures for ADA support. In addition, all infantry, armor, artillery, and cavalry battalions/squadrons have Redeye missile teams organic to each line company, battery, or troop in addition to organic small arms.

Aviation unit assets in static positions are extremely vulnerable to Threat tactical aircraft. Therefore, organic small arms and, when organic, Redeye missile assets must be integrated into position area defense. When satelliting near corps, division, and brigade command posts (CP), ADA coverage may provide a degree of protection for aviation unit assets.

CHECK THE AD COVERAGE PLAN AT S3/G3 OPERATIONS

The area AD coverage plan should be checked at S3/G3 operations. When possible, forward arming and refueling points (FARP) should be located so maneuver unit AD assets can provide a measure of AD for aviation unit assets. When this is not possible, Redeye teams can be requested through operations.

When conducting isolated type missions such as reconnaissance and surveillance, aviators may have to rely solely on organic on-board weaponry, if available, for immediate suppression of the tactical air threat. However, this should be considered only as a last resort—after all evasive and passive countermeasures have failed.

Passive countermeasures (in flight).

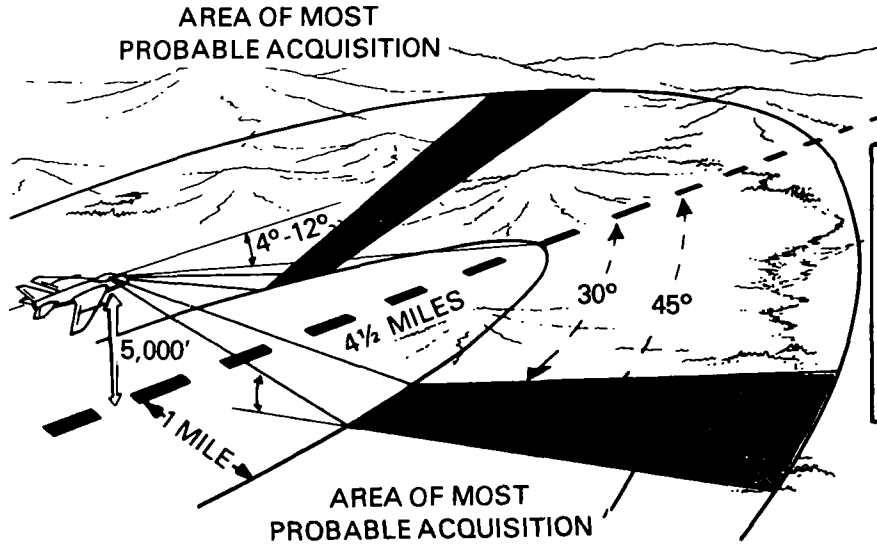
Terrain flight techniques. Due to inherent design and flight characteristics of Threat supersonic tactical aircraft and equipment, there are several weaknesses we can exploit by using terrain flight techniques. The speed, altitude, and cockpit visual limitations of Threat aircraft make it very difficult to visually acquire aircraft that are camouflaged or operating at terrain flight regimes amidst ground clutter. The faster the speed and the lower the altitude of Threat tactical aircraft, the smaller the chance of visual acquisition.

NOTE

Aircraft operating in open terrain, when paint color contrasts with terrain background, are easily acquired and engaged by high performance aircraft. The shadow of a moving aircraft is also easily detected from higher altitudes. Avoid extended flight in open areas, if possible.

Ground clutter and terrain flight levels make it very difficult for Threat tactical aircraft radar and infrared systems to acquire and lock onto aircraft in these flight regimes. For the most part, this equipment is designed for high-altitude, long-range target acquisition and interdiction. Maximum firing range for Threat radar homing missiles varies from 6 to 11 kilometers, depending on the type aircraft missile systems.

Currently, Threat tactical aircraft rely almost solely on dead-reckoning navigation in accomplishing missions. Therefore, the majority of the Threat aviator's attention is going to be spent flying and navigating.



Tha cockpit configurations ganarally limit the aviator's scanning viaw to about 40° to 10° forward and from 30° to 45° on each side. Figure 4-4 represents the Threat aviator's field of view.

FIGURE 4-4. THREAT HIGH PERFORMANCE AIRCRAFT VISIBILITY.

Considerations for aircraft operating at altitude. Aircraft operating at altitude must always be prepared to take action to avoid engagement by enemy fighters. Air traffic control (ATC) will warn you of approaching hostile aircraft when possible. Normally, such a warning will include number of aircraft, location, altitude, direction, and possibly the type. When you receive a warning, figure out which way to go to put as much distance as possible between you and him—*fast.* If he is fairly close to you, descend to nap-of-the-earth (NOE) altitude. This is a judgment call. If the enemy aircraft is 50 miles away and headed straight to the rear, you probably are not his target—after all, he has to worry about our ADs and turning parallel to the front line of own troops (FLOT) on our side would make him an ideal target. If he is only a couple of miles away, then you had better get down in a hurry. Stay low and fly in valleys and between ridges using terrain flight techniques as much as possible. Don't forget to tell ATC what you are doing.

REMEMBER TO TELL ATC WHAT YOU ARE DOING

It would be best to remember your *hostile criteria*—do not conduct any maneuvers over friendly tactical units that could be mistaken as hostile actions. While Stinger gunners have identification, friend or foe (radar) (IFF) capability and may be able to distinguish hostile from friendly aircraft, aviators must keep in mind that Redeye gunners and machine gunners do not have IFF capability.

There may be cases when the enemy aircraft is not picked up early enough for you to get a warning. And the first time you know he is there is when your threat display tells you that his airborne intercept radar is painting you. You have to act in a hurry—dive away from the threat and get down fast. As we mentioned in the planning phase, know where friendly AD elements such as Hawk or Chaparral/Vulcan are located. Once you are on the deck, head toward ADA engagement sectors. Be sure your IFF is on. On the way down, the copilot or sensor operator should try to visually acquire the enemy and notify AD units in the area.

Actions upon sighting Threat high performance aircraft prior to being acquired. Threat tactical aircraft normally operate in pairs, but can operate in greater numbers depending on the mission and tactical situation.

Upon sighting Threat high performance aircraft, get low, blend into terrain features, and stay still. Maintain surveillance of the aircraft and report the sighting to higher headquarters or AD operations, if possible. Terrain permitting, mask your aircraft. If operating in platoon or larger flight, disperse. Use overwatch to forewarn and protect one another.

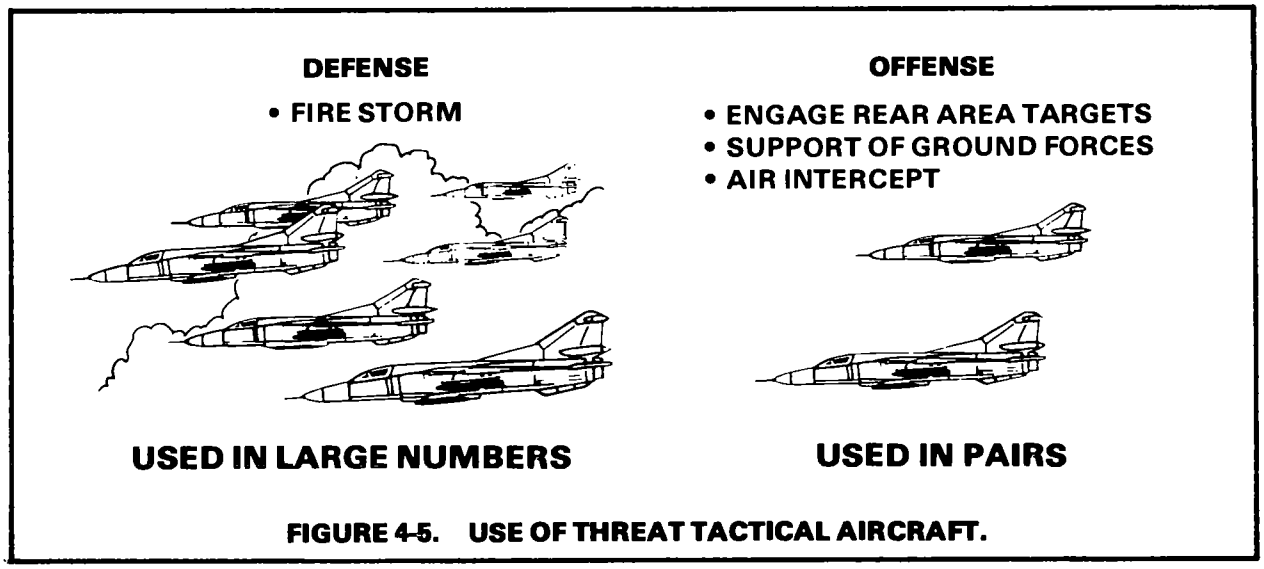


FIGURE 4-5. USE OF THREAT TACTICAL AIRCRAFT.

Actions upon being sighted and engagement is attempted by Threat. Once acquired by Threat high performance aircraft, your aircraft must be within certain parameters of the Threat aircraft flight envelope to be engaged. Therefore, you must try to outmaneuver the Threat aircraft. To do this, you must keep the attacking aircraft in sight while maneuvering on their blind side or out of the engagement envelope. To do this against two maneuvering Threat fighter aircraft may require maneuver instructions from other nearby friendly aircraft. Use teamwork.

Once you have maneuvered on the Threat aircraft blind side, try and blend into the terrain; mask; and remain still to make it difficult for reacquisition. Generally, Threat tactical aircraft engagement parameters are from a 5-degree to a 45-degree dive angle. Engagement could be by air-to-air missiles (infrared or radar guided), strafing, rockets, or bombs.

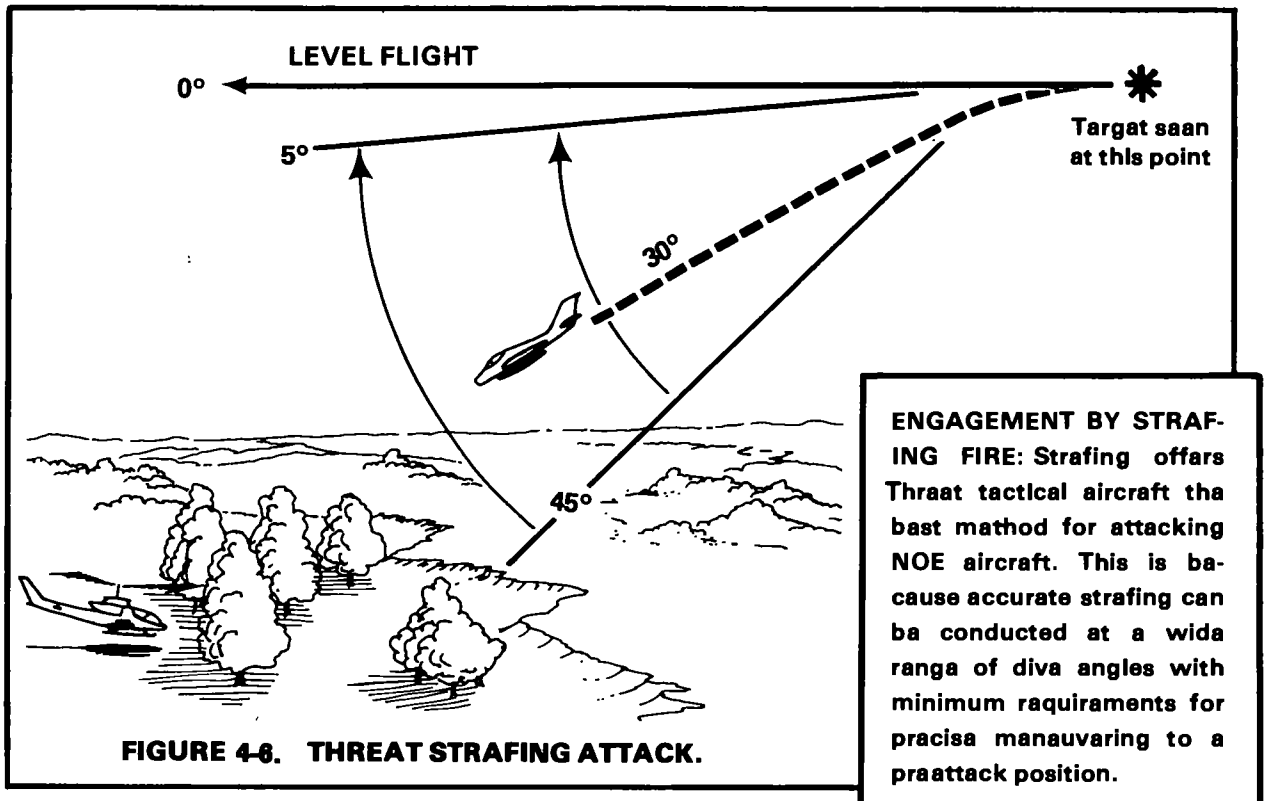


FIGURE 4-6. THREAT STRAFING ATTACK.

ENGAGEMENT BY STRAFING FIRE: Strafing offars Thraat tactical aircraft tha bast mathod for attacking NOE aircraft. This is bacause accurate strafing can ba conducted at a wida ranga of diva angles with minimum raquiraments for pracisa manauvaring to a praattack position.

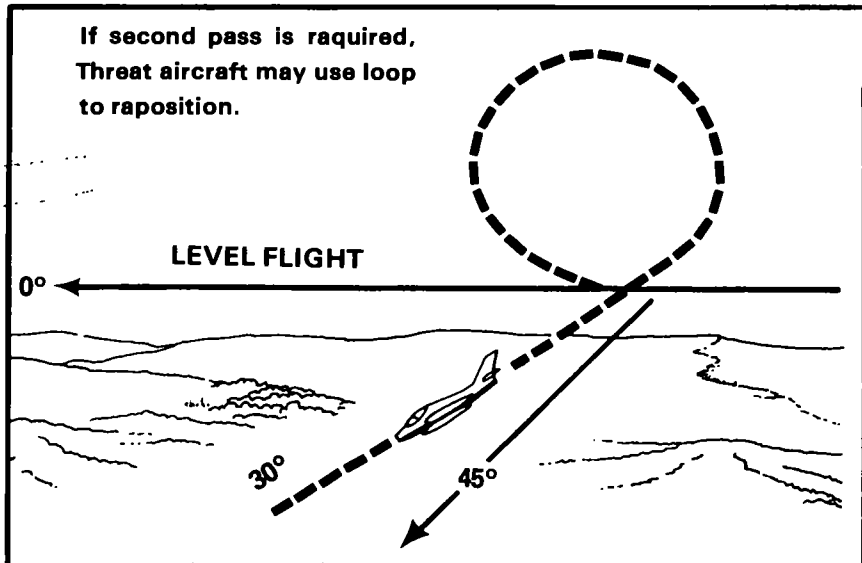


FIGURE 4-7. THREAT DIVE ANGLE, BOMB ENGAGEMENT.

ENGAGEMENT BY MISSILES, ROCKETS, AND BOMBS: Engagamant of NOE aircraft by missilas and rockats will ba much tha sama as by strafing fira (from a 10-dagraa to a 30-dagraa diva angla). Accuracy for angagamant by bombs raquiras a staapar diva angle (30° to 45°). At low altitudas, the fighter is at a disadvantaga. Dua to high spaeds and visibility limitations, targat acquisition at a sufficiant distance to initiate and attack is critical.

EVASIVE MANEUVERS: Due to high speeds and flight characteristics, Threat high performance aircraft, once committed on an attack angle, are not able to maneuver quickly and still keep the target within engagement parameters. Therefore, an effective evasive maneuver is to let the attacking Threat aircraft commit himself to the dive angle while you fly head-on to the attacking aircraft, causing him to increase the dive angle; then execute a sharp turn left or right. At the same time, try to keep the attacking aircraft in sight and stay in his blind area by maneuver. Once in his blind area, blend into the terrain, mask, and stay still.

NOTE

Remain alert to Threat wingman's position and intentions.

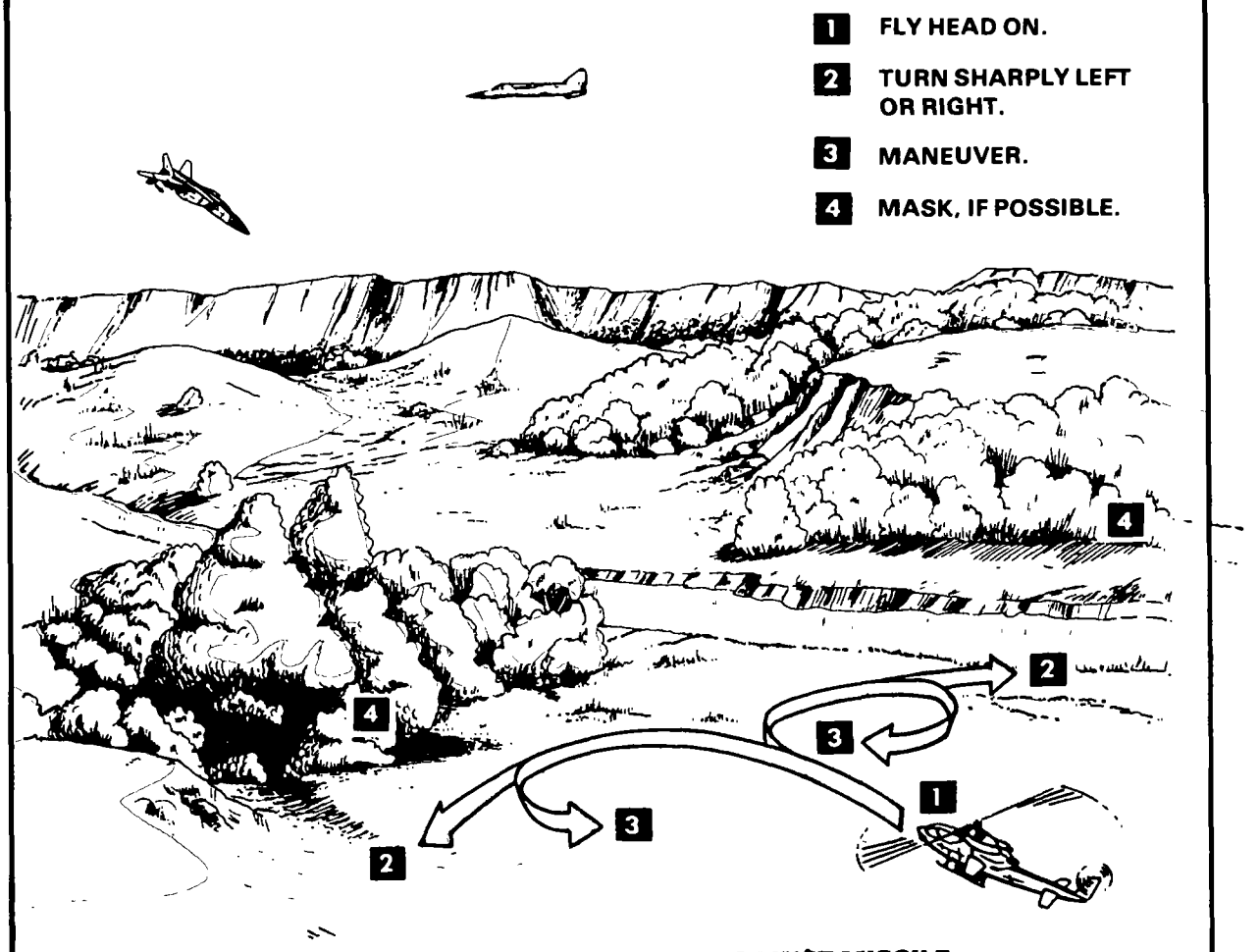


FIGURE 4-8. EVASIVE MANEUVER AGAINST MISSILE, STRAFING, ROCKET, BOMBING ATTACK.

WARNING

Threat aircraft may fire up to two missiles within an interval of 1 second.

EVASIVE MANEUVERS AFTER ENGAGEMENT BY INFRARED OR RADAR-GUIDED MISSILES: Once engaged by an air-to-air missile, survivability will depend on the evasive maneuvers and actions taken during the next few critical seconds. Without regard to aircraft survivability equipment (ASE), the first thing to do is get to NOE flight level as quickly as possible (if not already NOE). Ground clutter or a sharp turning maneuver (90 degrees or more to missile flight) may cause the missile to break-lock.

1 DESCEND TO NOE LEVEL.

2 TURN AT LEAST 90° FROM THE MISSILE.

3 MASK, IF POSSIBLE.

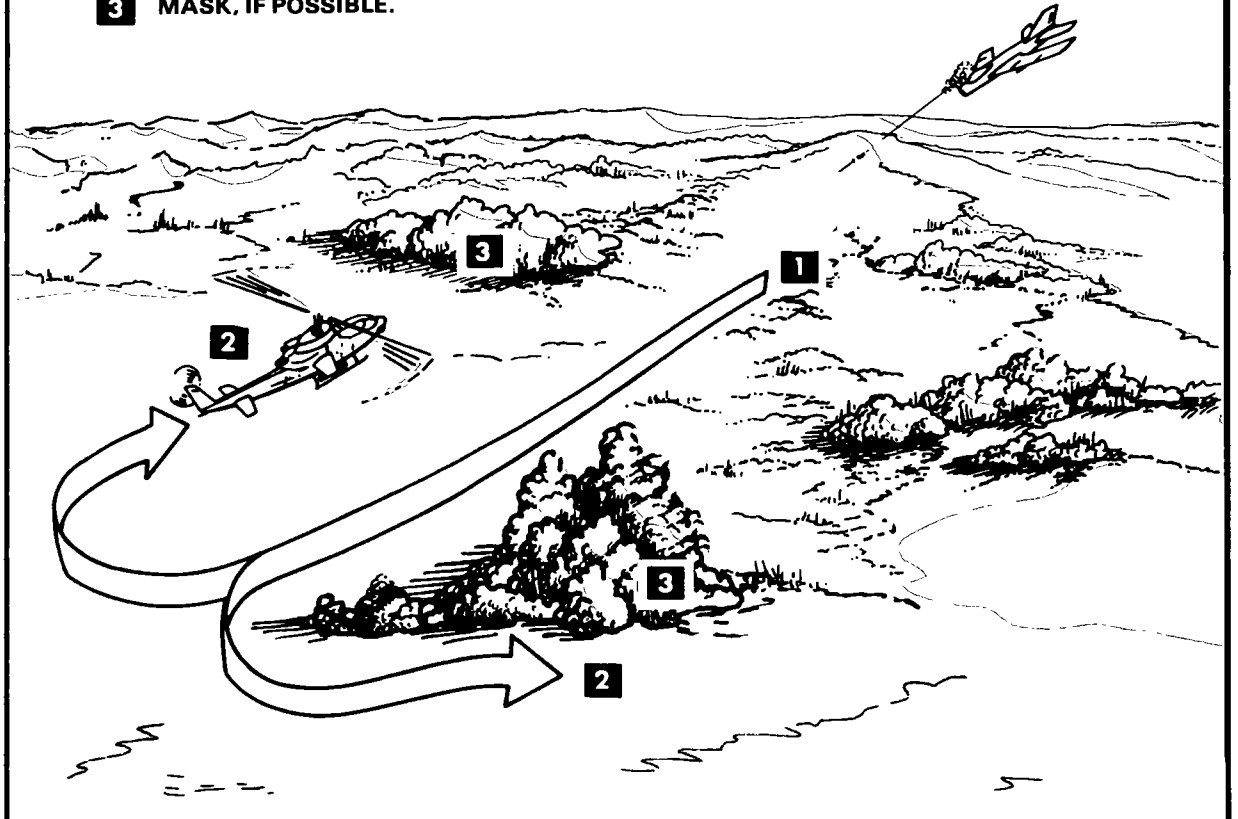


FIGURE 4-9. ENGAGEMENT BY AIR-TO-AIR MISSILE.

Passive countermeasures (*static locations*). The use of cover and concealment can enhance aviation unit static area survivability. Natural cover (ravines, hollows, reverse slopes) and artificial cover (foxholes, trenches, walls) can protect soldiers. Concealment includes not only camouflage but also light, noise, odor, and movement discipline. Natural camouflage, blending in with terrain, should be used when possible. Camouflage nets should be used in conjunction with natural camouflage or when natural camouflage is not available. Factors affecting the use of camouflage are *movement, position, shine, shape, color, texture, dispersion,* and *shadow.*

• MOVEMENT or arrivals and departures by aircraft into rear aree airfields, CPs, and other positions can be detected by radar if air assets are using procedures other than NOE or contour flight techniques. If deperture or arrivel altitudes above these are necessary, procedures should be used to ascend or descend away from the position area using NOE or contour flight to the position area. Ground movement by soldiers in e position area should be limited to within concealed routes, when possible. Vehicles make trecks and movement should conform to established trails or fit into the ground patterns; I.e., against and parallel to tree lines.

• POSITION refers to the relation of men or objects to the background. Positions should permit blending or absorbing to provide concealment. Camouflage material should blend with the ground or beckground.

• SHINE may be either a light source or reflected light such es glint from a windshield. Insure all light reflective sources are covered or cemouflaged. Maintain light discipline.

• SHAPE refers to the shape or outline an object presents in reletion to the background. Break up the familier shapes of equipment and use naturel or artificial camouflage to make them blend into the terrain.

• COLOR refers to the camouflage color thet should be used to blend in with background colors.

• TEXTURE is the degree thet a surface will absorb, scatter, or reflect light. Rough surfaces tend to appear dark. Smooth surfeces may change from dark to light depending on lighting and viewing direction. Use nets, burlep, flat paint, and foliage to avoid texture contrast.

• DISPERSION will prevent equipment clutter, meking detection more difficult and enhancing survivability should detection occur.

• SHADOW is used to conceal men or equipment from visuel detection by using the shadows cast from the sun's angle on terrain, foliege, or men-made structures.

THE HELICOPTER THREAT

Helicopters are organic to the Threat air army. There are two helicopter regiments per air army.

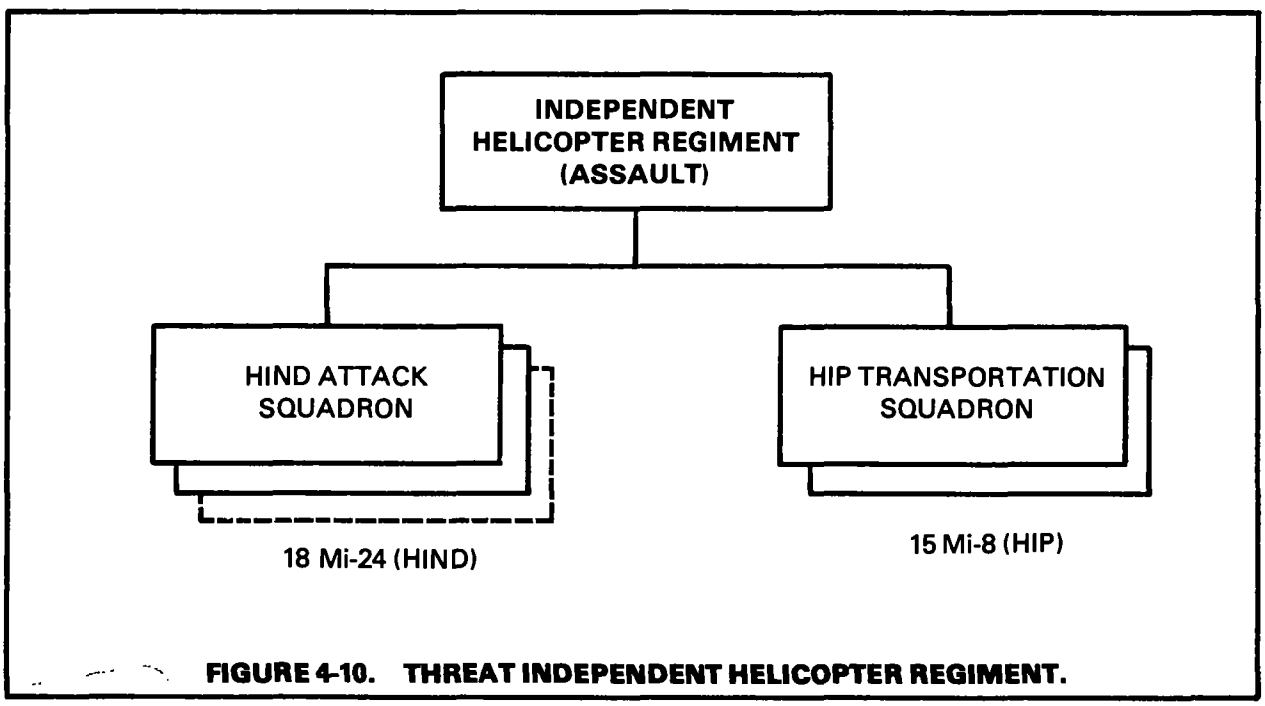
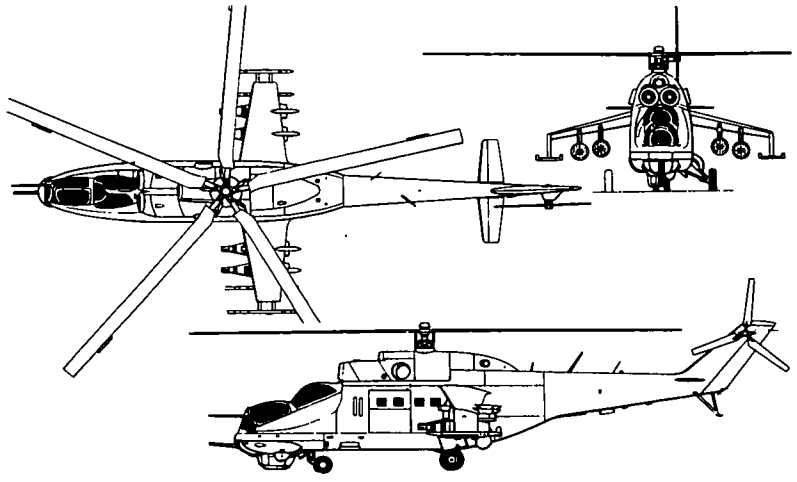


FIGURE 4-10. THREAT INDEPENDENT HELICOPTER REGIMENT.

Employment Tactics and Techniques. Helicopter regimental assets are provided by front commanders to lower organizational levels for specific missions and operations. Although Threat assignment of helicopters in the battlefield environment differs from US Army aviation units, roles and mission assignment are similar. Threat Forces are increasingly stressing the importance of helicopters in military operations (air assault, antitank, reconnaissance, resupply). The bulk of the Threat helicopter buildup has been in the area of troop transport and fire support. The significant helicopter threat to Army aviation assets is the Mi-24 HIND attack helicopter. Although the Mi-4 HOUND and Mi-8 HIP, which is replacing the Mi-4, are both capable of carrying 57mm rockets and have light machine guns, they are primarily used as troop transport (airmobile) helicopters and will not be addressed. The principal threat to Army aviation units is the Mi-24.



PURPOSE:
Multirole troop transport/ attack helicopter

CARRYING CAPABILITY:
8 troops; 4 SWATTER (AT-2C) antitank missiles; 128 57mm rockets; 1 4-barrel 12.7mm Gatling gun or 23mm cannon. HIND E carries 4 AT-6 spiral antitank guided missiles (ATGM).

CRUISING SPEED:
167 knots.

MAXIMUM SPEED:
173 knots.

NOTE:
HIND E carries
4 AT-6 spiral ATGMs.

FIGURE 4-11. HIND D.

We can expect the Mi-24 HIND to be employed in two broad mission profiles.

Close Air Fire Support. Employment of the HIND is very similar to employment of US close air support (CAS) aircraft. Included in the close air fire support mission are the antitank and antihelicopter roles.

CAUTION

HINDs operate in pairs for mutual security and redundant weapon employment; if you encounter one, another is likely to be close by.

Combat Air Assault. To improve the ground combat effort and increase mobility and flexibility, Threat Forces recently have emphasized training and development of existing troop and helicopter resources for use in joint airmobile operations. Airmobile operations are supported by AD and strong tactical air support. During the attack, air assault operations may be conducted as a flanking rear area assault, or bridgehead maneuver, to gain the advantage. It is anticipated that, in the future, Threat Forces will make much greater use of airmobile assault during both day and night

operations. The heliborne assault, often used in conjunction with paratroop operations, is becoming an important feature of the Threat Forces concept of the high-speed offense.

Armed reconnaissance missions are conducted by Threat helicopters in the advanced guard role during the attack to locate and fix enemy forces so artillery and ground forces can be brought to bear on these locations, or they can be bypassed.

The Soviets are aware of the threat that our attack helicopters pose to their armored formations. The maneuverability and firepower of the HIND make it a likely candidate for employment to disrupt US Army attack helicopter operations. In addition to USAF and AD weapon systems, attack helicopter crews must be prepared to employ all available onboard weapon systems in their own defense against the HIND. Tactics currently are being developed and tested for the air-to-air countering of Threat attack helicopters.

Survivability and Countermeasures.

Active countermeasures. When encountering Threat helicopters on the battlefield, suppression by fire should be considered as a self-defense measure or as a means of protection of combined arms assets. The attack of a Threat helicopter by Army aviation aircraft—for the sake of attack alone—is not currently compatible with the mission of Army aviation.

BOTH ARTILLERY AND ADA CAN BE USED AGAINST THREAT HELICOPTERS IF SURPRISE IS ACHIEVED

Due to the fleeting nature of helicopters (mobility/maneuverability) and their ability to operate under the ADA envelope, suppression by artillery and ADA may not be practical or feasible. However, both artillery and ADA can be very effective if the element of surprise is achieved. For instance, Threat attack helicopters, lying in ambush in static NOE firing positions, can be extremely vulnerable to first-round, fire-for-effect, preplanned or immediate artillery suppression using variable time (VT) fuze action. Chapter 8 contains considerations and procedures for the use of preplanned/immediate artillery suppression.

Threat helicopters, attacking Army aircraft, may be lured into friendly air defensive fire envelopes for

suppression purposes. Locations and engagement sectors of friendly ADA and Redeye missile teams can be ascertained through coordination with the supported combined arms maneuver unit S3/G3. This should be part of good premission planning. Threat helicopters also may be lured into position for suppression by maneuver unit small arms fire.

Friendly tactical air suppression may be requested through supported maneuver unit S3 (Air) channels. Considerations and procedures are discussed in chapter 8.

The availability and urgency of fire suppression will determine the means used against the threat.

Passive countermeasures. Passive countermeasures employed against Threat helicopters will be much the same as those employed against ground maneuver units.

- *Use terrain flight techniques.* In order to avoid detection and gain surprise, terrain flight techniques must be used. NOE flight techniques—overwatch, masking, pop-up—will aid in detection avoidance. Aviators also must divide their attention between ground and air sectors to achieve early detection of a helicopter threat.

- *Use teamwork.* The tactical advantage can be gained by using teamwork to observe, fire, and maneuver against Threat helicopters.

- *Minimize exposure time.* Exposure time can be minimized by taking advantage of available terrain for masking the aircraft. When engaging the enemy, employ fire and maneuver using pop-up firing techniques and preselected multiple firing points.

NEW DEVELOPMENTS

Infrared Jammers. Infrared jammers, when used in conjunction with infrared suppressors, offer an effective means of foiling lock-on by infrared missiles.

HELLFIRE Missile System. The helicopter-launched fire-and-forget (HELLFIRE) modular missile provides

extended range capability using either airborne or ground laser designators for guidance. It provides better and more lethal firepower and increases standoff range while significantly reducing exposure time.

M197 20mm Vulcan. Designed for use on the AH-1 Cobra, the 20mm Vulcan fires at an approximate rate of 750 rounds per minute. The effective range is 2,000 meters. This weapon may provide some close range defensive protection in an air-to-air confrontation.

XM230E1 30mm Chain Gun. The AAH will be equipped with the 30mm chain gun. It fires at an approximate rate of 750 rounds per minute and has an effective range of 3,000 meters. While the XM230 is considered an area fire weapon system, it is capable of providing high volume defensive fire against Threat aircraft.

Flare Dispensing System. A flare dispensing system would be employed as an infrared missile decoy system in conjunction with a missile launch/approach detector.

Chaff Dispensing System. Chaff would be dispensed in conjunction with initiation of an evasive maneuver upon radar warning receiver (RWR) tracking indications or visual detection of a missile launch.

NOTE

Visual detection of a missile launch without an RWR indication most likely means the missile is infrared guided. In this case, flares would be ejected.

Missile Launch/Approach Detector. The missile launch/approach detector will automatically dispense a flare on detection of an infrared missile launch.

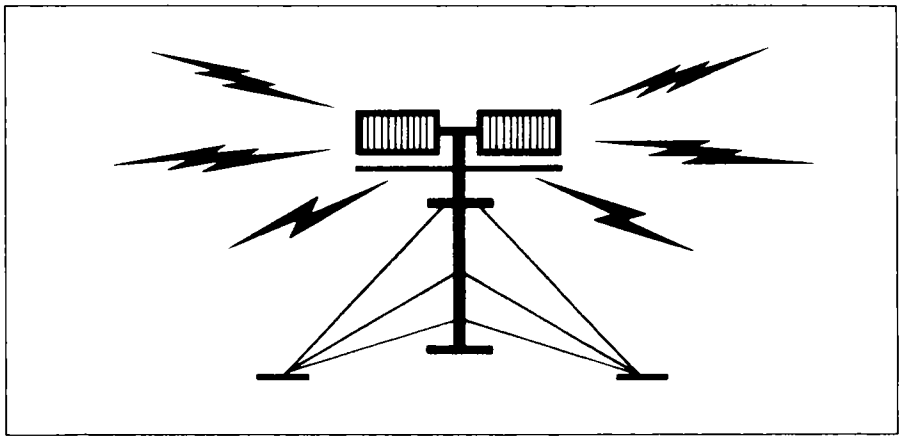
Vulnerability Reduction Equipment. Trends in vulnerability reduction include infrared signature reduction, ballistic tolerance, and radar cross-sectional reduction equipment as previously discussed in chapter 2.

Research has resulted in decreased visual detection vulnerability through improved paint and canopy designs that reduce glint and blend more favorably with the background.

The Threat tactical air capability has improved greatly over the past few years. Indications are that capabilities, both in numbers and weapon systems, will increase sharply in the future. Currently, through use of proper premission planning, combined arms teamwork, tactics, and countermeasures, we can meet the tactical air threat, survive, and win. However, we will need to develop new tactical doctrine and ASE on a consistent basis, coupled with rigorous testing and training, to remain able to meet the tactical air threat, survive, and win.

CHAPTER 5

THE ELECTRONIC WARFARE (EW) THREAT



GENERAL

Electronic warfare! The modern battlefield will be saturated with electronic emissions varying from the AN/PRC-77 platoon radio to the corps radio complex operated in the corps rear area. Between these two areas, from the front line of own troops (FLOT) to the corps rear area, hundreds more pieces of Army equipment will be emitting electromagnetic energy susceptible to being located, tracked, monitored, and destroyed by the enemy. To survive, the Army aviator must be aware of Threat EW capabilities and methods of employment.

We can expect the enemy to employ signal intercept operations, direction finding (DF), jamming, and deception as part of his overall combat plan. Further, we can expect him to attempt systematically to analyze US Army communications and noncommunications emitters which are key to command and control functions. Finally, we can expect the enemy to attempt to destroy one third of our communications facilities, degrade another one third by jamming operations, and leave one third open for surveillance/intelligence-gathering purposes.

SURVIVABILITY, COUNTERMEASURES, AND COUNTER-COUNTERMEASURES

Threat Forces will attempt to monitor, disrupt, or destroy our communications. Each member of the combined arms team must make every effort to reduce the Threat's EW capabilities. The free use of communications will not be available to the aviator on the high threat battlefield. Therefore, it is essential that aviation personnel know the EW capabilities of the Threat and what can be done to prevent or minimize their effects and continue the mission.

RADIO ELECTRONIC COMBAT (REC)

> **"Communications is the basic means to insure troop control. Loss of communications is the loss of troop control, and the loss of troop control in battle invariably leads to defeat."**
>
> **LTC L. TITOV**
> **Voyenny Vestnik No. 7, 1971**

The Soviets have developed their EW capabilities into an integrated system called REC. Basically, REC is the integration of EW assets with the physical destruction capabilities of the unit to attack enemy organizations and systems through their means of control.

The purpose of REC is to limit, delay, or nullify the use of your unit's radios and other command and control systems, while protecting their own command and control means. An estimated goal of the system is to destroy or disrupt at least 50 percent of the enemy's command, control, and weapon system communications, either by jamming or destructive fires.

THE SIGNAL INTERCEPT THREAT

The Threat will employ forces within the combined arms framework with the specific mission of intercepting and

analyzing US communications for intelligence purposes. Signal intelligence (SIGINT) includes information gathered from communications and noncommunications transmitters.

Threat Forces consider SIGINT a primary source of intelligence. Through pattern analysis, traffic analysis, and message content Threat Forces are able to determine the structure, composition, capabilities, and intentions of the opposing force.

The signal intercept capability of Threat Forces spans a large frequency band. Signal intercept operations are conducted to achieve the following:

Gain intelligence information for tactical operations.	**Gain information concerning the technical characteristics of enemy equipment and operating procedures.**	**Form a data base for the conduct of new and ongoing operations.**

FIGURE 5-1. SIGNAL INTERCEPT.

Army aviation units have a varied array of tactical communications equipment which normally is used constantly for navigation and communication. The frequency modulated (FM) radio is the most critical radio with respect to aviation combined arms operations.

The aviator must constantly be aware that his radio transmissions can be, and most probably are, being monitored. Using the secure radio mode, keeping transmission time short, and using authorized codes when not secure are only a few of the necessary defensive tactics discussed further in this chapter. Remember, the Threat has the capability to listen to almost anything you say, so keep it secure if possible or in code if not secure. The following countermeasures/countercountermeasures should be used:

- *Operate FM Radio in Secure Voice Mode.* Operating in the secure voice mode is the best method of radio communications to prevent the enemy from gaining intelligence.

• *Use Correct Communications Procedures.* Use approved and correct communications words, phrases, and codes. Plan what you want to say before you key the transmitter. This will eliminate confusion and reduce transmission time.

• *Limit Transmission Time.* Be brief and to the point. Don't give the Threat any more time to listen to your transmission than necessary. Ideally, a transmission should be 20 seconds or less.

• *Use Communications Equipment Only When Necessary.* Do not use electronic communications unless you absolutely need them. If you don't need them, turn them off. If alternate means are available and effective, use them instead. Plan missions in enough detail to prevent unnecessary transmissions. A solid communications standing operating procedure (SOP) will help.

• *Use the Communications-Electronics Operation Instructions (CEOI) Codes and Brevity Lists.* When operating in nonsecure modes, use codes and brevity lists to prevent compromise of information that could aid the enemy. The use of codes and brevity lists also will decrease transmission times. Never use your own makeshift codes.

AUTHENTICATION IS REQUIRED WHEN—

- **YOU SUSPECT THE ENEMY IS IN YOUR NET.**
- **SOMEONE CHALLENGES YOU TO AUTHENTICATE.**
- **YOU TELL A STATION TO GO TO RADIO SILENCE OR ASK IT TO BREAK THAT SILENCE.**
- **YOU TALK ABOUT ENEMY CONTACT, GIVE AN EARLY WARNING REPORT, OR ISSUE A FOLLOWUP REPORT.**

- YOU TRANSMIT DIRECTIONS WHICH AFFECT THE TACTICAL SITUATION, SUCH AS "CHANGE LOCATION," "SHIFT FIRE," "CHANGE FREQUENCIES," OR "TURN OFF THE RADIO."
- YOU ARE AUTHORIZED TO TRANSMIT A CLASSIFIED MESSAGE IN THE CLEAR.
- YOU TRANSMIT TO SOMEONE WHO IS UNDER RADIO LISTENING SILENCE.
- YOU CANCEL A MESSAGE BY RADIO OR VISUAL MEANS, AND THE OTHER STATION CANNOT RECOGNIZE YOU.
- UPON ENTERING A RADIO NET OR RESUMING TRANSMITTING AFTER A LONG PERIOD.
- YOU TRANSMIT A MESSAGE WITHOUT GETTING A TIMELY RESPONSE. IF AUTHENTICATING, REQUIRE ANOTHER AUTHENTICATION

• *Require Random Authentication by Operators in the Net.* Requiring random authentication by operators in the net will insure only friendly operators are using the net.

• *Change Operating Frequencies Often.* The CEOI establishes times for frequency changes. Use alternate frequencies only as necessary.

• *Use Alternate Means of Communications.* The use of hand, arm, smoke, pyrotechnics, placards, lights, and coded matrixes are a few of the alternate means. (See visual communications techniques discussed later in this chapter.) SOP and teamwork are a must. When used properly, alternate communications can be very effective.

• *Use Low Power When Available.* Use low-power transmitter modes on radios and beacons to limit range when high power is not necessary.

• *Mask Antennas.* Mask antennas to prevent signal radiation in the direction of the enemy.

• *Use Directional Antennas.* Aviation ground antennas can be directionally rigged to preclude signal radiation into enemy territory. This technique is most often used as a jamming countermeasure.

THE DIRECTION-FINDING THREAT

Direction finding (DF) is a *collective term applied to the technique of determining line bearings from one or more DF positions to radio or radar emitters.*

DF is accurate and effective. Its product, when integrated with other intelligence sources, can show our deployments in detail. It is used mainly to locate unit positions, track unit movements, and identify weakly defended areas.

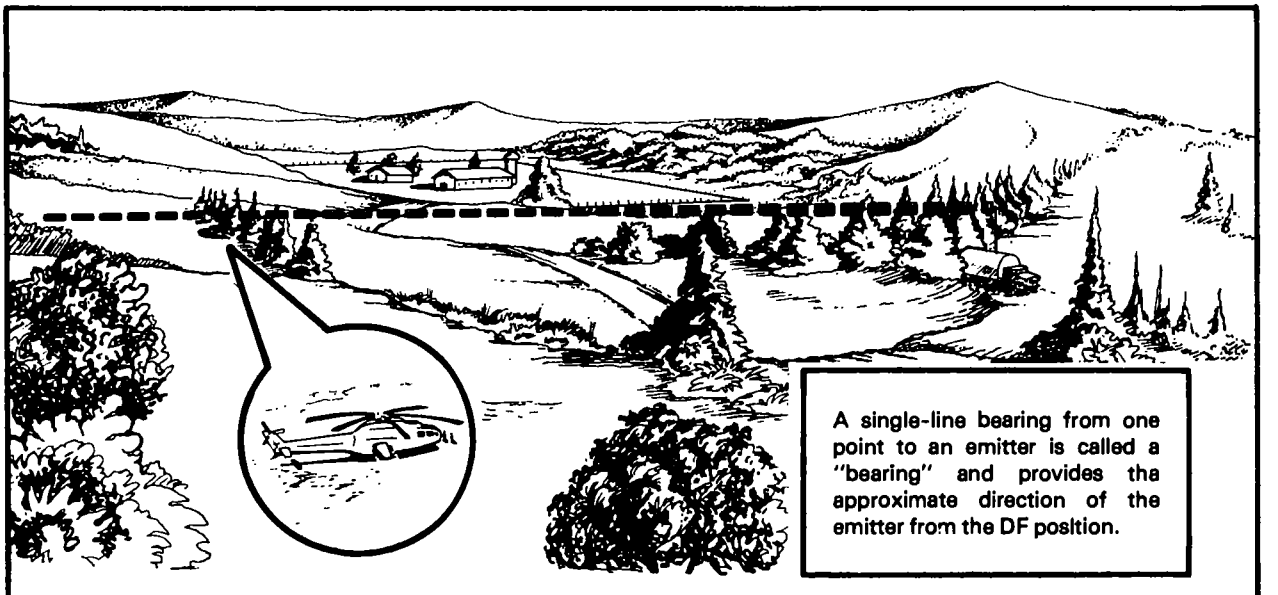
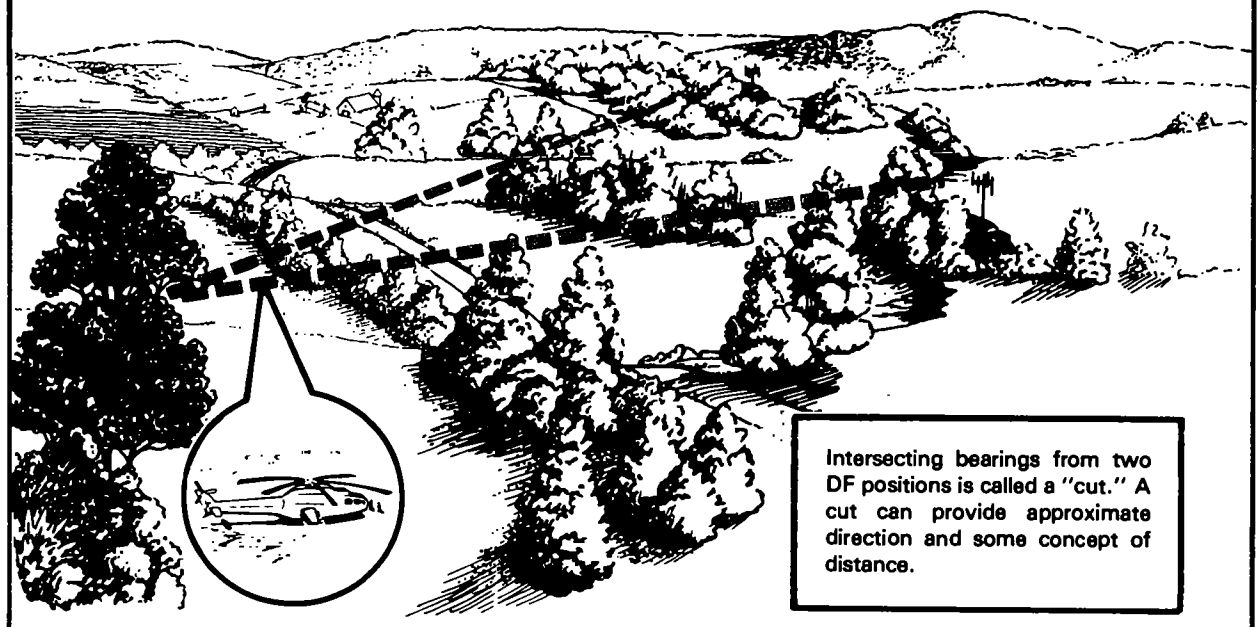
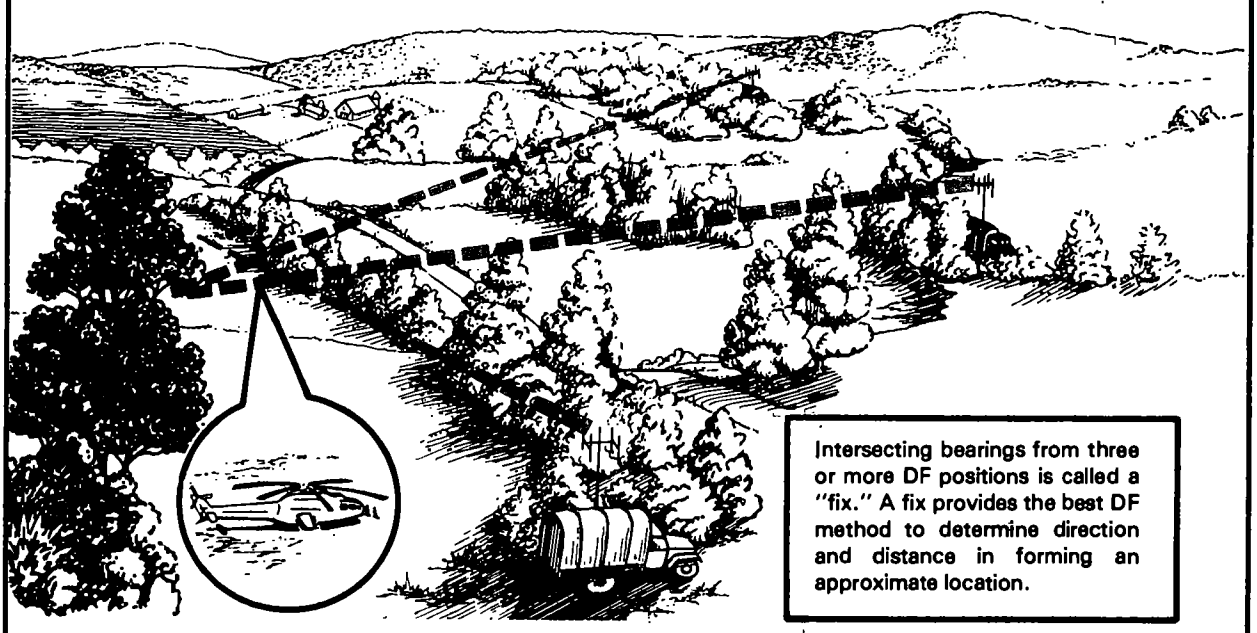


FIGURE 5-2. DF TECHNIQUES.



Intersecting bearings from two DF positions is called a "cut." A cut can provide approximate direction and some concept of distance.



Intersecting bearings from three or more DF positions is called a "fix." A fix provides the best DF method to determine direction and distance in forming an approximate location.

FIGURE 5-2. CONTINUED

DF SERVES A MULTITUDE OF INTELLIGENCE PURPOSES TO INCLUDE—

- **Location of transmitters.**
- **Targeting data for suppressive fires.**
- **Intelligence data for planning future operations.**
- **Planning data for jamming operations.**

FIGURE 5-3. PURPOSES OF DF.

Countermeasures and Counter-Countermeasures. For the most part, the mobility of Army aircraft will preclude effectiveness of the DF threat. However, stationary aviation assets, antennas, and transmitters can be particularly vulnerable to the DF threat if not cognizant of countermeasures/counter-countermeasures, such as—

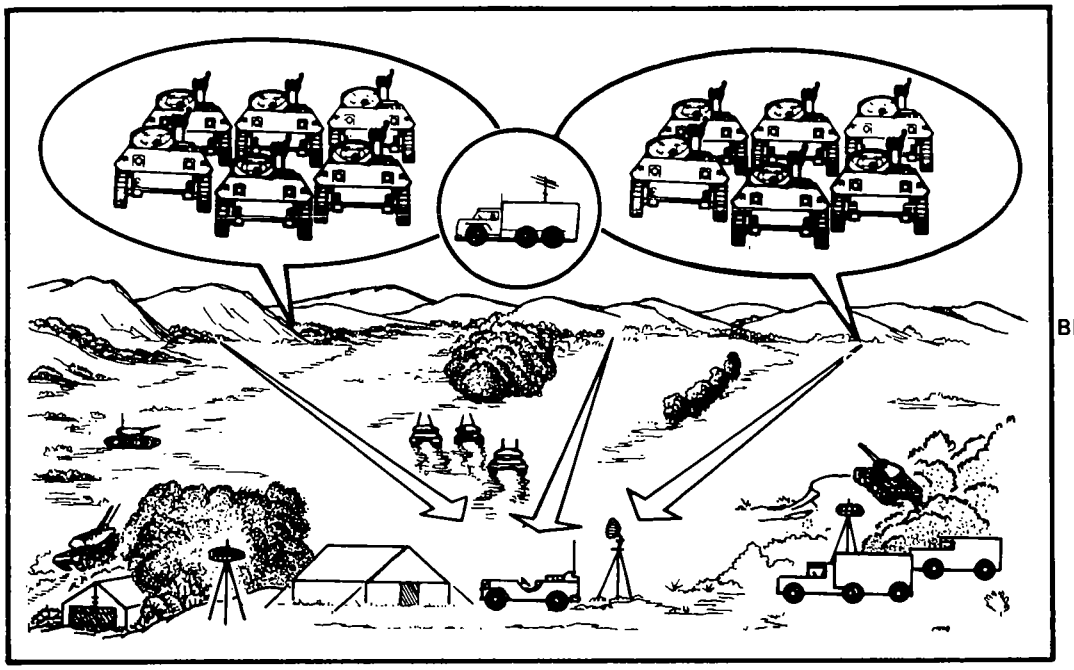
- *Use of communications equipment only when necessary.* Limit use of communications equipment. Turn beacons on only when necessary. Use other communications resources (wire) when available.

- *Limiting transmission time.* The use of codes, brevity lists, and short call signs (after initial contact) will help to decrease transmission times. Transmission times of 20 seconds or less, separated by periods of radio silence, are more effective in denying directional fixes by the Threat.

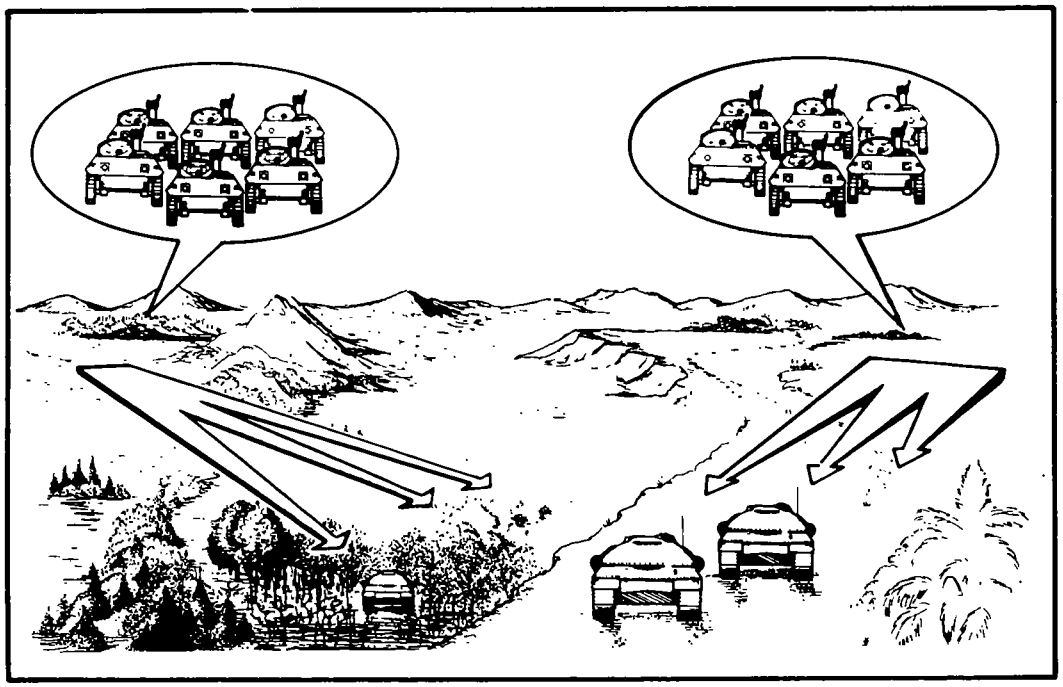
- *Relocating assets frequently.* Operation in one location for extended periods is an open invitation for elimination.

- *Remoting antennas.* Remote beacons and antennas as far away from ground locations as practically possible.

- *Use of decoy antennas.* If practical and equipment availability permits, erect decoy antennas in credible locations (2 to 5 kilometers) away from actual unit locations. Camouflage real antennas and beacons if possible.



FOR ENEMY BREAKTHROUGH OPERATIONS



FOR ENEMY FLANKING ATTACK

FIGURE 5-4. EXPECTED DF TARGET AREAS.

• *Use of low-power transmitting modes when feasible.* The use of low-power modes will limit signal radiation range.

• *Use of directional antennas when feasible.* Directional antenna modifications limit signal radiation to only desired directions.

• *Masking antennas and beacons.* Mask radiating antennas and beacons from the enemy.

• *Employing alternate means of communications.* See visual communications techniques portion of this chapter.

• *Not referring to your location by ground reference points.* A common practice by aviators is to use terrain features and headings to define targets. All the enemy has to do is plot a back-azimuth from the identified terrain feature. Use code, prearranged checkpoints, or azimuth only in identifying targets.

• *Use of only secure voice or authorized codes when referring to location.* Never use clear text or unauthorized codes in identifying friendly positions except in emergencies. Use authentication rules when asked for friendly locations.

THE JAMMING THREAT

Jamming is defined as *the deliberate radiation, reradiation, or reflection of electromagnetic energy with the objective of impairing the enemy's use of electronic devices, equipment, or systems.*

We can expect the Threat to use jamming as a means of disrupting, confusing, and denying our use of communications systems. It should be noted that all radio interference may not be jamming but rather could be related to radio malfunction, antenna placement, atmospheric disturbances, overcrowded radio nets, or a multitude of other reasons. Therefore, it must first be determined if the interference is caused by actual jamming.

TYPES OF JAMMING SIGNALS ARE AS FOLLOWS:

*BABBLED VOICE. This signal is composed of mixed voices engaged in simultaneous conversations, preferably in the same language, with voice characteristics similar to those found in the victim communications net.

*TONE. This jamming signal is a single frequency of constant tone. It is used to jam manually keyed Morse code, voice, and radio carrier circuits.

*PULSE. This signal resembles the monotonous rumble of rotating machinery. Pulse jamming signals produce a nuisance effect on voice communications circuits.

RECORDED SOUNDS. Any audible sound, especially of a variable nature, that can be used to distract operators and disrupt communications circuits. Music, screams, applause, whistles, machinary noise, and laughter are examples.

*RANDOM-KEYED Morse Code. This jamming signal is produced by keying a Morse signal at random and mixing the keyed signal with spark noise. It is effective against voice and Morse code communications.

SPARK. This signal is easily produced and is one of the most effective for jamming. Bursts are of short duration and high intensity, repeated at a rapid rate. The time required for receiver circuitry and the human ear to recover after each spark burst makes this signal effective in disrupting all types of radio communications.

GULLS. The gull signal is generated by a quick rise and slow fall of a variable audio frequency and is similar to the cry of a sea gull. It produces a nuisance effect on voice circuits.

RANDOM NOISE. This is synthetic radio noise which is random in amplitude and frequency. It is similar to the normal background noise and can be used to degrade all types of signals; however, a great amount of power is necessary to jam voice communications.

STEPPED TONES. These are tones transmitted in increasing pitch, producing an audible effect similar to the sound of bagpipes. Stepped tones normally are used against single-channel amplitude modulation (AM) and FM voice circuits.

WOBBLER. The wobbler signal is a single frequency varied by a low and slowly varying tone. The result is a howling sound which causes a nuisance effect on voice communications.

RANDOM PULSE. Pulses of varying amplitude, duration, and rate are generated and transmitted to disrupt teletypewriter, radar, and all types of data transmission systems.

ROTARY. The rotary signal is produced by a low-pitched, slowly varying audio frequency, resulting in grunting sounds. It is used against voice communications.

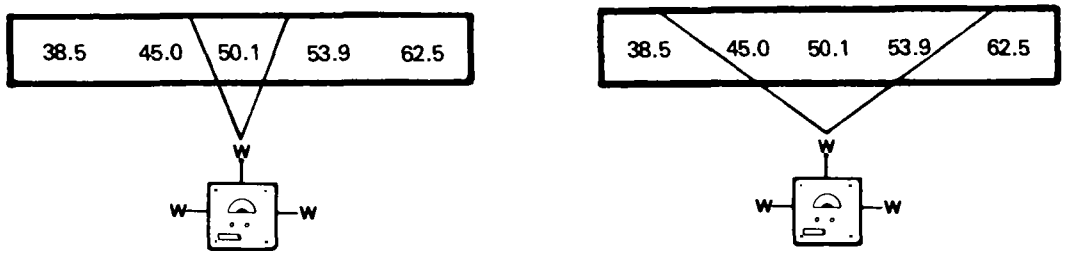
*Signal also can be unintentional.

THE THREAT NORMALLY WILL EMPLOY THREE TYPES OF JAMMING—SPOT, BARRAGE, AND SWEEP.

1 SPOT JAMMING. Threat spot jamming techniques concentrate most of the jamming power on one selected frequency. It is useful for accurate, effective, controlled jamming of a selected frequency; power is not wasted on frequencies other than the selected one. In this manner, spot jamming can be used within a frequency band without interfering with other transmissions.

2 BARRAGE JAMMING. Barrage jamming spreads the transmitted power over a wide band of frequencies. It affects all frequencies within both the band and the transmission range. Since the transmitted power is spread over a wide range of frequencies, barrage jamming does not saturate any single frequency. Its advantage is that little need be known about the receivers that are being jammed. Its disadvantages are that it wastes power, since it jams frequencies that are not being used, and it interferes with all transmissions—both enemy and friendly.

3 SWEEP JAMMING. Sweep jamming is typified by rapid changes in the jamming frequencies through a wide band. Sweep jamming is similar to barrage jamming in that it covers a wide frequency band. It is similar to spot jamming in that most of its available power is concentrated on a single frequency, though only for a short time, as the jammer repeatedly sweeps back and forth across the band. As the sweeper moves across the band, each frequency gets almost all the power of the jamming signal. Although the power of the jammer is only briefly concentrated on a frequency, it takes time for the receiver circuitry to recover from the effects of the jamming signal.



SPOT JAMMING BARRAGE JAMMING

FIGURE 5-5. JAMMING TECHNIQUES.

Countermeasures and Counter-Countermeasures. Jamming may take many forms, and therefore, may not be discernible to the untrained operator. All potential radio operators should be trained in Threat jamming techniques and how to determine if jamming is actually taking place. No counter-countermeasures should be taken until it has first been determined that jamming is taking place.

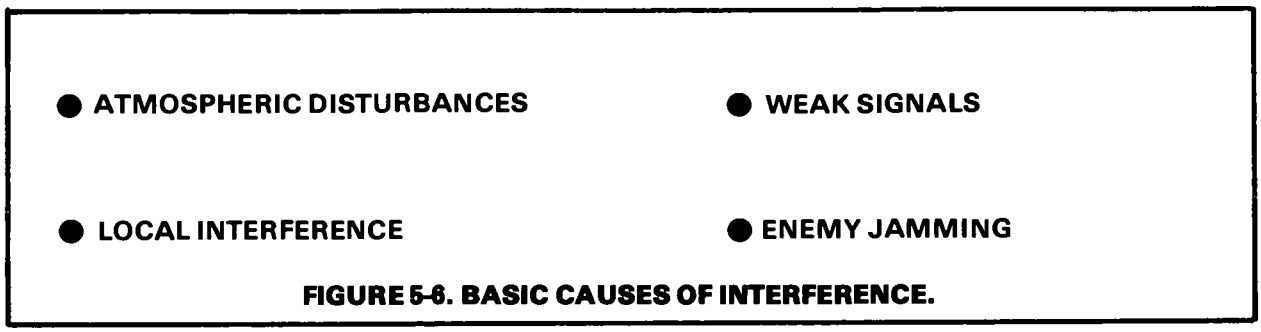


FIGURE 5-6. BASIC CAUSES OF INTERFERENCE.

However, it must be remembered that the best defense is a good offense—so those countermeasures that can be taken to preclude jamming will first be discussed.

• *Mask antennas.* Masking will preclude the enemy from receiving signals to spot jam and protect the antenna from barrage or sweep jamming.

• *Use communications equipment only when necessary.* Use radios, beacons, navigational aids, and electronic equipment only as needed. If you don't need them, turn them off.

• *Limit transmission time.* Use brevity lists and abbreviated call signs. Know what you want to say before keying the transmitter. Don't chatter.

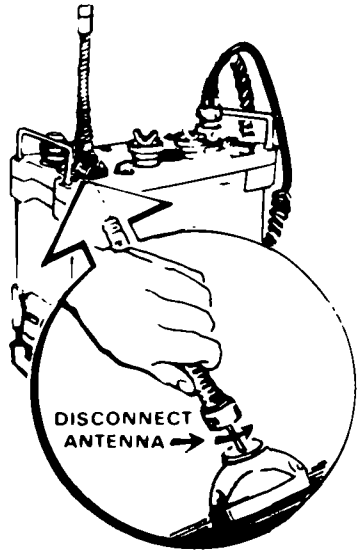
• *Use low power if possible.* Use of low power may prevent the enemy from receiving signals to spot jam.

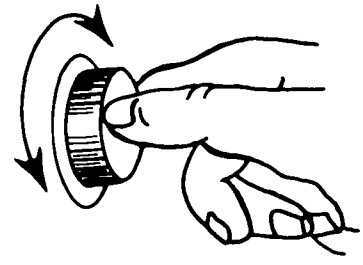
• *Rely on alternate means of communications when feasible.* The more you train using alternate communications means, the less dependent you will be on radio communications.

• *Use directional antenna modifications when feasible.* The use of directional antennas will limit the Threat's reception capabilities and strengthen your communications.

If interference is experienced by the radio operator on the ground, the following can be done to distinguish between receiver, local, and jamming interference:

Disconnect the antenna. If the interference continues, it is in the radio set. If not, the interference will stop.





If interference decreases when the antenna is disconnected, it must then be determined if it is local interference. Try tuning several hundreds of kilohertz on each side of the signal frequency to which you are tuned. If there is no change in the intensity of the interference, you are receiving electrical interference from a nearby source (power line, generator set, or radar set).

FIGURE 5-7. RADIO CHECK.

If the operator is well trained in types of jamming and jamming signals, he may be able to recognize jamming at the onset of interference. If determined that you are being jammed, counter-countermeasures must be taken to render the jamming ineffective.

• *Keep operating.* Never say anything to indicate to the enemy that he is effective in his jamming operations. Try to work through the jamming. Repeat transmission and give "Say again," as necessary. If the jamming is a sweep type, you may be able to transmit briefly during lulls of jamming intensity.

• *Mask your antenna.* If it can be determined from which direction the jamming is likely to be coming, locate your receiver between a natural obstacle and the enemy jammer.

• *Retune your radio.* Try tuning the radio a few kilohertz above or below the operating frequency to see if that will decrease the jamming signal and continue to operate.

• *Switch to high power.* If operating in low-power mode, switch to high power in an attempt to override the jamming signal.

• *Use alternate means of communications.* Switch to VHF, UHF, or FM radio if possible. Use CEOI brevity lists for switch code. Use hand, arm, placard, aircraft position, or smoke signals as per unit SOP if possible. Good premission planning also will eliminate many communications requirements.

• *Use a relay station.* If possible, use relay stations to work through jamming.

• *Change to an alternate frequency.* After all else has failed, short of messenger service, change to an alternate frequency. This should be on an emergency basis only and frequency change is designated by CEOI brevity code. Authentication is required.

• *Use messengers.* If jamming is too intense to operate through and communications are a must, the helicopter could be very adaptable to messenger type communications.

• *Use directional antennas.* Aviation unit communications electronic personnel may be able to rig a directional antenna to preclude jamming.

REPORT ENEMY JAMMING TO HIGHER HEADQUARTERS

• *Report enemy jamming.* Once discovered that you are being jammed, report the interference as soon as practicable to higher headquarters. The report is called a meaconing, intrusion, jamming, and interference (MIJI) report. Reporting Threat electronic interference or deception is our most important defense. When you do report, US intelligence can locate him, jam him, or destroy him.

THE MIJI REPORT IS RENDERED AS FOLLOWS BY LINE:

1. **Type report:** Meaconing, interference, jamming, or intrusion.
2. **Affected station:** Call sign and suffix.
3. **Location:** Your grid location (encrypted).
4. **Frequancy affected:** Frequency encrypted.
5. **Type equipmant affected:** UHF, VHF, FM, beacon, etc.
6. **Type intarfarence:** Type jamming and type signal.
7. **Strength of interference:** Strong, medium, or weak.
8. **Time interference started and stopped:** If continuing, so state.
9. **Interference effectiveness:** Estimate percent of transmission blockage.
10. **Oparator's nama and rank:** Self-explanatory.
11. **Ramarks:** List anything else that may be helpful in identifying or locating source of interference.

FIGURE 5-8. MIJI REPORT.

5-6. THE ELECTRONIC DECEPTION THREAT

Electronic deception is defined as *the deliberate radiation, reradiation, absorption, or reflection of electromagnetic energy in a manner intended to mislead an enemy in the interpretation or use of information received by his electronic system.* There are two major categories of electronic deception—manipulative and imitative.

Manipulative deception. Manipulative deception is erroneous information purposely inserted into electronic transmissions with the expressed intention of deceiving the enemy. Some examples of manipulative deception follows:

• Bogus radio calls divulging nonexistent units, equipment, or location for future employment.

• Exaggeration of enemy losses, battle damage, or prisoners of war.

• Propagation of false intelligence information as to the tactical plans, makeup, or composition of our forces.

• Chaff (chap 2) gives false imagery to the radarscope used for radar-guided antiaircraft systems.

Manipulative electronic deception is true electronic signature forgery. In other words, electronic emitters are manipulated to show communications that are nonexistent in that particular fashion. In essence, manipulative deception is a form of tactical deception.

Imitative deception. Imitative deception is intrusion into an enemy's communication or navigation net for the purpose of deceiving him by introducing traffic or signals in imitation of his own communications. Some examples include—

• *Voice imitations.* After monitoring a particular radio net, the Threat may attempt to mimic a particular person in order to pass bogus information or gain intelligence information.

• *Meaconing.* Meaconing is the term applied to the process of altering navigational signals in an effort to mislead aviators who depend on navigational aids for geographic orientation. Normally, this is accomplished by blotting out the desired signal and establishing a false beacon from another location. In this manner, aircraft may be lured into ambush positions or troops and ordnance dropped in the wrong areas. Aviators should be alert, especially while conducting tactical instrument flights, to detect unexplained changes in automatic direction finder (ADF) needle heading indications, signal strength, FM homing audible differentiations, or unexplained changes in radar vector headings.

IMITATIVE AND DECEPTIVE MEACONING ARE THE FOREMOST DECEPTIVE THREATS TO ARMY AVIATION

Countermeasures and Counter-Countermeasures. The foremost deceptive threats to Army aviation are imitative deception and meaconing.

Imitative Deception. Imitative deception could be used in an attempt to get you to compromise tactical

information of intelligence value or mislead you into taking a desired course of action. Aviation personnel should be on guard against this threat and take remedial action to prevent deception.

—Use secure voice when feasible. The use of secure voice modes will prevent the enemy from entering your net.

—Authenticate randomly with known stations. Random authentication will let you know if the enemy is operating in your net.

—Authenticate when required. Always require unknown stations to authenticate. Play by the rules for transmissions requiring authentication. If stations are not able to authenticate within 20 seconds, require authentication again using different letters. Sometimes the enemy will call another station with the challenge and get the correct authentication response.

RELY ON RADIO COMMUNICATIONS AS LITTLE AS POSSIBLE

—Use alternate means of communication when feasible. Good premission planning and unit communications SOP will help. Rely on radio communications to the least degree possible.

Meaconing. The Threat may use meaconing against Army aviators to try and draw them into ambush, drop men or equipment at erroneous locations, or place ordnance at unintended locations. When using navigational aids, aviators should be on guard against this threat:

—Preplan the mission in detail. When planning a mission with the use of radar, radio beacons, or FM homing, use checkpoints and time/distance/heading as a backup. This will aid you in determining if you are on the right course.

—Require authentication. Require stations giving radar vector and FM homing assistance to authenticate.

—Use resection. If you suspect meaconing, take two to three fixes from known locations along your flight path and locate the origin of the beacon by resection. You must know the location of the friendly beacon and your location to do this.

—Report meaconing. Use the MIJI report format. The meaconing station can then be located, jammed, or destroyed.

VISUAL COMMUNICATIONS TECHNIQUES

Limitations of visual communications systems include range, reception errors, and the time required to encode and decode messages. These shortcomings can be minimized if communicators—

- Conduct extensive premission planning.
- Use optical amplification devices for viewing the visual signals.
- Insure communicators use the same code definition sheets.
- Provide radio communications as a backup or primary means of communications during the following conditions:

—When success of a mission depends on immediate and accurate passage of information.

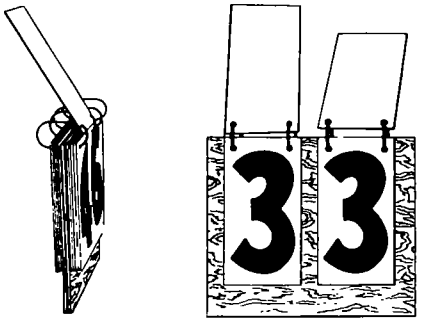
—When the enemy would not have sufficient time to react to the information and when detection would not degrade the mission.

—Where terrain masking will deny the enemy the capability to receive or interfere with the radio transmission.

—After the attack has begun.

—When transmitting perishable information.

Visual Signaling Devices. Passage of messages, both day and night, without danger of electronic detection or interference is possible using the send-a-message (SAM) visual communications system. The SAM system consists of a binder containing two sets of 5-inch by 8-inch colored communications cards with 5 1/2-inch-high numbers of a contrasting color and a definition sheet for encoding or decoding 36 words, letters, and numbers. A second (spare) definition sheet enables aviators to either change codes or double the number of coded messages. At night, the codes are transmitted as dots and dashes using a flashlight. During the day, when held against the side window or canopy of an aircraft, the communications cards permit unaided viewing over distances up to 150 meters. Receipt of message transmissions may be acknowledged by repeating the message, sending a prearranged signal or code, or specific movement of the aircraft. In addition to the use of the SAM system for air-to-air communications, it may be useful for both air-to-ground and ground-to-ground communications when the use of electrical communications is restricted.



COLOR

Number	Number Color	Card Color
1	White	Blue
2	White	Green
3	Black	Orange
4	White	Red
5	Black	White
6	Orange	Black

DEFINITION SHEET

Code	Letter	No.	Key Word	Code	Letter	No.	Key Word
1-1	A	1	Azimuth	4-1	S	19	Aircraft
1-2	B	2	Move-ing	4-2	T	20	Gas/CBR
1-3	C	3	Check point	4-3	U	21	Artillery
1-4	D	4	Distance	4-4	V	22	Danger (ADA, ambush)
1-5	E	5	Return	4-5	W	23	Cease fire
1-6	F	6	Follow me	4-6	X	24	Mine(s), (ED)
2-1	G	7	Grid	5-1	Y	25	On the road
2-2	H	8	Troops	5-2	Z	26	Camouflaged
2-3	I	9	Squad	5-3	AA	27	Stationary
2-4	J	10	Platoon	5-4	BB	28	Fire
2-5	K	11	Company	5-5	CC	29	All clear
2-6	L	12	Holding position	5-6	DD	30	Friendly
3-1	M	13	Atk helicopter	6-1	EE	31	Bridge/ford
3-2	N	14	BMP/APCs	6-2	FF	32	PZ/LZ
3-3	O	15	Tanks	6-3	GG	33	I spell
3-4	P	16	POL/refuel	6-4	HH	34	Recon
3-5	Q	17	HQ/CP	6-5	II	35	Need Medevac
3-6	R	18	Atk position	6-6	JJ	36	Spare

NOTE: Azimuth to nearest 10 degrees; distance to nearest 100 meters. Codes 1-1 through 2-4 correspond to numbers 1-9 and 0.

Dashes

Dots	1	2	3	4	5	6
1	1-1	1-2	1-3	1-4	1-5	1-6
2	2-1	2-2	2-3	2-4	2-5	2-6
3	3-1	3-2	3-3	3-4	3-5	3-6
4	4-1	4-2	4-3	4-4	4-5	4-6
5	5-1	5-2	5-3	5-4	5-5	5-6
6	6-1	6-2	6-3	6-4	6-5	6-6

NIGHT CODE SYSTEM

FIGURE 5-9. SEND-A-MESSAGE (SAM) VISUAL COMMUNICATIONS SYSTEM.

TRANSMISSION OF MESSAGE (EXAMPLE)

WANTED: To send the message, "Seven tanks on the road."

STEP 1: Refer to definition sheet and determine code for key words.

Key Word	Card Code	Light Code
I spell	6-3	6 dots—3 dashes
Seven	2-1	2 dots—1 dash
I spell	6-3	6 dots—3 dashes
tanks	3-3	3 dots—3 dashes
on the road	5-1	5 dots—1 dash

NOTE

When sending letters or numbers, the code 6-3 (I SPELL) should precede the first letter/number and follow the last letter/number to enable the receiver to distinguish from the coded text portion of the message.

STEP 2: Position the aircraft so the receiver has a clear view of the cards/flashlight. Display each set of coded numbers for at least 15 seconds.

STEP 3: The receiver can acknowledge receipt of the message by repeating it or by sending a prearranged signal.

Shielded Lights. Communications at night can be conducted by the use of a flashlight. Morse code or a predetermined code system may be used. Covers or tubes may be made to assist in making the light more directional. Colored lenses can be used in conjunction with light signals unless night vision goggles (NVG) are being used. All light sources appear green with NVGs.

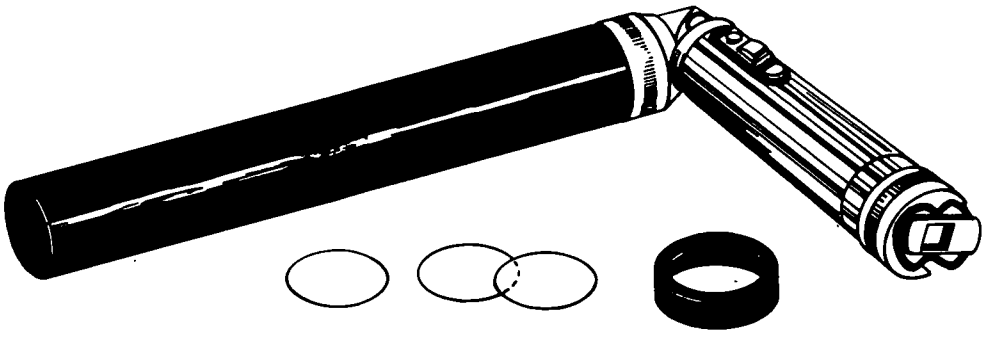


FIGURE 5-10. SHIELDED LIGHT SOURCE.

Aircraft Light Signals. The use of aircraft lighting systems for night communications may not be practical due to the possibility of enemy detection. However, some general applications of aircraft lighting could be used to signal events, phases, or operational problems during a mission.

Colored Pennants. The navies of the world have communicated for many years by means of color-coded pennants. Use of such pennants would not be practical in numerous quantities carried aboard an aircraft; however, a few colors or color combinations in conjunction with arm signals may provide a general limited use. The pennant(s) could be used to communicate events or phrases during mission. Generally, pennants would be more visibly interpreted than other means, but they still require line-of-sight.

Smoke and Pyrotechnics. The use of smoke and pyrotechnics has numerous disadvantages. Therefore, it is suggested that usage be limited to signal general events, such as to attack, withdraw, refuel, rearm, or for similar activities.

Premission Planning and Coordination. Proper coordination with the supported unit/commander and unit briefings can eliminate the requirement for extensive radio communications. Premission planning and briefings are discussed in detail in chapter 8. If all concerned aviation unit and/or maneuver unit personnel know what the mission, scheme of maneuver, and team/individual responsibilities entail, decentralized operations are greatly enhanced.

Aircraft Position/Maneuver. A system of codes and phrases could be worked out in relation to aircraft position and maneuver. Some examples are illustrated below. Additional maneuvers should be developed per unit SOP.

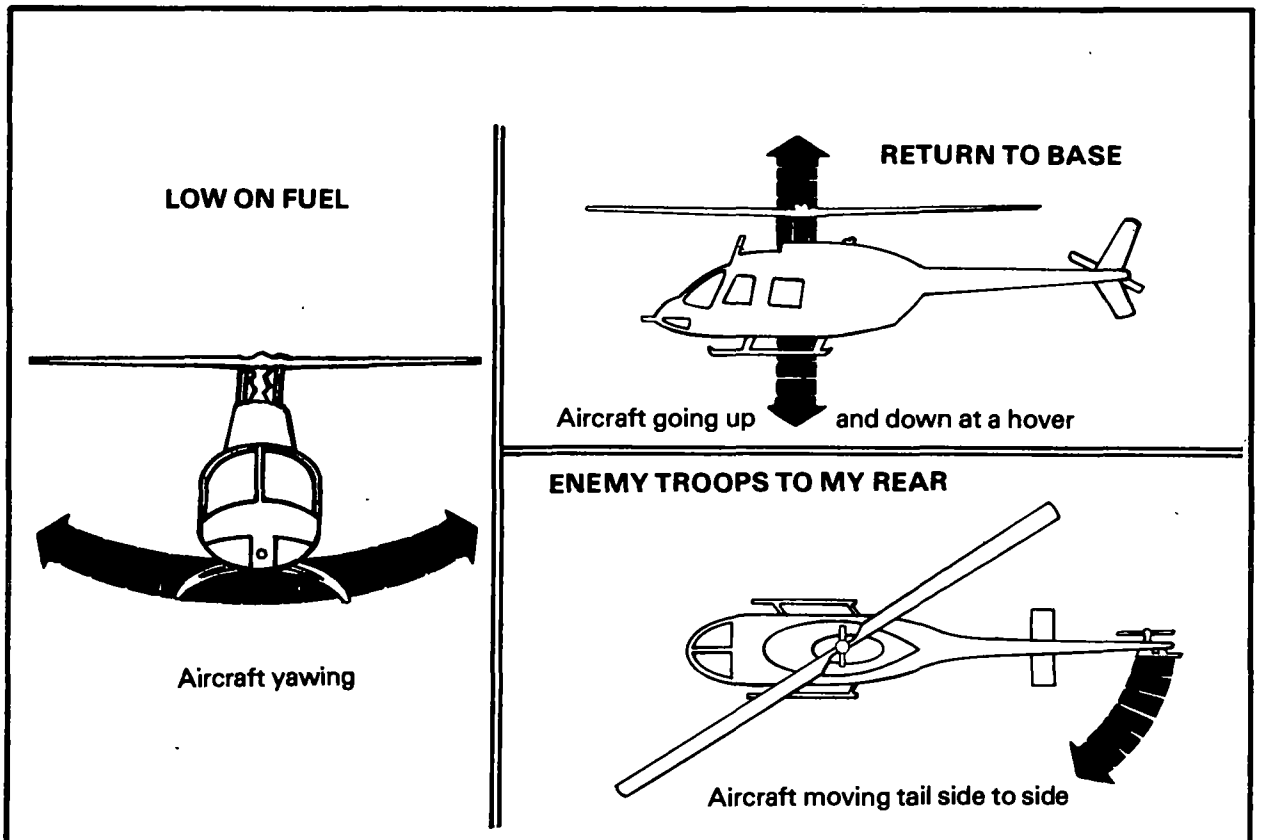


FIGURE 5-11. AIRCRAFT POSITION MANEUVERS.

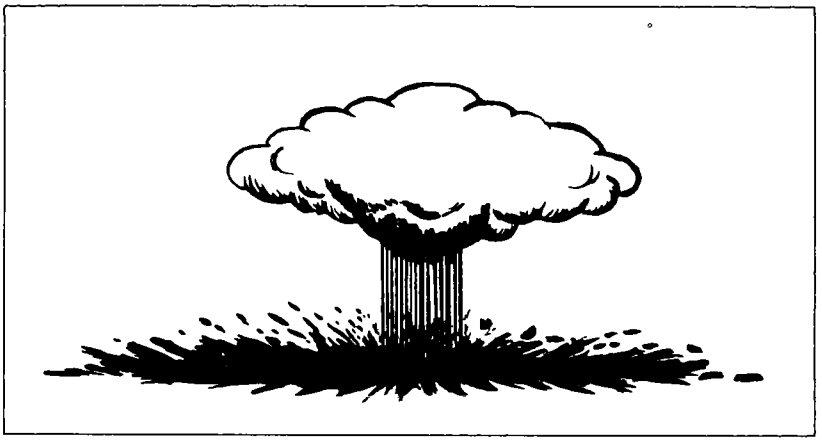
Arm and Hand Signals. Arm and hand signals also are applicable to aviation. They should be considered as a possible alternative to electronic communications for transmitting messages over short line-of-sight distances when dictated by the tactical situation. However, the aviator should keep in mind that visual signals are easily misunderstood and are vulnerable to interception. Also, their use is restricted during poor visibility. FM 21-60, prescribes the use of visual signaling techniques.

SUMMARY

Aviation unit operations on the high-intensity battlefield will only be as effective as our planning and training. In order to insure adequate communications are provided on a continuing basis, we must know the EW threat and applicable countermeasures/counter-countermeasures. We must also be able to employ alternate communications means should the use of our radios be denied. The outcome of the battle may well depend on our ability to cope with communications problems. Alternate communications methods presented in this chapter are yet to be solidified. Work on standardized methods continues and will be presented in future texts.

CHAPTER 6

THE NUCLEAR, BIOLOGICAL, CHEMICAL (NBC) THREAT



GENERAL

Nuclear, biological, and chemical (NBC) warfare poses substantial hindrances to the successful accomplishment of the aviation mission in the high threat environment. The availability to Threat Forces of sophisticated, highly mobile delivery systems for NBC munitions has been well documented.

NBC weapons are viewed by Threat Forces as weapons of mass destruction. Heavy emphasis is placed on training with these weapons, as evidenced by operations and war games being conducted in a near-real environment.

If Threat Forces fail to achieve their objectives with conventional munitions and make the decision to use NBC weapons, the aviator can expect the NBC environment to contain a mix of conventional, chemical, nuclear, and possibly biological weapons. It would not be unlikely for an aviator to

encounter two or possibly all three threats during the same mission. This is particularly true of chemical and nuclear attacks which have similar target priorities. In the high threat NBC environment, aviators must fly fully clothed in chemical protective garments because, once airborne and an NBC attack occurs, it will be virtually impossible for aircrews to get into protective clothing before becoming casualties.

The primary countermeasure to this threat must be the ability to continue operations while subjected to a nuclear, biological, or chemical attack. Our training must be realistic, rigorous, and repetitive to achieve a state of readiness in this area. NBC warfare must not impair our ability to survive, fight, and win.

THE NUCLEAR THREAT

In a nuclear environment, frontages are larger, and units and vehicles are separated by greater distance. If nuclear fires are used, they may be delivered prior to the nonnuclear preparation. The purpose is to silence the bulk of the enemy's supporting fires and neutralize his reserves. A short, heavy preparation, which may include nuclear fires and air support, usually will precede the commitment of a second echelon army during an attack by a front.

The nuclear delivery means available to Threat Forces can reach from the forward edge of the battle area (FEBA) to the rearmost boundaries of the theater. These systems include short-range and medium-range ballistic missiles, rockets, aircraft, and artillery. A primary target for enemy nuclear employment will be our aviation assets, since we pose such a formidable threat to their main battle weapon—the tank.

Nuclear Weapon Effects. A nuclear detonation results in a fireball formed as the result of the sudden release of an immense quantity of energy. Temperatures ranging into the millions of degrees, coupled with initial pressure ranges to millions of atmospheres, are found inside the fireball, creating devastating physical changes in the normal balance of the

environment. This release of energy causes a shock or blast wave. In addition, nuclear weapons emit nuclear and thermal (or heat) radiation and electromagnetic energy.

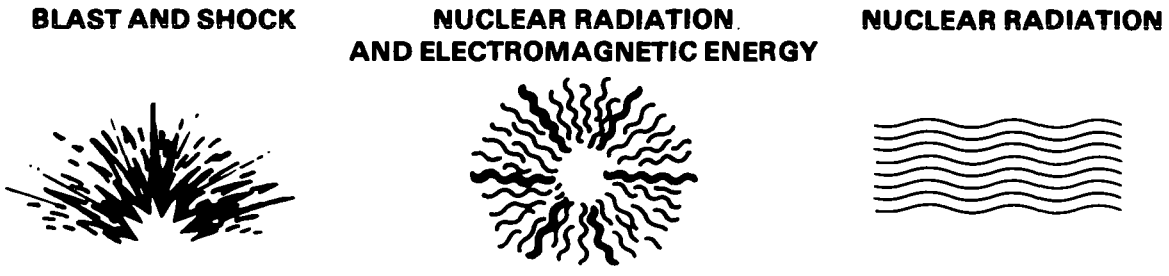


FIGURE 6-1. NUCLEAR WEAPON EFFECTS.

Blast and shock. Blast and shock account for most of the materiel damage and a considerable number of the casualties after a nuclear detonation. As the intensely hot gases expand within the fireball, the resultant high pressures cause a blast wave to form in the air, moving outward at high velocities. The blast wave is characterized by the abrupt rise in pressure above ambient conditions. The damage mechanisms for air blast result from two areas—overpressure and dynamic pressure.

—*Overpressure.* As the blast wave reaches an object, such as an aircraft, high initial pressures are applied to the side of the aircraft nearest the burst. Since the side of the aircraft away from the burst is still at ambient pressure, initially there is a temporary pressure differential about the aircraft. As the blast wave envelops the aircraft, the overpressure is applied to all sides of the aircraft and produces a squeezing or crushing force on the aircraft which may result in damage.

—*Dynamic pressure.* Dynamic pressure is a measure of the force exerted by winds associated with the blast wave. The dynamic pressure can cause damage by pushing, tumbling, or tearing target apart.

Parked aircraft and aircraft in flight are damaged by a combination of overpressure and dynamic pressure. Aircraft plexiglass windows are particularly vulnerable to low overpressure effects.

Thermal radiation. Thermal radiation results from the heat and light produced by the nuclear explosion within the atmosphere. While flying, aviators are particularly vulnerable to the effects of thermal radiation because of their inability to protect themselves.

TRAVELS AT THE SPEED OF LIGHT	TRAVELS IN STRAIGHT LINES	CAN BE SCATTERED	CAN BE REFLECTED	CAN BE EASILY ABSORBED

Thermal radiation may cause injury, damage, or ignition of combustible materials.

FIGURE 6-2. CHARACTERISTICS OF THERMAL RADIATION.

Thermal burns are produced either directly as flash burns or indirectly by fires caused by the detonation. Exposed skin areas may be burned by intense heat, or burns may result from combustible material in the aircraft catching fire. The fire-resistant characteristics of the nomex flight suit, gloves, and leather boots will help protect aviators from thermal radiation.

Due to the intense brightness of the flash of light produced by the nuclear explosion, a temporary (flash blindness) or permanent (retinal burns) loss of vision may result.

—*Flash blindness.* Flash blindness (dazzle) is a temporary impairment of vision caused by the saturation of the light sensitive elements (rods and cones) in the retina of the eye. It is an entirely reversible phenomenon which normally will blank out the entire visual field of view with a bright afterimage. Normally, flash blindness will be brief, and recovery is

complete. Flash blindness may be produced by scattered light and does not necessarily require eye focusing on the fireball. Flash blindness will be more severe and recovery slower at night since the pupil is larger than during the day, and the object being viewed and background usually are dimly illuminated. Flash blindness is considered a hazard to aviators because of the probability of an aircraft crash if the aviator is temporarily blinded.

—*Retinal burns.* A retinal burn is a permanent eye injury that occurs when the retinal tissue is heated excessively by the focused image of the fireball within the eye. The visual capacity is permanently lost in the burned area. The natural tendency of personnel to look directly at the fireball tends to increase the probability of retinal burns. Under certain conditions, retinal burns may be produced as far away as the horizon on a clear night. A retinal burn is painless and normally will not be noticed by the individual concerned if it is off the central axis of vision. However, very small burned areas may be noticeable if they are centrally located. Personnel generally will be able to compensate for a small retinal burn by learning to scan around the burned area.

Table 6-1A. DAYTIME VISUAL EFFECTS OF NUCLEAR DETONATION.

ORIENTATION	Eyes focused on point of detonation.	Burst in field of vision, but not focused on point of burst.	Personnel shielded or looking away.
FLASH-BLINDNESS	Yes: Recovery in approximately 2 minutes.	Yes: Recovery in less than 2 minutes.	Not very likely.
LOSS OF NIGHT ADAPTATION	NA	NA	NA
RETINAL BURNS	Very likely.	Possible.	No.

Table 6-1B. NIGHTTIME VISUAL EFFECTS OF NUCLEAR DETONATION.

ORIENTATION	Eyes focused on point of detonation.	Burst in field of vision, but not focused on point of burst.	Personnel shielded or looking away.
FLASH-BLINDNESS	Yes: Recovery gradual in 10 minutes or less. Will depend on visual task to be performed and level of illumination.	Yes: Recovery in approximately 5 minutes or less for most situations. Depends on visual task to be performed and level of illumination.	Possible from reflection. Recovery in 2 to 3 minutes for most situations. Depends on visual tasks to be performed and level of illumination.
LOSS OF NIGHT ADAPTATION	Yes: Recovery gradual in 15 to 35 minutes.	Yes: Recovery gradual in 15 to 35 minutes.	Possible: Recovery in no less than 15 minutes.
RETINAL BURNS	Very likely.	Possible.	No.

Nuclear radiation. Gamma and neutron radiation from nuclear bursts causes personnel casualties by damaging body tissues.

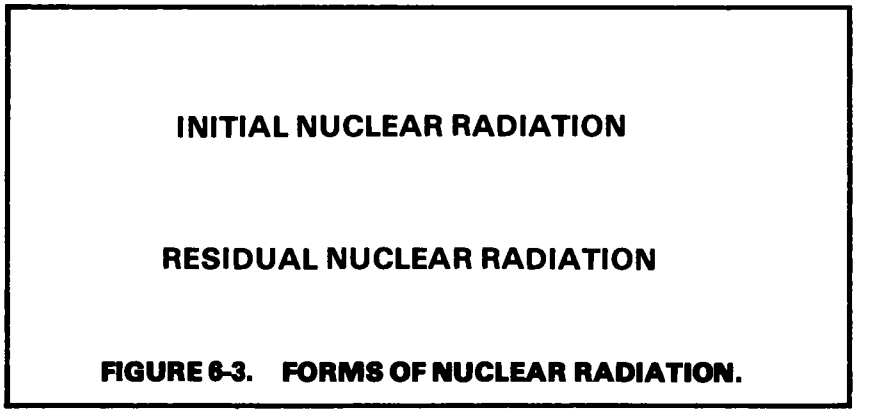


FIGURE 6-3. FORMS OF NUCLEAR RADIATION.

TABLE 6-2. *EXPECTED RESPONSE IN GROUPS OF PERSONNEL EXPOSED TO GAMMA AND NEUTRON RADIATION.

DOSE IN RADS	EARLY SYMPTOMS	EFFECTIVENESS	FATALITIES
0-70	Less than 5% hospitalized	Full	None
150	Approximately 5% within 6 hours	Reduced effectiveness while vomiting, depending on task. Ineffective if hospitalized.	None
650	Within 2 hours, 100%	Symptoms continue intermittently for next few days. Effectiveness reduced significantly for 2d to 6th day. Hospitalization required.	More than half at approximately 16 days
2,000-3,000	Within 5 minutes, 100%	Immediate, temporary incapacitation for a period of 30 to 40 minutes, followed by recovery period during which personnel efficiency is impaired. No operational capability.	In approximately 7 days
8,000	Within 5 minutes, 100%	Immediate, permanent incapacitation for personnel performing physically demanding tasks. No period of latent "recovery."	In 1-2 days
18,000	Immediate, 100%	Permanent incapacitation for personnel performing even undemanding tasks. No operational capability.	Within 24 hours

*Symptoms include vomiting, diarrhea, dry heaving, nausea, lethargy, depression, and mental disorientation. At lower dose levels, incapacitation is a simple slowing down of the rate of performance due to a loss of physical mobility and/or mental disorientation. At the high dose levels, shock and coma may be the early symptoms.

—*Initial nuclear radiation.* Initial nuclear radiation is defined as that nuclear radiation emitted by a nuclear explosion within the first minute after the burst. The primary casualty producers associated with initial nuclear radiation are neutrons and gamma rays. Personnel are extremely vulnerable to initial nuclear radiation; and, for yields of 50 kilotons (KT) or less, it is the dominant casualty producer.

The individual response to initial nuclear radiation depends on several factors, including the—

Total dose received from previous radiation exposure.

Periods over which the doses are received.

Recuperation time between exposures.

Physical condition and age of the individual.

Presence of any additional injuries.

—*Residual nuclear radiation.* All nuclear radiation emitted from radioactive particles that a nuclear burst produces after that first minute is called residual radiation. Most residual radiation is fallout which occurs from surface bursts. Dirt and debris from the ground are sucked up into the fireball and carried by the wind. The radioactive debris eventually falls back to the ground. While flying, aviators will be exposed to residual radiation for only short periods. Therefore, the radioactive hazard is small. However, aviators should avoid flying through airborne debris or clouds which may have become contaminated since high levels of radiation may be encountered even if the exposure time is very short. Likewise, when mission requirements necessitate flying through or into an area of a previous nuclear strike, aviators should be aware of both areas of induced radiation and fallout patterns so they may be avoided, especially in case of aircraft emergencies which require landing. The biological response to residual radiation is the same as that to initial radiation. A critical responsibility on the part of commanders will be to keep accurate account of *total* dosage received by members of their unit. Radiation exposure records are maintained as described in FM 3-12.

AVOID FLYING INTO THE DEBRIS CLOUD

KEEP ACCURATE ACCOUNT OF DOSAGE RECEIVED BY UNIT

Radiation sickness is the adverse biological response of those exposed to radiation. Since most people will react differently, it is impossible to predict the effect of a specified

dose of radiation on any one individual. However, the *average* effect on a large group may be predicted with enough accuracy for military purposes.

Electromagnetic pulse (EMP). EMP is an intense flux of electromagnetic energy that moves out from the nuclear burst at approximately the speed of light. As this flux moves out, it causes current flow in all conductive materials in its path. Excessive current is generated in antennas, long wire, and cables, metal objects, radios, and electronic equipment. The excessive current can cause arc-over, burning, and destruction of equipment. Due to the electromagnetic nature of the flux, it travels farther than blast, affects objects shielded from thermal radiation, and is difficult to predict the extent of the area which will be affected. Effects vary from complete burning out (from arc-over) to temporary or permanent circuit disturbances caused by reverse or excessive current flow.

Countermeasures Against the Nuclear Threat. Since the hazards associated with nuclear weapons are so unique, aviation countermeasures are dependent on many elements. For example, for a 1-kiloton detonation, the difference between the distance where you are a certain casualty and the distance where you may assume you are reasonably safe is only 330 meters.

• THERMAL RADIATION—either heat, light, or combination of both which can damage the aircraft and burn the aviator.

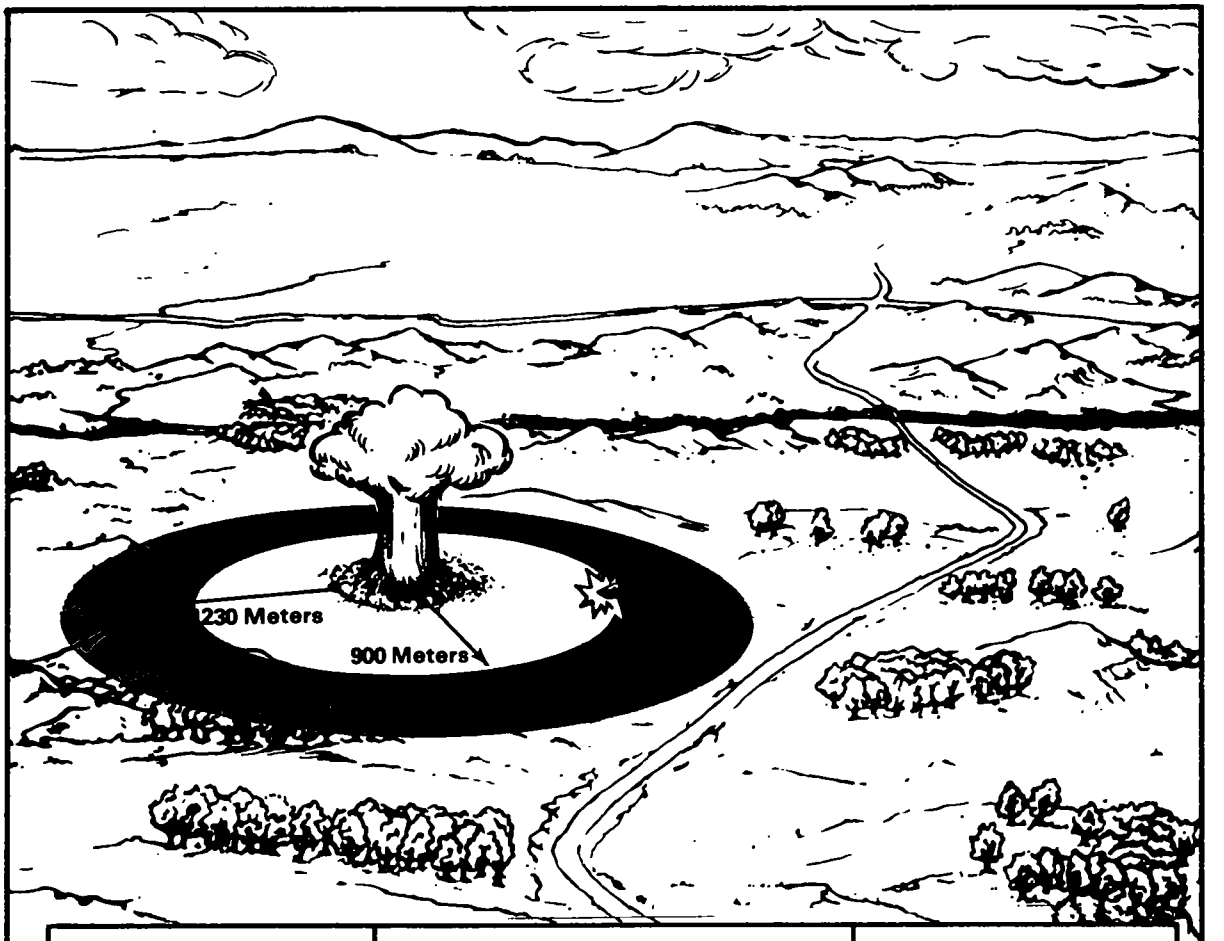
• NUCLEAR RADIATION—total dose absorbed by aviator may be incapacitating or lethal.

• BLAST—overpressure and dynamic pressure absorbed by aircraft may cause structural damage or failure.

• ELECTROMAGNETIC PULSE—may destroy/degrade aircraft electronic systems.

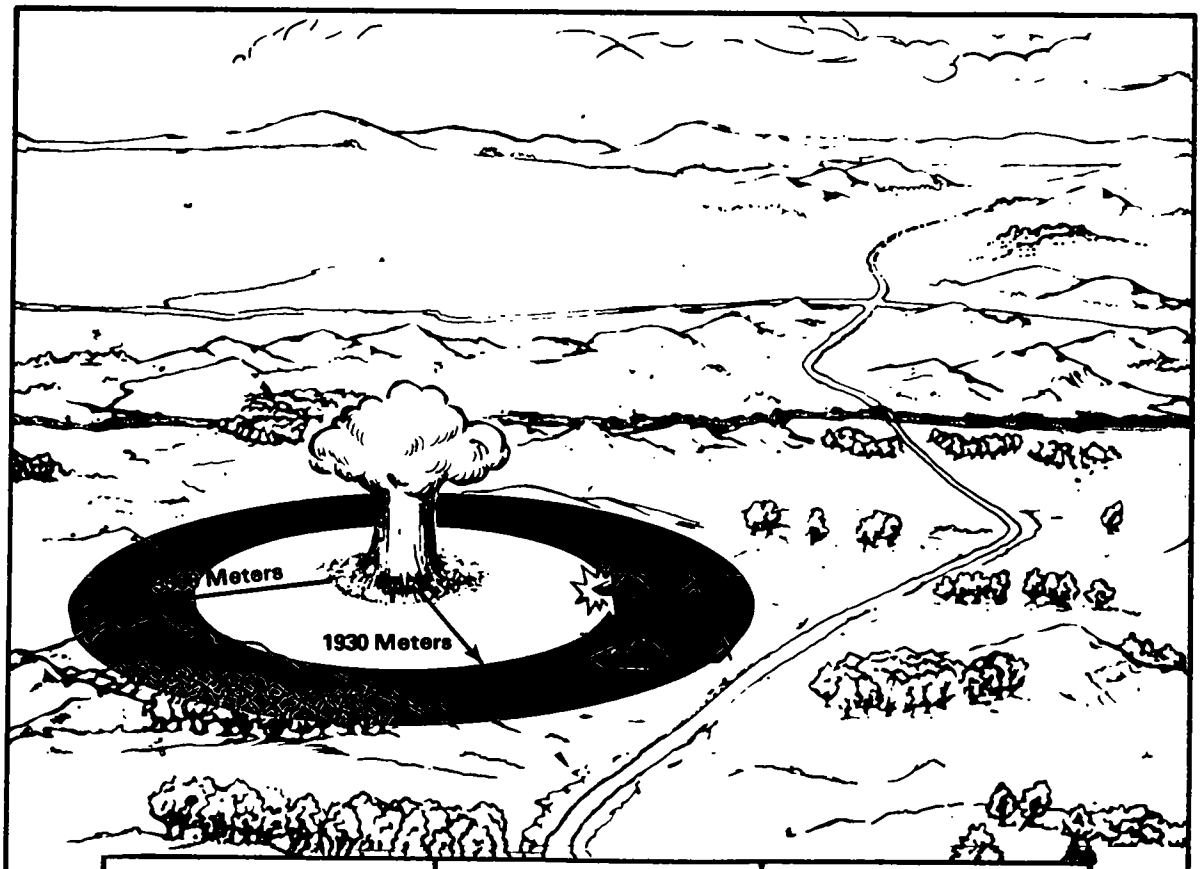
FIGURE 6-4. CATEGORIES OF DANGER TO AIRCRAFT AND AVIATORS.

Two samples of circular patterns describing at what distance the aircraft and aviator are susceptible to damage and at what distance both are safe are illustrated in figures 6-5 and 6-6.



NUCLEAR EFFECTS	ABORT (900 METERS)	SAFE (1,230 METERS)
Radiation dose	*1,600 rads	50 rads
Overpresaure	6 pounds per square inch (psi)	1.1 psi
Thermal	*7 calories/cm^2 (cal/cm^2)	3.1 cal/cm^2
*Lethal/Incapacitating		

FIGURE 6-5. NUCLEAR EFFECTS ON ARMY AIRCRAFT OF A 1-KILOTON NUCLEAR DETONATION.



NUCLEAR EFFECTS	ABORT (1,930 METERS)	SAFE (3,300 METERS)
Radiation dose	*12 rads	1 rad
Overpressure	2 psi	1.0 psi
Thermal	*12 cal/cm^2	3 cal/cm^2
*Thermal/lethal implications.		

FIGURE 6-6. NUCLEAR EFFECTS ON ARMY AIRCRAFT OF A 10-KILOTON NUCLEAR DETONATION.

Actions prior to a nuclear detonation. The single most important element of our defense against a nuclear attack will be the efforts of our intelligence community to forewarn friendly units of the possibility of Threat Force employment of nuclear weapons. Once the threat has been ascertained, certain defensive measures may be employed. These measures are to be considered consistent with the threat and need not be employed simultaneously.

—*Command emphasis.* Commanders must insure that aviators and support personnel understand the effects of nuclear weapons and are trained to perform those tasks that minimize nuclear weapon effects.

—*Detection equipment.* All monitoring, warning, and detection equipment must be fully operational and in the hands of capable operators.

—*Medical treatment.* First-aid procedures for nuclear-associated injuries should be reviewed and provisions made for medical evacuation (MEDEVAC) procedures. Plans for local treatment of minor wounds should be understood by all members of the unit.

Actions during a nuclear attack. Due to the shock effect of the nuclear blast, aviators must take certain actions immediately.

THE SHOCK WAVE FOLLOWS A NUCLEAR BLAST BY ONLY A FEW SECONDS

—The action a rotary wing aviator takes will depend on whether he has been forewarned of a Threat nuclear attack or has received a STRIKEWARN (warning of a friendly nuclear strike), distance from the blast, and flight altitude. The aviator must keep in mind that once a nuclear blast occurs, a decision on what action to take will have to be made immediately because it will only take a few seconds for the shock wave to reach the aircraft. If flying at terrain flight altitudes or if forewarned, the probability for survival will be best if the aviator puts the helicopter on the ground. Turn the nose of the helicopter away from the blast to present a smaller area for the shock wave to strike. If possible, choose a landing area that provides terrain masking from the blast and descend rapidly. Don't panic; be alert for aircraft damage due to tree strikes or hard landing. As the aircraft rests on the ground, put your visor down and place your head as low as conditions

permit, while maintaining control of the aircraft. After the blast wave passes, check the aircraft for structural damage and, if possible, continue your mission. If a STRIKEWARN has been received, avoid the target in accordance with (IAW) local standing operating procedure (SOP).

—If flying above terrain flight altitudes, and sufficient time is not available to land, initiate a climb and turn away from the blast to minimize the effects of the nuclear explosion.

—Fixed wing aircraft also should turn away from the blast. By doing so, damage should be diminished. Initiation of a climb is recommended because the blast effect decreases as altitude increases.

—Personnel on the ground should lie face down, heads pointed away from the blast, and cover exposed areas of their body as well as possible.

The measures illustrated below provide protection against the initial effects of nuclear weapons, to include blast, heat, and nuclear radiation. Deep, covered foxholes or deeply buried culverts offer the best protection against fallout.

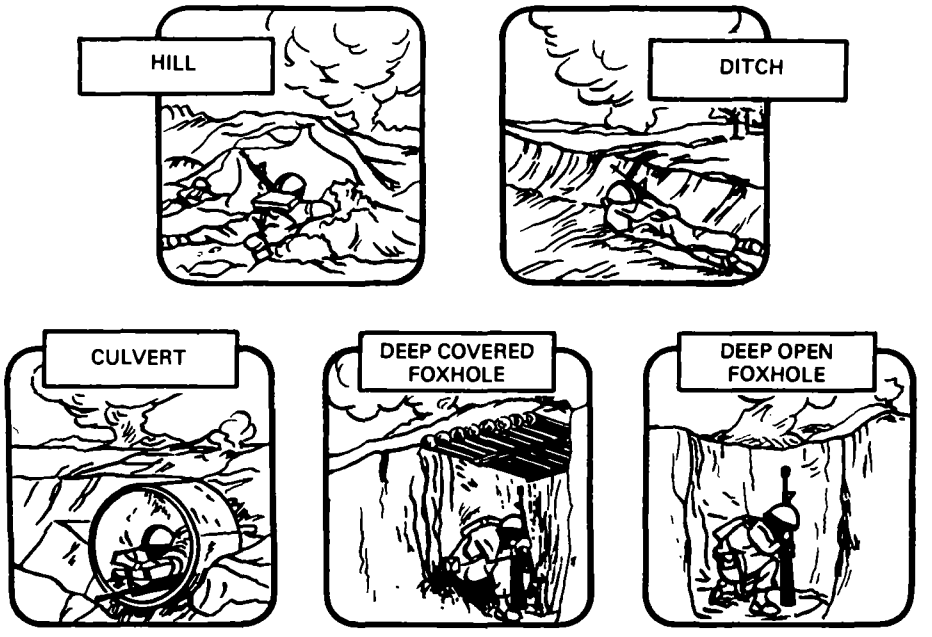


FIGURE 6-7. PROTECTIVE MEASURES FOR DISMOUNTED PERSONNEL.

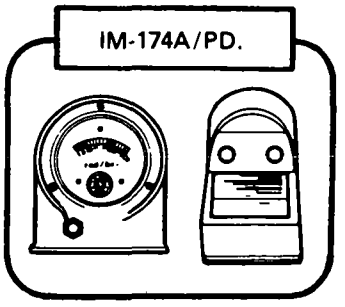
Actions to be taken after the nuclear attack. The most catastrophic consequence of a nuclear burst can be the negative psychological effects on soldiers. Calm, effective, and intelligent leadership will overcome the inherent fear most soldiers will experience.

As soon as the blast wave has passed, radiological monitoring should commence to detect radiological contamination of equipment and personnel. Radios possibly will be affected by EMP. Unit commanders should be prepared to carry out their assigned missions in radio silence. Therefore, operational plans should include provisions for mission continuation even without radios.

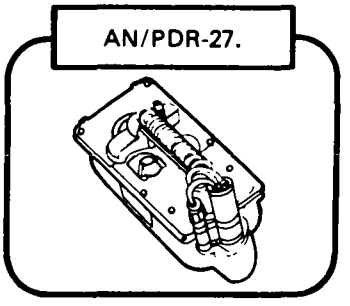
—*Aircraft and vehicle decontamination.* Measures that prevent radioactive contamination of the interior of aircraft and vehicles will greatly reduce the time and effort required for decontamination. If aircraft or vehicles are contaminated by radioactive debris emitting high dose rates, the debris should be removed by washing, sweeping, or brushing. Radioactive contamination cannot be destroyed or neutralized. Therefore, after radioactive debris is removed from personnel, aircraft, and vehicles, the equipment should be moved to another area or the radioactive debris covered with fresh soil. Radiological decontamination procedures are provided in TM 3-220. Aircraft performing aerial radiological surveys should select areas to establish an air-ground correlation factor which will produce the least amount of aircraft contamination (hard-stand sod). Aviators should monitor the dose and dose rate carefully and turn back if the dose or turn-back dose rate is reached.

AVIATORS SHOULD MONITOR THE DOSE AND DOSE RATE CAREFULLY

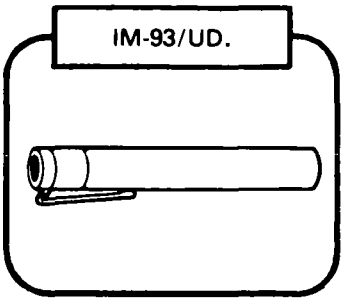
—*Radiological monitoring.* Radiation, detection, indication, and computation (RADIAC) instruments are used to detect nuclear radiation and are available in all aviation units. Radiological monitoring of the unit area alerts the commander to a hazard that would otherwise go undetected.



A standard ion-chamber RADIAC meter used for area monitoring and survey, that measures rad-per-hour dose rate (issued on a one-per-platoon basis).



A low-range, dose-rate-type instrument similar to a Geiger counter used for monitoring personnel, food and equipment.



An individual dosimeter designed to measure the total nuclear radiation (gamma) dose received by individuals. These dosimeters are recharged by the PP-1578/PD.

FIGURE 6-8. STANDARD INSTRUMENTS AVAILABLE IN AVIATION COMPANY.

THE BIOLOGICAL THREAT

Disease has proven to be a formidable antagonist, determining the outcome of many battles. Biological warfare cannot be discounted as an option to the Threat Forces. Any method which appears to offer advantages to a nation at war may be vigorously employed by that nation. Biological weapon systems possess mass casualty potential which cannot be safely ignored since Threat doctrine treats their use as an integral part of warfare.

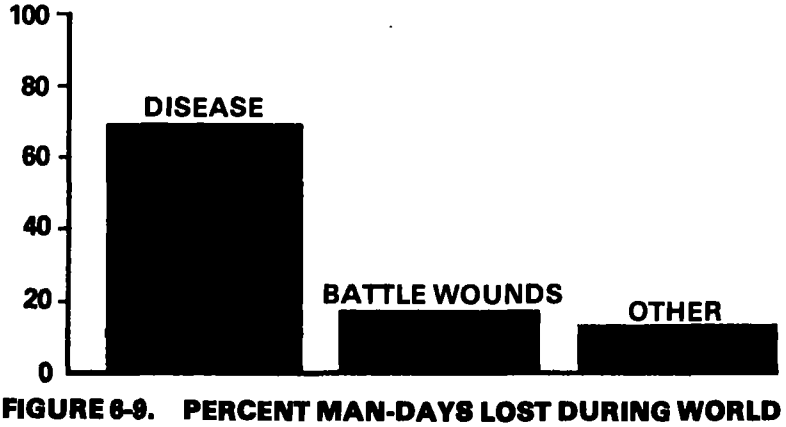


FIGURE 6-9. PERCENT MAN-DAYS LOST DURING WORLD WAR II DUE TO DISEASE AND BATTLE WOUNDS.

Biological Weapon Effects. Biological weapon systems are unique in that the agents involved are alive or the toxic products of living organisms. Only a small number of microorganisms are needed to inflict casualties. The agents reproduce in the host and cause disease. The area covered by biological weapon systems can be up to many thousands of square kilometers. Biological agents do not produce casualties immediately because time is required to overcome the body's internal defense mechanisms.

Biological agents are living microorganisms or their by-products which cause diseases in man, animals, or plants or cause the deterioration of material.

BIOLOGICAL AGENTS—

- **Are characterized by a low agent requirement—very little goes a long way.**
- **Cover a large area.**
- **Are weather dependent.**
- **Have a delayed effect.**
- **Easily penetrate fortifications, buildings, etc.**
- **Do not destroy material.**
- **Are hard to detect.**
- **Decay with time.**
- **Are easy to manufacture.**
- **May have graduated severity.**

FIGURE 6-10. CHARACTERISTICS OF BIOLOGICAL AGENTS.

There are several kinds of microorganisms, or germs, that can be used as biological agents. These agents include bacteria, rickettsia, viruses, and fungi. They have different characteristics, cause different diseases, and require different methods of treatment.

Germs can enter the body in three ways—through the skin, respiratory tract, and digestive tract. Some germs can

attack one way and cause a rather minor disease or attack another way and cause a high percentage of sickness or death. As illustrated in table 6-3, there are three forms of anthrax that affect man—cutaneous (skin), pulmonary (respiratory tract), and intestinal (by ingestion). The mortality rate of the pulmonary form may exceed that of the cutaneous form by 75 percent.

Countermeasures Against a Biological Threat. Biological agents can be delivered in various forms, chiefly by spray and bomblets. Infective vectors, such as ticks, fleas, or mosquitoes, also might be used.

SUSPECT A BIOLOGICAL ATTACK IF—

- **Low flying aircraft appear to produce a mist or spray.**
- **A munition is delivered by enemy aircraft that has no apparent explosive impact.**
- **Unusual bomblets are found.**
- **Numerous unexplained ill personnel are observed.**
- **Unusual swarms of insects are observed, such as mosquitoes, suddenly appearing after aircraft have dropped containers that do not have an immediate effect.**
- **Numerous sick or dying animals become apparent.**

FIGURE 6-11. SIGNS OF POSSIBLE BIOLOGICAL ATTACK.

Before the attack. The measures taken before the attack are designed to minimize the effect of the agent on personnel.

—Personal hygiene and area sanitation. These measures are important in routine preventive medicine and are implemented in every unit. During normal situations, these measures tend to reduce the incidence of infectious disease and

promote the general health of the individual and unit. The infective dosage is, in part, dependent upon the physical condition of the exposed individual. Area sanitation plays an important part in defense against a biological attack by preventing rodents and other vectors from transmitting disease to previously unexposed personnel.

—*Immunization.* The use of immunization procedures provides protection against several biological agents and airborne vectors such as mosquitoes. Disease symptoms are less severe or absent in immunized individuals. An enemy might hesitate to use a particular agent against troops protected by immunization because he could not be sure of the results. It also would be unlikely for Threat Forces to employ the use of airborne vectors since their movement after release is unpredictable. The assumption must not be made that immunization is the only defense needed against biological agents. Effective immunization procedures are not available for all potential biological agents, and acquired immunities to some agents may be overcome if the dosage is sufficiently high.

During the attack. The measures taken by troops while under biological attack are similar to those taken while under chemical attack. The most important single item of protective equipment is the mask as it provides protection from spraying and aerosol delivery of biological agents. The importance of proper fit, adjustment, and maintenance of the protective mask and hood cannot be overemphasized. Protective clothing is not necessary for protection against field concentrations of biological agents. Normal clothing, buttoned and arranged so that all skin areas are covered, will give good protection. Any open wounds should be bandaged.

Table 6-3. EFFECTS OF BIOLOGICAL AGENTS.

POSSIBLE AGENT	SYMPTOMS	SOURCE OF INFECTION	METHOD OF ENTRY	MORTALITY		TIME BETWEEN EXPOSURE AND SYMPTOMS
				TREATED	UNTREATED	
ANTHRAX Cutaneous	Swelling, ulcerated soras	Infactad livestock, through skin scratches, Importad animal hides	Skin	Up to 5%	Up to 25%	1-7 days
ANTHRAX Intestinal	Abdominal pain, nausea, vomiting, fever, shock, daath	Insufficiently cookad maat from infectad animals, contaminatad water	Mouth	Up to 100%	Up to 100%	1-7 days
ANTHRAX Pulmonary	Fevar, cough, respiratory distress	Sporas braathed into lungs	Lungs	Up to 100%	Up to 100%	1-5 days

Table 6-3. CONTINUED.

POSSIBLE AGENT	SYMPTOMS	SOURCE OF INFECTION	METHOD OF ENTRY	MORTALITY		TIME BETWEEN EXPOSURE AND SYMPTOMS
				TREATED	UNTREATED	
BRUCELLOSIS (Undulant Fever)	Fever, joint pain, melelse; illness may last months	Milk; infacted goats, cattle, hogs, dogs	Mouth, skin, lungs	Approachas 0	2 to 6%	Usually 5-21 days (may be several months)
TULAREMIA (Rabbit Faver)	Chills, faver, disease of lymph node, occasionelly pneumonia	Wild animals (in particular rebbits) and flies; eating infected animals	Skin, mouth, lungs	Approachas 0	Up to 40%	1-10 days (usually about 3-5 days)
PLAGUE, Bubonic	High fever, may progress to pneumonia	Bite of infected flea; handling infected animal	Skin	Usually less than 10%	25-100%	2-6 days
Pnaumonic	High fever, cough	Inhaling organisms	Lungs	Properly treated, than 50%	100%	1-4 days
CHOLERA	Nausea, vomiting, diarrhea	Water, food	Mouth	1%	15-90%	1-5 days
DIPHTHERIA	Sore throat, followed by extreme fever, overall body infection	Direct contact with ill patient or carrier	Raspiratory trect, skin	5-10%	10-15%	2-5 days; occasionally longar
TETANUS	Wound; spasm and increased muscle tone	Soil, dirt, feces	Wound	50-60%	80%	3 days to 3 weeks
TYPHOID FEVER	Fever, ulcers in intestines, diarrhea, or conatipation	Feces/urine of infected people	Mouth	2%	7-14%	6-21 daya
EPIDEMIC TYPHUS	Headeche, high fever, general pains	Infected person, lice	Skin	Usually lass than 10%	10-40%	6-15 days
ROCKY MOUNTAIN SPOTTED FEVER	Fever, joint, muscle peins, akin rash	Infected ticks	Skin	Approachas 0	30-40%	3-10 daya
Q FEVER	Flu-like headache, fever, chest pains	Contaminated milk, dust	Lungs, mouth	Approaches 0	Less than 1%	2-3 weeks
ENCEPHALITIS & ENCEPHALOMYELITIS (many varieties)	Headache, faver, dizziness, convulsions	Mosquitoes, wild birds	Skin	1-40%	1-60%	4-24 daya
SMALLPOX VARIOLA, MAJOR	Severe fever, skin blisters and scabs; very contagious	Laboratory	Respiratory tract	20-35%	20-35%	10-14 days
YELLOW FEVER	Fever, headeche, GI problema, jaundice	Blood from infected people; passed by mosquitoes	Skin	5-30%	30-40%	3-6 days
RIFT VALLEY FEVER	Fever, severe headache, joint pain, dizziness	Infected animals, mosquitoes	Skin, lungs	Usually 0	Lass than 1%	4-6 days
RABIES	Fever, headache, nausea, nervouaness	Bites from infected animals, inhalation of germs	Skin, lungs	99.9%	100%	10 days to 8 months (usually 50-60 days

Table 6-3. CONTINUED.

POSSIBLE AGENT	SYMPTOMS	SOURCE OF INFECTION	METHOD OF ENTRY	MORTALITY		TIME BETWEEN EXPOSURE AND SYMPTOMS
				TREATED	UNTREATED	
DENGUE FEVER	Fever, chills, pain behind the eyes; most incapacitating, least fatal	Mosquitoes	Skin	Approaches 0	Approaches 0	4-10 days
COCCIDIOIDOMYCOSIS (Valley Fever)	Low fever	Dust, soil	Lungs	Approaches 0	Low, about 5%	10-21 days
HISTOPLASMOSIS	Skin lesions	Dust, spores	Lungs	Approaches 0	Less than 1%	5-18 days

After the attack. Because units have no devices to indicate when a biological hazard no longer exists, individuals continue wearing the protective masks after a suspected biological attack until authorized by their commanders to remove them. After a suspected biological attack, other actions which may be necessary are as follows:

—*Decontamination.* Generally, decontamination of personnel and equipment is not a matter of immediate urgency in the field when biological agents are disseminated as an aerosol. Decontamination usually is carried out when time and resources permit. Some methods for use in the field for the decontamination of biological agents are discussed below. For detailed information on large scale decontamination operations refer to FM 3-5.

—*Personnel.* Individuals can decontaminate themselves by showering with hot water and soap; germicidal soaps are used, if available. The nails should be thoroughly cleaned and hairy parts of the body scrubbed. Contaminated clothing should be washed in hot, soapy water if it cannot be sent to a field laundry for decontamination. Cotton items may be boiled.

—*Outdoor areas.* Sunlight kills most microoganisms and usually will decontaminate unshaded outdoor areas. However, shaded areas, especially at low temperatures, may remain hazardous from several hours to several days. Decontamination of large areas is not feasible, but critical areas suspected of being contaminated may be decontaminated by the use of DS2 or caustic soda solution.

—*Indoor areas.* Personnel in a shelter or building that is suspected of being contaminated with biological agents

should wear their protective masks until the building is decontaminated or until they leave the contaminated area. Decontamination team personnel provide the support required for the interior decontamination of buildings.

—*Guard against contamination.* Individuals must avoid food and water that could be contaminated. Microorganisms are difficult to detect; therefore, if a biological attack is suspected, all exposed surfaces must be assumed to be contaminated. Food and water in sealed containers may be consumed if the containers are boiled or washed thoroughly with soap and water before seals are broken.

—*Report sickness promptly.* Prompt reporting of sickness serves three purposes. First, it allows early treatment of the disease; second, it enables medical personnel to identify the biological agent to which individuals were exposed; and, third, it helps prevent the spread of disease from person to person. Once the disease has been identified, effective medical measures can be taken.

—*Treat casualties.* Personnel who become ill because of a biological attack will be treated in the same way as patients are treated for illnesses resulting from normally transmitted diseases. The patients are transported to an aid station by medical aidmen and may then be evacuated to a hospital, if necessary.

THE CHEMICAL THREAT

The Threat has the capability to produce and deliver persistent and nonpersistent lethal chemical agents. Chemical agents—nerve, blood, and blister agents—may be used against aviation units to kill or incapacitate personnel and to contaminate aircraft, vehicles, and equipment.

Chemical munitions are available for surface-to-surface missiles, multiple-rocket launchers, artillery, and aircraft munitions. Threat doctrine describes chemical agents as weapons available to the commander, and Threat Forces are well equipped to wage both offensive and defensive operations in a chemical environment.

Additionally, Threat Forces have various chemical delivery means ranging from mortars to supersonic aircraft. These systems can deliver both persistent and nonpersistent agents either by airburst or surface burst, depending on the agent used.

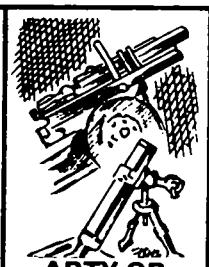
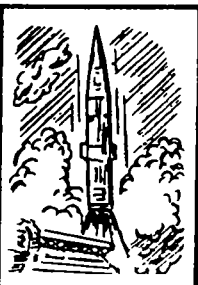
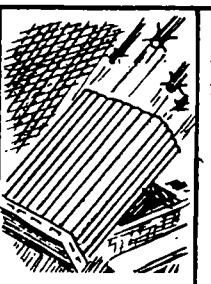
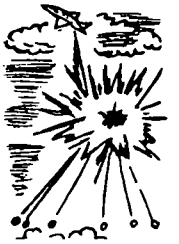
WEAPON	 ARTY OR MORTAR	 MISSILE	AIRCRAFT SPRAY	 ROCKET	 BOMB OR BOMBLET	LANDMINE
AGENT	NERVE BLOOD BLISTER	NERVE BLOOD BLISTER	NERVE BLISTER	NERVE BLOOD BLISTER	NERVE BLOOD BLISTER	NERVE BLISTER

FIGURE 6-12. PROBABLE ENEMY WEAPON SYSTEMS FOR DISSEMINATING CHEMICAL AGENTS.

Threat chemical staff personnel are assigned down to the company level, while chemical reconnaissance and decontamination units are present from the front level down to regimental level.

Types of Chemical Agents.

Nerve agents. Nerve agents directly affect the nervous system and are highly toxic in liquid and vapor form.

—*Physiological effects.* Nerve agents interfere with the normal activity between the nervous system and muscles and organs of the body.

—*Symptoms.* Runny nose, tightness of the chest, difficult breathing, excessive sweating, drooling, nausea, vomiting, dimness of vision, pinpointing of the pupils, convulsions, and eventually death.

—*Characteristics.* Nerve agents generally are odorless, colorless, and tasteless vapors or liquids. When inhaled, they are quick acting with some symptoms developing in 1 to 2 minutes after inhalation.

Blister agents. Blister agents affect the eyes, lungs, and skin. Some are initially painless while others cause immediate burning or stinging sensations.

—*Physiological effects.* Blister agents cause chemical burns and blisters on all parts of the body that they contact. A droplet of mustard-type agent the size of a pinhead may produce a blister 1 inch in diameter.

A DROPLET OF MUSTARD-TYPE AGENT THE SIZE OF A PINHEAD MAY PRODUCE A BLISTER 1 INCH IN DIAMETER

—*Symptoms.* In addition to causing blisters on the skin, blister agents, when contacting the eyes, may cause redness, inflammation, and temporary or permanent blindness. If inhaled, blister agents can cause serious damage to mouth tissues, nose, throat, and lungs.

—*Characteristics.* Some blister agents are odorless, while others have faint odors. If used in droplet form, they range from colorless to a dark brown oily liquid.

Blood agents. Blood agents usually are dispensed as vapors of aerosol and are inhaled.

—*Physiological effects.* Affects the respiratory and circulatory systems by preventing the use of oxygen in the blood by the body cells.

—*Symptoms.* Convulsions, leading to a coma. If a high enough concentration, death will occur.

—*Characteristics.* Colorless as gases and may have a faint odor.

Choking agents. Choking agents are disbursed as vapors or aerosols and are ingested into the body by breathing.

—*Physiological effects.* Affects the respiratory process and causes death by dry-land drowning.

—*Symptoms.* Coughing, choking, nausea, headache, cyanosis, gasping for breath, and a pinkish frothing from the mouth.

—*Characteristics.* Colorless in the gaseous form.

Techniques of Chemical Attack. The purpose, type, and primary effect of a Threat chemical attack often can be determined by evaluating the weapon system and delivery technique used.

Persistent agents. If a Threat chemical attack consists of liquid droplets from airburst artillery munitions or bomblets, bulk-filled missile warheads, or spray from aircraft, persistent agents are probably being used. These agents are used to contaminate equipment and terrain and cause casualties by the skin absorption route. The agents may include persistent nerve agents, blister agents, or a combination of these.

Nonpersistent agents. If a Threat attack consists of vapors and aerosols from point detonation or near-surface detonation or artillery munitions, bombs, or bomblets, nonpersistent agents are probably being used. Use of these agents is primarily intended to cause casualties by entry into the body through the respiratory system. The agents may include nonpersistent nerve agents, blister agents, blood agents, choking agents, or various combinations of these.

Table 6-4 provides a basic description of the chemical agents most likely to be encountered in combat and the defensive measures to be employed against them. For more detailed descriptions, see TM 3-220.

Countermeasures Against Chemical Warfare. Since the threat of chemical warfare must be considered during all future military operations, certain protective measures must be readily available to the commander. Mission-oriented protective posture (MOPP) is a system of progressive protective measures designed to permit the maximum comfort, mobility, and protection IAW enemy threat. Due to the inherent discomfort and heat buildup associated with wearing the protective equipment and clothing, MOPP was designed to facilitate work operations in a threatened or actual chemical environment. For a full discussion of MOPP, refer to FM 21-40.

THE THREAT OF CHEMICAL WARFARE MUST BE CONSIDERED IN ALL FUTURE MILITARY OPERATIONS

The Physical Needs of the Soldier. In using the MOPP system, the commander and staff also must consider the physical needs of the troops, such as eating, drinking, sleeping, elimination of body wastes, bathing, shaving, and changing clothes. The wear of protective clothing and equipment creates unique problems in these areas.

Feeding. The feeding of personnel in a chemical environment depends primarily on the type and extent of the contamination. Some of the available options are as follows:

—If the unit is in a contaminated area where there is also a vapor hazard, feeding must be done inside some type of collective protection if any is available. An expandable van truck, such as the M291A2 with the M14 collective protection equipment, or the M51 collective protection shelter could be used for this purpose. Since any available shelter will probably have a small capacity, the commander will have to establish a rotational system, feeding small elements of the unit and rotating in other elements until the entire unit is fed.

Table 6-4. CHARACTERISTICS AND DEFENSE AGAINST TYPES OF CHEMICAL AGENTS.

TYPE OF AGENT	NERVE		BLISTER	BLOOD	CHOKING
HOW NORMALLY DISSEMINATED	Aerosol or vapor	Liquid droplet	Liquid droplet	Vapor (gas)	Vapor (gas)
MEANS OF DETECTION	Automatic chemical agent alarm and chemical agent detector kits to detect vapors and aerosols; chemical agent detector paper to detect liquids.				
SYMPTOMS IN MAN	Difficult breathing, drooling, nausea, vomiting, convulsions, and sometimes dim vision.		Mustard, nitrogen mustard—no early symptoms; lewisite, mustard-lewisite—searing of eyes and stinging of skin; phosgene oxime—irritation of eyes and nose.	Convulsions and coma.	Coughing, choking, nausea, headache.
EFFECTS ON MAN	Incapacitates; kills if high concentration is inhaled.	Incapacitates; kills if contaminated skin is not decontaminated rapidly.	Blisters skin; is destructive to respiratory tract; can cause temporary blindness. Some agents sting and form welts on skin.	Incapacitates; kills if high concentration is inhaled.	Damages and floods lungs.
RATE OF ACTION	Very rapid by inhalation; slow through skin.	Delayed through skin; more rapid through eyes.	Blistering delayed hours to days; eye effects more rapid. Mustard lewisite and phosgene oxime very rapid.	Rapid.	Immediate to 3 hours.

Table 6-4. CONTINUED.

	TYPE OF AGENT	NERVE		BLISTER	BLOOD	CHOKING
INDIVIDUAL	HOW NORMALLY DISSEMINATED	Aerosol or vapor	Liquid droplet	Liquid droplet	Vapor (gas)	Vapor (gas)
	First Aid	Give nerve egent antidote injection. Artificial respiration may be necessary.		None.	Inhale amyl nitrite. Artificial respiration may be necessary.	For severe symptoms, avoid movement and keep warm.
	DECONTAMINATION	None needed.	Flush eyes with water. Decontaminate skin using M258 kit.	Flush eyes with water. Decontaminate skin with M258 kit or soap and water.	None.	None.
PROTECTION REQUIRED		PROTECTIVE MASK AND CLOTHING		PROTECTIVE MASK AND CLOTHING	PROTECTIVE MASK	PROTECTIVE MASK
US AGENTS EQUIVALENT	SYMBOL/NAME	GA/tabun GB/sarin GD/soman	VX Thickened G-agents.	HD/mustard HN/nitrogen mustard L/lewisite HL/mustard lewisite CX/phosgene oxime.	AC/hydrogen cyanide CK/cyanogen chloride.	CG/phosgene.
	FIELD CHARACTERISTICS	Colorless.		HD/HN—pale yellow droplets; mustard—dark droplets; HL/lewisite—dark, oily droplets; CX/phosgene—colorless droplets.	Colorless.	Colorless.

Table 6-5. MOPP LEVEL.

MOPP LEVEL	OVERGARMENT	OVERBOOTS	MASK/HOOD	GLOVES
1	*Worn	Carried	Carried	Carried
2	*Worn	Worn	Carried	Carried
3	*Worn	Worn	**Worn	Carried
4	Worn Closed	Worn	Worn Closed	Worn

*Overgarment worn open or closed based on temperature.
**Hood worn open or closed based on temperature.

—If the unit is located in a heavily contaminated area and no collective protection is available, it may be necessary to withdraw troops to a nearby safe area or rear area for feeding. This could be done on a rotational basis, but also could be done by a unit replacement system. The method used would depend on the situation, distance involved, and availability of an uncontaminated area.

—If the unit is located in an uncontaminated area but under constant threat of chemical attack, feeding can be accomplished in the open on a rotational basis, allowing about 25 percent of the unit to unmask at one time. In all of these situations, it is imperative that great care is taken to insure food has not been contaminated with chemical agents.

Drinking water. Troops equipped with the M17A1 protective masks use the drinking device while in a contaminated area. Normally, drinking from the canteen in an area contaminated with a chemical agent can be done with only minor decontamination of the canteen cap. In more hazardous areas, the commander must make arrangements for the delivery of filled canteens with the caps on in exchange for empty ones that are collected in the contaminated area. The empties must then be decontaminated thoroughly before refilling.

Sleeping. Personnel should sleep in full chemical protection and under cover when possible.

Personnel identification. The wear of chemical protective clothing and equipment makes normal identification of personnel impossible. Each unit should devise an expedient method of making identification easier.

CAUTION

If wax crayons are used for personnel identification, markings must not be placed on the charcoal treated layer of the protective overgarment.

Elimination of body wastes. A decontaminated area should be provided, if possible, for troops to use for the elimination of body wastes. Troops also should be instructed in methods of opening, closing, and removal of contaminated protective clothing to prevent contamination of underclothing or exposed skin. See TM 10-277 for these methods.

A CLOSE SHAVE IS NECESSARY TO INSURE A GOOD SEAL FOR THE PROTECTIVE MASK

Shaving, bathing, and changing clothes. Personnel must be provided with a means of shaving, bathing, and changing clothes when operating for extended periods in a contaminated environment. *A close shave is necessary to insure a good seal for the protection mask.* Bathing and changing clothes are essential for troops wearing the impregnated type of protective clothing because long-term exposure (2 to 3 days continuously) to the impregnating compound can cause severe skin rashes.

Individual Actions Before Chemical Attack. In any combat situation, the commander should designate a level of MOPP for the unit. His decision is based on an analysis of the situation in which he balances his mission requirements against the chemical protection requirements and other factors.

Extended wear of protective clothing. Based on the MOPP level designated by the commander, the individual may have to adapt to requirements for wearing his protective clothing and equipment for extended periods. The amount of time required to put these items on during a chemical attack usually will be longer than the amount of time required to receive a casualty-producing dose of chemical agent.

Alertness and proficiency. Even with MOPP, individuals must remain alert and constantly aware of the chemical threat, especially when duty requirements prevent the wearing of full protective equipment. The individual must

understand the chemical alarms and signals and be proficient in attaining the maximum level of protection when alerted to a chemical attack. Also, he must attain and maintain excellence in the other individual tasks listed in the "Soldier's Manual of Common Tasks" (SMCT).

INDIVIDUALS MUST REMAIN ALERT FOR A CHEMICAL ATTACK

Protection of individual equipment. The individual protects his equipment and supplies against liquid chemical agent contamination by keeping them organized and covered, if duty requirements permit. Individuals should wear full protective clothing and equipment when sleeping and, if possible, cover themselves and their equipment before they go to sleep.

Individual Actions During a Chemical Attack. A chemical attack may come directly in the area in which individuals are located or upwind from that area. In either case, when an individual recognizes or is alerted to a chemical attack, he should take the following immediate defensive actions:

- If not already masked, he—

  Puts on his protective mask.

  Gives the alarm.

  Continues the mission.

- In addition, if—

  The situation permits, he takes cover.

  Symptoms of nerve agent poisoning appear, he uses appropriate nerve agent first aid.

  The skin or eyes are contaminated, he decontaminates them.

  Clothing and equipment are contaminated, he decontaminates as soon as situation permits.

- Any individual recognizing or suspecting a chemical attack gives the local alarm after masking if not already masked.

FOR PROTECTION FROM LIQUID DROPLETS, USE A PONCHO OR SHELTER HALF

• If an individual recognizes an attack as a chemical spray attack, he should use some protective cover such as a poncho or shelter half (if possible) to further protect his body from liquid droplets. After the spray has stopped falling, he can throw the cover off, taking care to prevent liquid contamination of his clothing and equipment. When the situation permits, he can decontaminate as required.

• When the chemical agents are used by friendly forces against enemy forces, the headquarters directing the fire mission should provide the necessary troop safety information to friendly units that may be affected by the mission. Individuals take the same protective measures under these circumstances that they take against a similar type enemy chemical attack.

Conditions Requiring Masking. If an attack is reported to be imminent or if chemical attacks have already been used by enemy forces, individuals not already masked will mask when—

• Any artillery, mortar, rocket, or aircraft attack occurs on or near their position.

• Smoke or mist of an unknown source arrives in the area.

• A chemical attack is suspected for any other reason.

• They or their unit must enter an area known to be, or suspected of being, contaminated with a chemical agent.

• For no obvious reason, they see or feel any of the following symptoms:

A runny nose.

A feeling of choking and tightness in the chest or throat.

Dimming of vision and difficulty in focusing the eyes on close objects.

Irritation of the eyes.

Difficulty in or increased rate of breathing.

Individual Actions After a Chemical Attack.

Immediate actions. Whether an attack comes in the form of a vapor, an aerosol attack, or a liquid agent attack, the individual remains masked and continues his mission. He gives first aid to any casualties in his immediate vicinity, if required, and reports the local casualty status to his squad or section leader, platoon leader, or company headquarters as appropriate.

Subsequent actions. As time permits, he checks his clothing and equipment for possible contamination and decontaminates as required. He should first decontaminate those parts of his equipment that require handling to operate or function; e.g., butt plate, trigger housing, and hand guard of individual weapons, telephone handsets, and radio microphones. Squad and section leaders inform the next higher command level of the status of themselves and their troops IAW the unit SOP.

TROOPS DO NOT UNMASK UNTIL AUTHORIZED BY THEIR IMMEDIATE SUPERVISOR

Conditions For Unmasking. After a chemical attack, troops do not unmask until authorized by their immediate commander. In the absence of command guidance, the procedures described below are followed by the ranking person present.

Procedure when a detector kit is available. A chemical agent detector kit (M18A2 or M256) is used to test for the presence or absence of chemical agents. After determining the absence of agents, two or three individuals unmask for 5 minutes, remask, and are then examined in a *shady area* for chemical agent symptoms for 10 minutes. If none appear, the remainder of the troops may safely unmask. It should be noted that bright light will cause contraction of the pupils which could be erroneously interpreted as a nerve agent symptom.

Procedure when a detector kit is not available. As an emergency field expedient when no detector kit can be obtained, two or three individuals are selected to take a deep breath, hold it, break the seal of their masks, and keep their eyes wide open for 15 seconds. They then clear their masks, reestablish the seal, and wait for 10 minutes. If no symptoms appear after 10 minutes, the same individuals again break the seal, take two or three breaths, and clear and reseal the mask.

After another 10-minute wait, if no symptoms have developed, these same individuals unmask for 5 minutes and then remask. After 10 more minutes, if no symptoms have appeared, the remainder of the group can safely unmask. However, everyone should remain alert for the appearance of any chemical symptoms.

OUTDOOR EQUIPMENT AND SUPPLIES ARE PROTECTED WITH COVERS

Protection of Unit Equipment and Supplies. Because contaminated equipment and supplies pose a threat to personnel, covers are used to protect equipment and supplies stored outdoors. The following guidance is appropriate for combat, combat support, and combat service support units:

Equipment. Important items of equipment are covered. Plastic sheets serve as excellent covers because they are nonporous. If plastic material is not available, tarpaulins or other suitable material may be used. If nothing else is available, dense foliage will provide some protection for the items below.

- *Ammunition.* Covered or kept in its containers as long as possible.

- *Weapons.* Covered or dispersed under foliage when possible.

- *Instruments (such as those used for fire control).* Kept in their containers when not in use, because certain chemical agents can corrode them.

- *Vans.* Located to take advantage of any available natural shielding. If possible, vans are located so that the air conditioners are opposite the prevailing wind direction. Personnel responsible for the operation of the vans should make every effort to reduce leakage in the vans and components.

- *Aircraft.* Provided with covers (at least for cockpits, plastic windows, guns and gun compartments) when not in hangars.

- *Vehicles.* Parked in woods or under bushes or covered (if possible).

• *Communications equipment.* Covered when not housed in shelters. Special care is taken to protect headsets and microphones on radios and handsets on telephones from contamination.

• *Field latrines.* Provided with overhead cover.

VAPOR, AEROSOL, OR LIQUID CHEMICAL AGENTS MAY CONTAMINATE FOOD

Packaged food items. Vapor, aerosol, or liquid chemical agents may contaminate food. The type of food, type and amount of agent, and effectiveness of protective measures influence the edibility of food. Protective measures include the packaging of food, proper storage procedures, dispersal of supplies, and maximum use of both natural and man-made shelters or other forms of overhead cover. Foods not in protective packages generally are most susceptible to contamination. The current packaging methods for overseas shipment substantially reduces the possibility of contamination.

Unpackaged subsistence items. Oily and fatty unpackaged foods are particularly vulnerable to chemical contamination. These foods are protected from contamination when stored in containers such as field iceboxes and refrigerators, if the sealing gaskets are serviceable. As a rule, contaminated unpackaged food will not be eaten unless released for consumption by medical personnel.

Water. Engineer personnel are responsible for the operation of water supply systems and the purification of water from these sources. Medical personnel are responsible for recommendations on the potability of water. Water not in sealed containers may become contaminated. Water suspected of being contaminated is not consumed until tested and declared safe by a surgeon.

Chemical Protective Equipment. If chemical agents have been or are expected to be employed in the theater of operations, aircrews must adopt the policy "to fly is to be dressed in full MOPP." This is necessary because during flight it is impossible to detect chemical agents in sufficient time to don protective equipment before receiving an incapacitating or lethal dose.

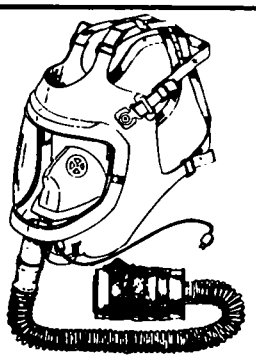


FIGURE 6-13.
ABC M-24 MASK.

ABC M-24 mask. The M-24 aviator protective mask protects aviators from inhaling vapors and aerosols of chemical, biological, and riot control agents. It does not protect the wearer from ammonia or carbon monoxide fumes. An M-2 anti-glare eye lens outsert is provided with the ABC M-24 mask since the sun visor of the protective flying helmet cannot be used with the mask. The mask can be attached to the aircraft oxygen supply system by the use of an M-8 adapter kit. Accessories include the M-7 aircraft protective mask hood and winterization kit. The hood is attached to the mask by the faceplate. For further discussion of the ABC M-24 mask, refer to TM 3-4240-280-10.

Chemical protective clothing. In a chemical environment, aviators and support personnel wear the chemical protective overgarment as their standard uniform. The nomex flight suit (or fatigues for support personnel) must be worn underneath. In addition, the M-7 protective hood is mounted on the M-24 protective mask. The hood may be worn over or under the aircrewman's helmet, depending on the mission. The protective mask with hood, protective overboots, and protective gloves complete the aviator's protective ensemble. The protective garments protect personnel from liquid agents that penetrate the skin. The garments are worn or carried consistent with MOPP. Commanders of units on a chemical battlefield and those with a high threat of attack with chemical agents should have their aircrews flying in masks and overgarments, since rapid donning of the mask and protective clothing while flying is virtually impossible.

CONTAMINATION FROM LIQUID CHEMICAL AGENTS HAS THE GREATEST IMPACT ON AVIATION OPERATIONS

Detection and Decontamination. Contamination from liquid chemical agents has the greatest impact on aviation operations. Contaminated aircraft and vehicles must either be decontaminated or aviators and ground support personnel must operate in complete protective ensembles. Heat stress and task degradation result from wearing protective equipment. Therefore, unit leaders must decide whether to decontaminate or accept performance degradation.

Liquid chemical contamination is detected by using chemical agent detector paper. Vapors that result from the evaporation of liquid chemicals are detected using chemical agent detector kits. These items of detection equipment are

described in FM 21-40. After contamination is detected, unit commanders conduct partial decontamination of *aircraft and vehicles* as described in FM 21-40 and TM 3-220. Ground vehicle operators spray decontaminants on those parts of their vehicles that are frequently touched, using the portable decontaminating apparatus assigned to each vehicle. For gross contamination, partial decontamination support is requested from NBC units. Partial equipment decontamination reduces the hazard, limits the spread of contamination, and makes complete decontamination easier at a later time. In fact, partial decontamination coupled with natural weathering or evaporation of the agent may eliminate the need for complete equipment decontamination. Complete decontamination is done at an equipment decontamination station which is operated by NBC units with assistance from the serviced unit.

Aircraft decontamination. Adapting measures that prevent the contamination of the interior of aircraft will greatly reduce the time and effort required to decontaminate the aircraft. Aircraft may become contaminated by enemy spray attacks, bombs, shells, or rockets, or while performing a spray mission. Contamination may occur during spray missions by leaking chemical tanks or by the slipstream carrying the spray against the aircraft. Due to the requirement for proper maintenance of the aircraft, personnel may come into physical contact with contaminated surfaces. If the aircraft is lightly contaminated by spray, it may be decontaminated by aeration. Flying the aircraft is a method of aerating the outer surface. A major problem in the decontamination of aircraft is the requirement to avoid the use of decontaminants that remove paint, corrode the surface of the aircraft skin, etch plastic cockpit covers, or damage flight control mechanisms. Normally, NBC units, with assistance from the aviation unit, will be used to wash and rinse aircraft since they have specialized equipment. However, when NBC units are not available, aviation units may have to use field expedients to partially decontaminate aircraft in order to continue combat operations. Upon determination that the aircraft is contaminated, the type of agent should be identified. If the interior of the aircraft has been contaminated, blow compressed air on equipment that water will damage. Wash remaining surfaces with warm soapy water, and repeat washing several times. Rags used during this phase are contaminated. Properly dispose of all rags used. Fabric seats,

FLYING THE AIRCRAFT IS A METHOD OF AERATING THE OUTER SURFACE

floor coverings, curtains,safety belts, etc., should be replaced. If the exterior of the aircraft is contaminated with thickened agents, the following procedures should be followed:

• Move the aircraft to a nonoperational area and apply supertropical bleach (STB) slurry or dry mix (two parts STB to three parts earth, sand, or ashes) to the ground beneath the aircraft.

WARNING

Full-strength STB reacts violently with liquid mustard, producing a fire. Fires can be prevented by diluting STB with water to form a slurry. Particular care must be taken to keep STB and DS2 off the aircraft.

• Prepare a hot solution (refer to the appropriate aircraft maintenance manual [-23] for maximum allowable cleaning solution temperature) of 300 gallons of water in the M12A1 power-driven decontaminating apparatus (PDAA), or other suitable container, 20 kilograms (kg) (44 pounds) of GI soap and 10 kilograms (22 pounds) of washing soda; add water to make 400 gallons.

• Spray this solution to the outside surface of the aircraft, using a fan-shaped spray under reduced pressure. Scrub the contaminated surfaces with medium-stiff, long-handled brushes, taking special care to wash thoroughly those areas and parts that require intensive hands-on type of maintenance.

AFTER WASHING THE AIRCRAFT THOROUGHLY, RINSE ALL OUTSIDE SURFACES WITH HOT WATER

• After the aircraft has been washed thoroughly, rinse all exterior surfaces with hot water (refer to the appropriate aircraft maintenance manual for maximum allowable cleaning solution temperature). Hold the nozzle at least 1 meter (3 feet) from the surface in such a manner that the spray strikes away from the operator at about a 45-degree angle. Use reduced pressure and a fan-shaped spray on transparent surfaces; e.g., windows and canopies.

• Decontaminate tires with STB slurry. Replace heavily contaminated tires with clean tires.

• After decontamination, move the aircraft, if not required for immediate use, to an uncontaminated area for aeration. If the aircraft is required for immediate use, it should be flown to assist in removing any external contamination overlooked during the wash and rinse cycles.

Except for the use of STB on aircraft tires, neither STB nor DS2 is to be used as a decontaminant on aircraft. Aircraft, while parked on airfields or in revetments, should be covered with some type of protective material to prevent contamination by spray attack. Tarpaulins offer best results as they can be decontaminated by washing with STB slurry and rinsing with clear water.

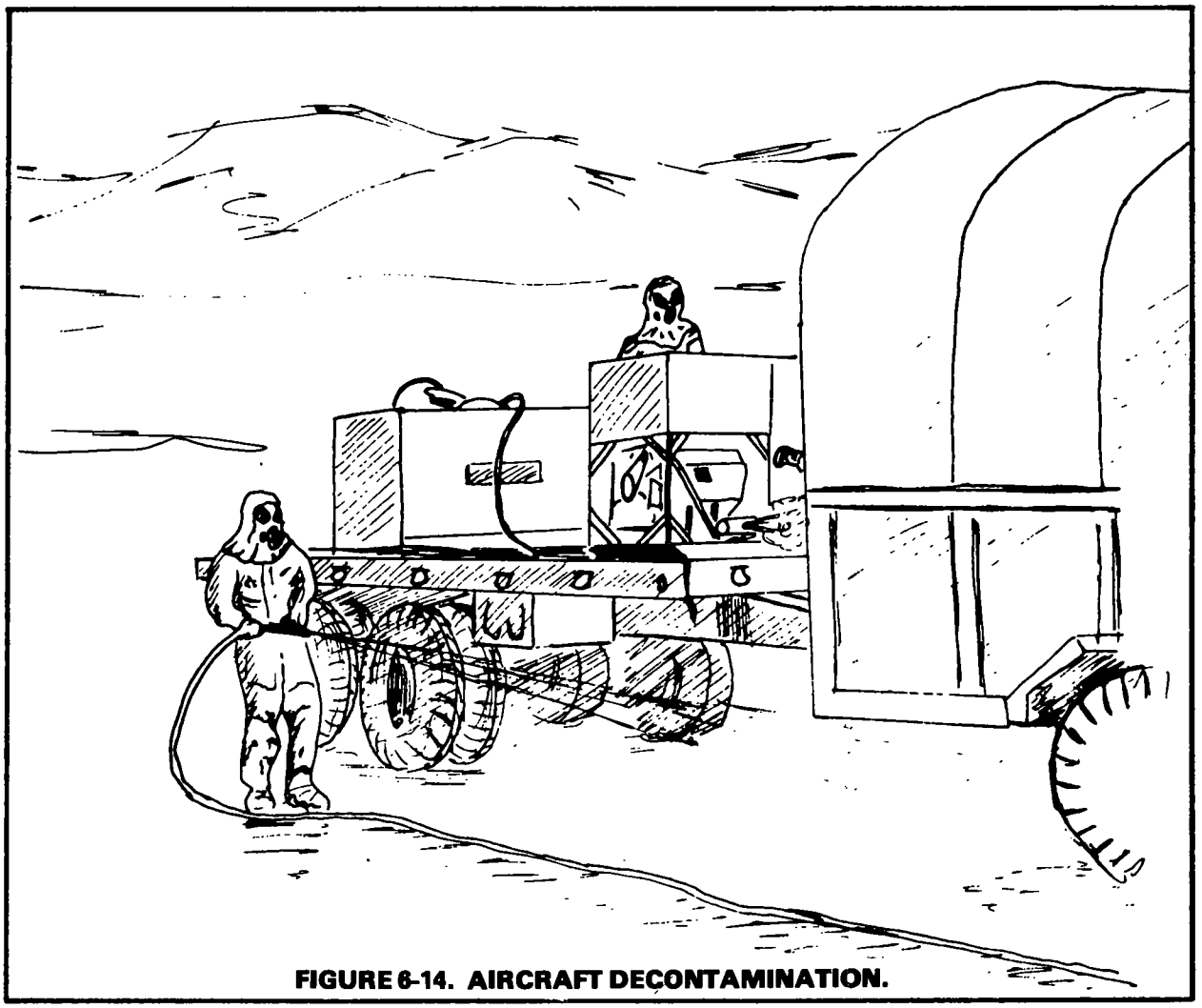


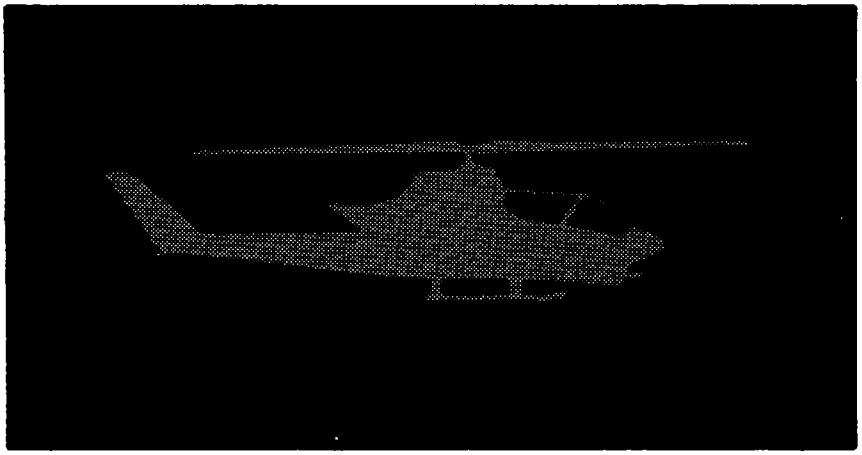
FIGURE 6-14. AIRCRAFT DECONTAMINATION.

Personnel decontamination. Aircrew members and ground support personnel contaminated by liquid chemical agents perform emergency and partial decontamination procedures as described in TM 3-220. If vapor hazards continue to be released from individual clothing, complete personnel decontamination is scheduled when time and mission permit. Complete personnel decontamination is conducted at a personnel decontamination station operated by NBC units as described in FM 3-87, and FM 3-5. Full protective ensemble must continue to be worn as long as vapor hazards are present or until complete personnel decontamination is accomplished.

Aviation personnel, both flight and ground support, must be constantly aware of the impact that the use of NBC weapons can have on their operations. Threat Forces can be expected to employ NBC weapons when it is to their advantage to do so. The adverse impact of Threat NBC use can be minimized by proper use of NBC defensive equipment and operational procedures and by meaningful training in a simulated NBC environment.

CHAPTER 7

REDUCED VISIBILITY OPERATIONS



GENERAL

Threat doctrine, training, and equipment capabilities demand that US Forces be capable of conducting sustained combat operations on a 24-hour basis regardless of weather conditions. Technological advances in night vision and reduced visibility aids will soon make sight ranges equivalent to weapon ranges and increase maneuver speeds to the equivalent of daylight operational capabilities.

A decisive tactical advantage can be gained by one force over another if it is better equipped and trained to operate during periods of reduced visibility. As members of a numerically inferior force, we must maintain every advantage in order to win the battle.

Combat operations during periods of reduced visibility include—

- Night operations.
- Reduced visibility due to meteorological conditions (rain, snow, fog, haze, clouds).
- Reduced visibility due to combat operations (smoke, dust).

The task force and aviation unit commander must carefully weigh the employment decisions of aviation assets according to—

- Equipment capabilities.
- Training proficiency.
- Weather.
- Mission urgency.

THREAT EMPLOYMENT TACTICS AND TECHNIQUES

Threat Forces are skilled at night fighting and conducting combat operations during periods of reduced visibility. They take advantage of periods of reduced visibility to press the attack trying to achieve surprise; bypass defensive positions; and destroy and disrupt command, control, and support systems.

Threat Forces habitually conduct around-the-clock operations to maintain the uninterrupted momentum of the offensive. Immediate objectives for a Soviet regiment in a daylight attack may be from 8 to 15 kilometers deep. Night attacks normally will be less.

The Attack. Preparations for night attacks are made in detail by Threat Forces. Plans are based on careful reconnaissance, simplicity of maneuver, speed of execution, and surprise. Two phase lines are selected. The first is located within the enemy forward defense area. It is used to regroup assault teams and establish coordination with supporting artillery for the attack toward the next objective. The second

phase line is selected so that its capture will force the enemy to displace its division artillery.

Timing for the attack is planned to achieve surprise when enemy forces might least expect it or when they may be relaxed after a hard day of fighting. An attack also may be planned a few hours before dawn to permit exploitation of success during daylight hours.

Motorized rifle battalions normally attack in a single echelon, supported by tanks, and preceded by a small advance guard. Companies are deployed in a line of platoons. If the assault zone is narrow (500 to 600 meters), a battalion may attack in two echelons. The second echelon may then consist of a reinforced company used to protect the battalion flanks. To achieve surprise, artillery preparations may not be used. Illumination is used to identify deep objectives and mark important targets for artillery and tactical air support. Care is taken not to illuminate organic forces or interfere with night vision equipment.

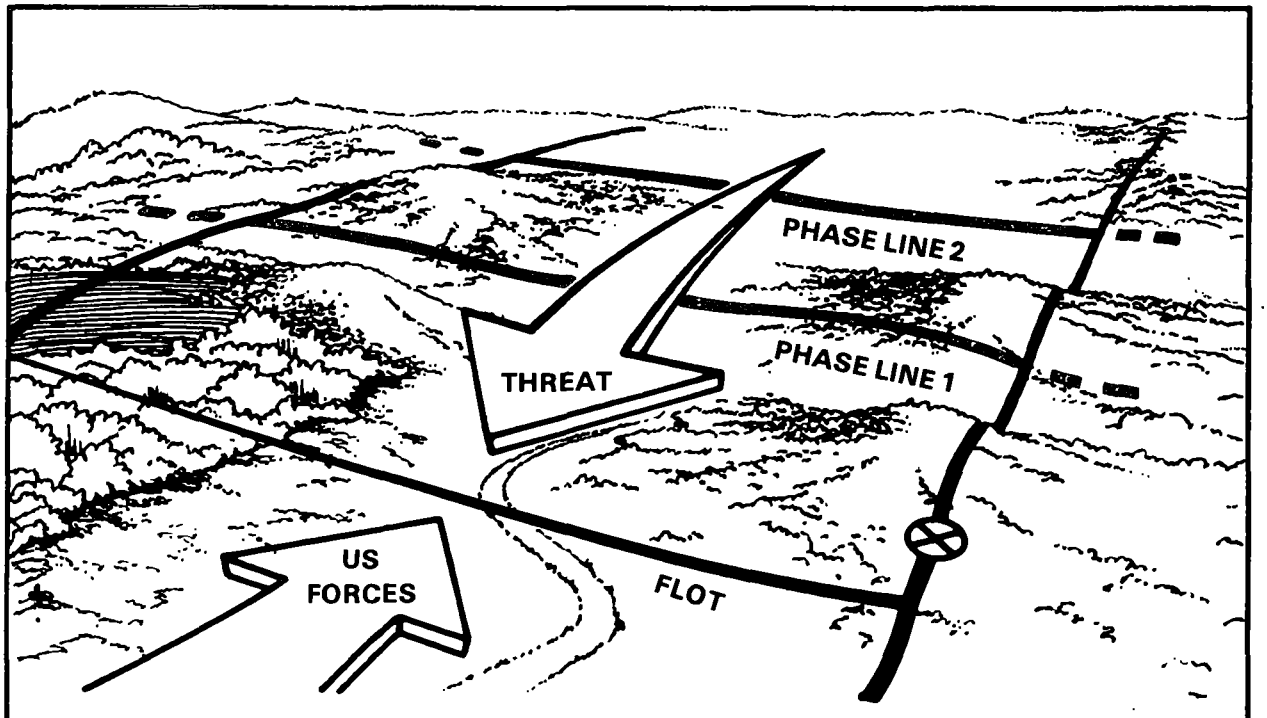


FIGURE 7-1. THE ATTACK.

The Defense. The Threat night defense is organized much the same as the daylight defense—in echelons with a security zone and main defensive belt. To guard against enemy night counterattacks, reconnaissance is intensified along the flanks and to the front. Illumination of terrain along all probable approach axes is used.

THREAT NIGHT VISION CAPABILITIES

Most Threat night vision devices are infrared and include—

- Weapon sights.
- Surveillance devices.
- Driving aids on all vehicles.
- Sniper scopes.
- Intrusion alarm devices.
- Metascopes.

Night observation equipment, organic to both tank and motorized rifle units, makes full integration of all combat weapons and vehicles possible. Threat night vision capabilities are shown in table 7-1.

COUNTERMEASURES DURING PERIODS OF REDUCED VISIBILITY

Generally speaking, US Army night vision/reduced visibility aids are superior to those used by Threat Forces. This advantage should be capitalized upon to increase Army aviation combat effectiveness. In the final analysis, the crux of the present opportunity boils down to training proficiency. It must be remembered, however, that training using night vision equipment and employing tactical instrument flight should be conducted by qualified unit personnel and under strict control measures. Tactics used during periods of reduced visibility are the same as for daylight conditions. However, effective use of available equipment requires a high level of training proficiency.

TABLE 7-1. THREAT NIGHT VISION AIDS.

EQUIPMENT	INDIVIDUAL/ CREW MEMBER	**RANGE (METERS)	SOURCE
*Tanks T54, T55, T62, T64, T72	Commander Gunner Driver	400-500 800-1,000 100	ACTIVE INFRARED
Mechanized vehicles BMP, BRDM, BTR, AACV	Commander Gunner Driver	400 900 100	
Air Defense ***ZSU-23-4 (23mm)	Commander Driver	400 100	
Artillery, self-propelled (SP)	Commander Gunner Driver	400 1,000 100	
Towed	Gunner	1,000	
Observation posts	Observer	1,300	
Small arms	Sniper Machine gunner	300-400 300-400	

*Tank gunners using the infrared searchlight can see out to 1,000 meters directly in line with the main gun, but not to the sides.

The tank commander has a separate infrared searchlight which allows independent scan out to 500 meters.

**Range dependent on ambient light level. Ranges given are maximum under ideal conditions.

***Radar engagement ranges are not affected by light level or meteorological conditions. ZSU-23-4 is still 3,000 meters and S-60 is still 6,000 meters. Radar-guided missile ranges are still the same.

Active Countermeasures.

Suppression by fire. Suppress Threat radar-guided, antiaircraft artillery (AAA)/missile systems first in an attempt to destroy them or render their radar ineffective. Then concentrate on weaker weapon systems that are at an optical disadvantage. Suppression by fire can cause tank and mechanized infantry and artillery vehicles to button up, thus restricting the use of night vision equipment by the driver and gunner. This will degrade their field of view, leaving them vulnerable to flanking engagements by attack helicopters.

SUPPRESSION BY SMOKE DEGRADES INFRARED OPTICAL DEVICES

Suppression by smoke. Suppression by smoke degrades infrared optical devices and impairs normal vision. However, for night combat, the use of smoke must be judiciously weighed because it also can create vision problems for our own forces. For example, smoke suppression should not be used when helicopters are employed at stand-off ranges because they are already out of the Threat visual range.

Illumination. Illumination can provide a better optical view of enemy forces, render enemy infrared night vision devices ineffective, and temporarily blind their night vision capability. Illumination employment systems available to the aviator include mortars, artillery, tank-mounted searchlights, and the attack helicopter M257 illumination warhead adapted to the 2.75-inch folding-fin aerial rocket (FFAR). (The helicopter-delivered Mk-45 drop flare is not discussed as the Threat probably will make its use unfeasible.)

— The proper use of illumination (helicopter, artillery, and mortar) requires experienced and well-trained observers to preclude the illumination, skylining, or blinding of friendly forces.

— Attack helicopters employed with tanks may be able to coordinate defensive fires when tank-mounted searchlights are being used.

— Procedures for requesting and adjusting artillery and mortar illumination are similar to adjusting other types of

artillery fires, except, that in the request-for-fire, the number of guns and shells must be specified.

—In the adjustment, the height of burst must be adjusted up or down so the flare burns out as it hits the ground. The point of burst must be moved forward or back (drop or add), left or right, in accordance with (IAW) wind conditions so the target receives maximum illumination time. For illumination/targeting purposes, the flare should be adjusted behind the target to get a skyline effect of Threat Forces. For sight degradation or blinding purposes, the flare should be located to the front of the target.

FOR BEST RESULTS, LOCATE FLARES IN FRONT OF THE TARGET

—The M257 illumination warhead, for use by attack helicopters, has been developed as an interim capability for the 2.75-inch FFAR system. The M257 has a stand-off range of approximately 3,000 meters.

In addition, development and testing are currently underway for a combined rocket management system with remote fuze setting capability to employ with the illumination warhead. This will enable stand-off employment ranges from 1,500 to 6,000 meters with a new rocket motor concurrently being developed.

TC 1-16 and FM 17-40 contain complete tactical and technical data for use of the M257 illumination warhead.

Radar and infrared jammers. The effective use of these systems is most important during periods of reduced visibility. Radar jammers, such as chaff would be used in conjunction with evasive maneuvers, upon radar warning receiver (RWR) indication to counter radar-directed Threat air defense (AD) systems. Infrared jammers should be turned on when atmospheric conditions are conducive to infrared acquisition.

Passive Countermeasures.

Terrain flight techniques. These will be used to even greater advantage during periods of reduced visibility than during daylight. However, due to visibility limitations,

airspeed will have to be reduced accordingly. As a result of reduced airspeed, power limitations and loads will have to be checked closely to insure flight safety. Formations (type and internal distances) will have to be adjusted to insure flight safety. Command and control procedures also will be more difficult unless careful preplanning is conducted.

Stand-off distances. The stand-off distance with the unaided eye during periods of reduced visibility will decrease. For this reason, commanders should carefully evaluate the use of attack helicopters for reduced visibility missions. However, with night vision goggles (NVG), a significant advantage can be gained in attack helicopter night operations due to increased visibility range. The mast-mounted sight discussed in chapter 2 also will contribute to operational capabilities during periods of reduced visibility.

Vulnerability reduction equipment. Vulnerability reduction equipment, as discussed in previous chapters, will aid survivability during operations in any environment.

Aircraft survivability equipment (ASE). ASE will be used in the same manner during periods of reduced visibility as during daylight. However, timing for use of chaff and flare dispensing with the M-130 dispensing system will rely much more on indications from the RWR or missile launch or approach indicator. Reduced visibility will limit visual acquisition of a missile or gun system in flight or being fired at you. Chaff should be dispensed on indication of being tracked. This will disguise your aircraft on the radar screen or cause the gun/missile system to lock-on the chaff cloud long enough to maneuver to mask or destroy the system with on-board tube-launched, optically tracked, wire-guided (TOW) or helicopter-launched, fire-and-forget (HELLFIRE) missile systems. Remember, exposure time for attack helicopters from unmask to remask will not exceed 10 seconds against radar-guided weapon systems.

REDUCED VISIBILITY EQUIPMENT AIDS

The AN/PVS-5 NVG System. The AN/PVS-5 NVG system does not fully meet Army aviation user requirements;

but it is an interim system which has been adopted to improve Army aviation night operations in a high threat environment. Night vision capabilities (detection distances) under low to medium ambient light levels are shown in figure 7-2.

Personnel ----------400 meters

Vehicles/large stationary targets ---2,000 meters

Moving vehicles----------3,000 meters

Prominent terrain features ----------3,000 meters

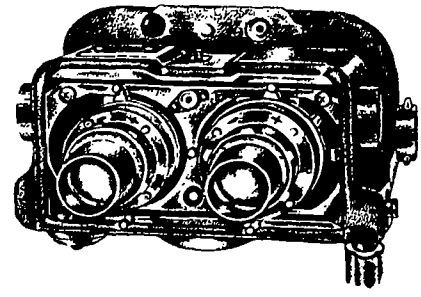


FIGURE 7-2. NIGHT VISION CAPABILITIES (LOW TO MEDIUM AMBIENT LIGHT LEVELS).

Under quarter moon to full moon conditions, on a clear night, visibility is greatly increased. Night stand-off capabilities against Threat Forces give Army aviation reconnaissance and attack helicopters a significant advantage. Blind side (rear/flanking) reconnaissance/attack angles further increase the advantage against Threat Forces.

When using the goggles, internal lighting should be adjusted to the lowest intensity that will allow ease of reading cockpit instruments for night hawk (NH) flight. Of course, external lighting will be off to prevent detection. Because the goggles amplify and regulate ambient light at a constant level, a sudden flash or illumination does not affect the aviator's ability to see. Illumination flares, however, should not be viewed directly as the surrounding visibility will darken. In order to prevent this, view the area under illumination or to the side without looking directly at the illumination source.

For night firing techniques, refer to FM 17-40. For training purposes, only AN/PVS-5 qualified instructor pilots should be used due to limiting factors that require a high level of training proficiency for safe use.

LIMITING FACTORS IN THE USE OF AN/PVS-5 GOGGLES

- The field of view with the goggles on is limited to 40 degrees. Therefore, a wide field scan technique must be developed to compensate for peripheral vision loss. Sideward hover and night formation flight can be extremely dangerous to an improperly trained crew.
- Fog, haze, smoke, clouds, and small wires are not detectable with the goggles. Therefore, night flight under adverse weather conditions could be fatal to the untrained crew should it inadvertently go IMC (instrument meteorological conditions) with no lights on in the cockpit. Good premission terrain reconnaissance or map planning is necessary to prevent wire strikes.
- The goggles can be adjusted to compensate for individual sight differences, but astigmatism cannot be corrected. Additionally, the goggles must be constantly adjusted when looking inside and outside the cockpit.
- Because the goggles adjust to the immediate light intensity, cockpit lights must be adjusted to a low intensity. Warning, caution panel, and proximity lights may tend to have a blinding effect, if illuminated, as the goggles adjust to light intensity.
- Standard maps are difficult to interpret using the NVGs. Specialized maps are being tested.
- Pilot fatigue factors are increased with goggle use. The goggles may become uncomfortable after 2 hours of use.
- Eyepieces of the goggles will fog over during use in cold climate conditions. De-mist shields, warming the goggles, or wiping the lenses can eliminate this problem.
- Battery life expectancy cannot be determined accurately. Batteries should be changed before each new mission. For all missions, a spare battery should be carried.
- The infrared illuminator trouble light is used for emergency extreme darkness conditions and for viewing within 2 meters. This light source can be detected by Threat night vision viewing devices.
- Each set of NVGs may vary as to light amplification capability due to the manufacturer's quality control tolerances.
- Marginal performance can be expected at light levels below quarter moon illumination.

Aviator's Night Vision Imaging System (ANVIS). The AN/PVS-5 NVGs, currently being used by Army aviators, will eventually be replaced with an ANVIS. The ANVIS incorporates design features to overcome or reduce the effects of most shortcomings of the AN/PVS-5 NVGs. The ANVIS is a lightweight, high-performance image intensification system which optimizes helicopter night flying at terrain flight altitudes. It enables aviation operations during periods of very low ambient light to include overcast starlight conditions. The ANVIS is mounted on a new visor shield that fits in the standard flight helmet. (For the Cobra, it is offset to permit concurrent mounting with the helmet mounted sighting system.) The mounting also incorporates a flip-up/flip-down feature. The ANVIS weighs approximately 14 ounces and provides a 40-degree field of view and 20/30 visual acuity. It is designed to operate on aircraft electrical power and/or batteries. Field evaluation results indicate that aviators can fly considerably lower, faster, and safer with ANVIS than with the AN/PVS-5 NVGs.

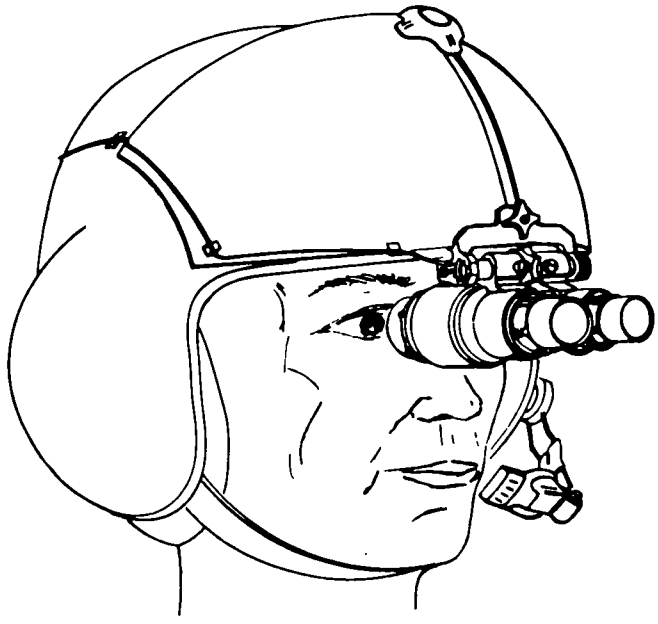


FIGURE 7-3. AVIATOR'S ANVIS.

Improved Lighting System for Army Aircraft (ILSAA). Research, development, and testing are currently underway to provide an improved lighting system modification package for existing and future Army aircraft. The modifications to improve both the current and future fleet of Army aircraft include, but are not limited to—

- Painting crew stations with nonreflective, flat black paint.

- Modifying instrument's light controls to permit dimming to light levels compatible with night vision devices (NVGs and ANVIS).

- Reducing glare and reflections in the cockpit.

- Reducing the overall electro-optical signature of the aircraft.

• Increasing night operational capability by achieving compatibility with night vision devices of the time frame and providing uniform and balanced lighting for unaided-eye night operations.

Modification of current Army aircraft inventories will be controlled at the appropriate maintenance echelon. Field modification fixes are unauthorized until the ILSAA has been tested and proven safe and effective. Modification work orders (MWO) or directives will be issued by the appropriate agency to allow aircraft modifications to achieve night vision device compatibility.

TACTICAL INSTRUMENT FLIGHT

The feasibility of tactical instrument flight to accomplish the mission in the high threat environment will depend on Threat AD and electronic warfare (EW) capabilities, ceilings and visibility, available air traffic control (ATC) aids, and on-board ASE/EW counter-countermeasure support. Planning considerations are provided in chapter 8. FM 1-103 provides current doctrine, procedures, and techniques to be used by Army aircraft and FM 1-5 provides techniques, methods and planning considerations for tactical instrument flight.

REDUCED VISIBILITY OPERATIONS OTHER THAN NIGHT TACTICAL INSTRUMENT FLIGHT

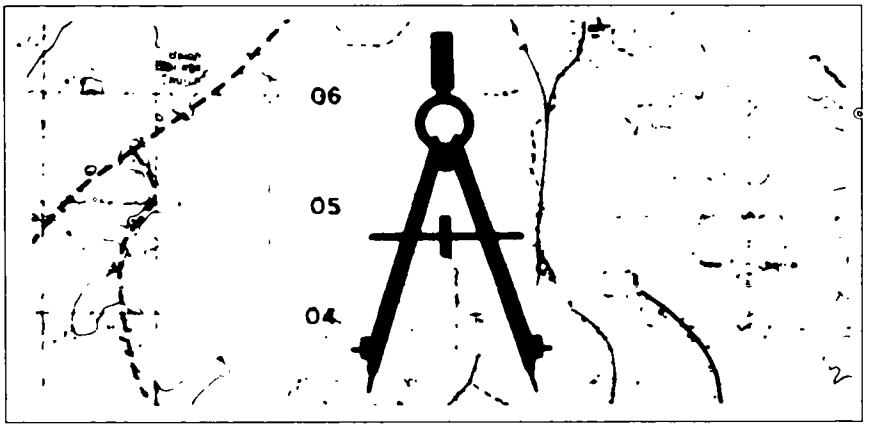
The tactical advantage of surprise also can be gained during daylight reduced visibility operations. As with night or tactical instrument missions, planning will be much more detailed. Planning considerations are provided in chapter 8. Flight techniques, with regard to airspeed, altitude, and loads, will be what visibility allows for flight safety. Threat visual detection will be degraded and will allow increased effectiveness of such missions as air assaults, raids, and deployment of troops and equipment on the battlefield to gain a tactical advantage. The high performance air threat also will be degraded, thus increasing Army aircraft survivability.

SUMMARY

Commanders must continue to stress Army aviation operations during periods of reduced visibility. Tactics will remain the same to survive the Threat, but techniques must be adjusted to fit the situation. We know that the combat operational doctrine of Threat Forces stresses decisive offensive tactics in defeating an enemy force. We must be prepared to meet the Threat on a 24-hour basis. With the advantage of superior reduced visibility aids, we can defeat a numerically superior force, provided training proficiency complements reduced visibility operations.

CHAPTER 8

PREMISSION PLANNING IN THE HIGH THREAT ENVIRONMENT



GENERAL

Army aviation unit survival in the high threat environment will depend on sound application of the principles of employment and good judgment and common sense in implementing mission plans.

The successful application of the principles of employment on the battlefield will depend to a large extent on how well we have preplanned the mission. Each part of the combined arms team, in conjunction with the scheme of maneuver, must work in continuous harmony if we are to defeat a numerically superior force.

- Fight integrated on the combined arms team.
- Exploit capabilities of other Services.
- Capitalize on intelligence-gathering capabilities.
- Suppress enemy weapons and acquisition means.
- Exploit firepower.
- Exploit mobility.
- Integrate fire and maneuver.
- Employ surprise.
- Mass forces.
- Use terrain for survivability.
- Displace forward elements frequently.
- Maintain flexibility.
- Exercise staying power.

FIGURE 8-1. PRINCIPLES OF EMPLOYMENT.

In order to properly preplan the mission, first consider the factors that will affect it. Each mission will be peculiar in that the unexpected element is a factor. But, much of the unexpected can be eliminated through training, coordination, preplanning, and the use of standing operating procedures (SOP). Figure 8-2 provides a list of those factors that most commonly affect our ability to accomplish the mission.

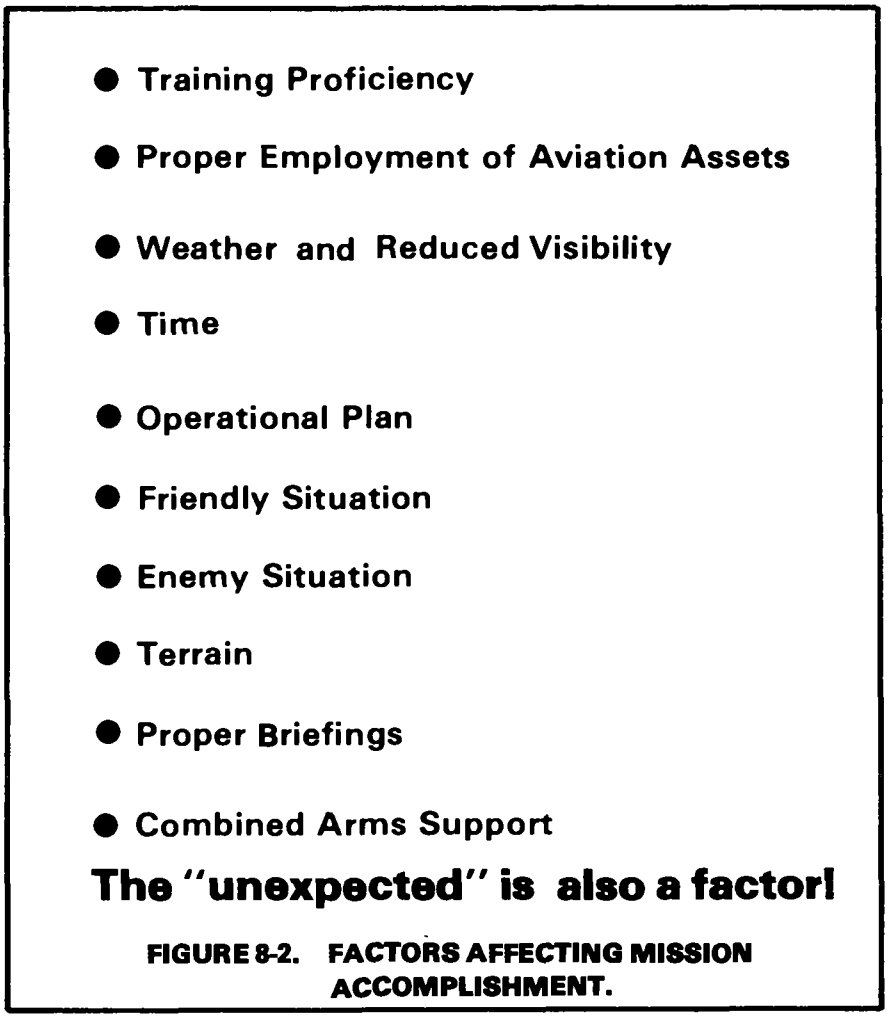


FIGURE 8-2. FACTORS AFFECTING MISSION ACCOMPLISHMENT.

TRAINING PROFICIENCY

Training proficiency will determine how well you are able to apply the principles of employment, use on-board aircraft survivability equipment (ASE), and work as a member of the combined arms team. Your knowledge of the Threat (employment techniques, capabilities, limitations) plus your ability to react and use the right mix of equipment at the right moment, will determine the success of your tactics. Finally, your knowledge of coordinating agencies and procedures may get you out of a jam when you need fire support or inadvertently enter instrument meteorological conditions (IMC).

PROPER EMPLOYMENT OF AVIATION ASSETS

In order to properly employ aviation assets, the commander must be aware—or you as the staff member, aviation unit commander, or air mission commander must make him aware—of Army aviation capabilities and limitations.

- Mission Effectiveness
- Command Relationships and Tactical Support Mission
- Number and Type of Aircraft Available
- Weather Capabilities and Limitations
- Aircraft Vulnerabilities
- Air Traffic Control (ATC) Requirements
- Logistical Requirements
- Allowable Cargo Loads
- Fuel and Ordnance Mix

FIGURE 8-3. FACTORS AFFECTING EMPLOYMENT OF AVIATION ASSETS.

Mission Effectiveness. Mission effectiveness refers to employment of aviation assets in conjunction with type mission. For instance, the use of assault or attack helicopters in the attack of fortified or built-up areas is not mission-effective for those assets. On the other hand, the mission effectiveness of the cavalry troop of the divisional cavalry squadron is optimized in the reconnaissance, intelligence-gathering, and security roles. Therefore, the mission will determine the type and configuration of aviation assets that are most effective or if aviation assets should be used at all. In general, though, Army aviation units offer a high degree of mobility and flexibility to the commander because they can perform all five functions of land combat.

THE FIVE FUNCTIONS OF LAND COMBAT	
• FIREPOWER	• COMMAND AND CONTROL
• MOBILITY	• COMBAT SERVICE SUPPORT
• INTELLIGENCE	

Command Relationships and Tactical Mission. The command relationships and the tactical mission should be determined by the type, size, and friendly situation of the supported unit. Air cavalry and attack helicopter units may be attached, but most often will be placed under the operational control (OPCON) of brigade-level units due to the logistical burden created by aviation maneuver units. In either relationship, these units are fully integrated into the overall tactical scheme of maneuver.

The normal relationship of assault helicopters and other aviation support units will be OPCON to the supported unit for assignment of tactical missions. This relationship provides for better control, greater flexibility, and optimum effectiveness.

Number and Type of Aircraft Available. The number and type of aircraft available may affect our ability to accomplish the mission or at least how we will go about accomplishing the mission. If an aviation unit is assigned many tasks in support of another unit, priorities may have to be established or additional aviation support may have to be requested by the commander.

Weather Capabilities and Limitations. The commander must be aware of the effects of wind, temperature, humidity, icing, precipitation, ceilings, and visibility on Army aviation operations. However, Army aviation is striving to increase staying power and to develop around-the-clock operational capability even though under adverse conditions.

The system of ATC and navigational aids (NAVAID) can extend tactical instrument flight capabilities from the corps or division rear area (flight operations center (FOC), flight coordination centers (FCC)) to the front-line elements (ATC platoons, tactical (tac) teams). However, the Threat and aviation element mission size will determine the practicability of tactical instrument flight.

In the high threat environment, the air defense artillery and electronic warfare (ADA/EW) threat may negate tactical instrument flight, especially near front-line units. For multiple-aircraft missions, time and separation requirements may degrade mission effectiveness. Moreover, the use of attack helicopters in the armor-killing role may not be mission-effective if the visibility is so low that their standoff capability cannot be used.

However, the positive approach toward mission accomplishment should be emphasized. The total battlefield weather picture should be considered. A combination of tactical instrument flight and altitude adjustment to terrain flight modes under visual meteorological conditions (VMC) nearer front-line elements may be able to get the job done.

ARMY AVIATION IS CONSTANTLY STRIVING TO INCREASE STAYING POWER

Aircraft vulnerabilities. Aircraft vulnerabilities must be considered by the commander to maximize Army aviation effectiveness. The type and amount of ASE on board the aircraft may determine mission effectiveness. The size and shape of pickup zones (PZ) and landing zones (LZ) and their degree of security must be considered in relation to the size and number of aircraft. Terrain must be considered in relation to vegetation, altitude, and temperature. Aircraft should be employed at standoff distances or in conjunction with suppression against enemy ground units as aircraft are soft targets.

ATC Requirements. The commander must consider ATC requirements in conjunction with the type mission. Flight corridors, coordinating altitudes, standard-use Army aircraft routes, minimum risk routes, airfield terminal control procedures, identification, friend or foe (radar) (IFF) codes, and available NAVAIDs are just a few of the items that should be coordinated with higher headquarters and disseminated to aviation elements.

In certain instances, pathfinders and tac teams may aid in the orderly conduct of the mission. FCCs can aid in mission control through radar vectors or flight-following. They can also act as information and coordinating agencies in passing advisories or reports to higher headquarters or in disseminating advisories on hostile air traffic in the area. Air rescue assistance coordination also may be effected through the FCC.

Logistical Requirements. Logistical requirements for Army aviation unit operations must be thoroughly coordinated by the commander to aid in rapid turn-around times, on-the-spot maintenance, and aircraft recovery.

Allowable Cargo Loads. The type aircraft, area of operations, and climate will affect allowable cargo loads. The commander must be made aware of aircraft capabilities and limitations in this regard in order to assure a smooth, coordinated mission or operation.

Fuel and Ordnance Mix. The same factors affecting allowable cargo loads also can affect the fuel and ordnance mix capability of attack helicopters. The commander must be mindful of the fuel/time/ordnance trade-off necessitated by these factors.

WEATHER AND REDUCED VISIBILITY

Weather and reduced visibility can be a help or a hindrance to Army aviation operations. The optimum advantage to the conduct of any combat operation during periods of weather and reduced visibility is gaining the element of surprise. In addition, weather and reduced visibility may be a hindrance to Threat high performance aircraft operations, visual acquisition weapon systems, and infrared homing missiles. However, it must be noted that *weather and reduced visibility is not a hindrance to radar-guided weaponry.*

There are four reduced visibility conditions under which missions may be flown. They are weather (actual tactical instrument flight), night/reduced visibility (due to smoke, haze, fog, rain, or snow), night tactical operations, or a combination (night weather). The two that we will discuss are weather and night/reduced visibility.

Weather. If the threat (enemy situation) has been considered, the flight route has been planned accordingly, and basic flight safety requirements (weight/balance, fuel, wind, power, and icing) can be met, peculiar planning requirements for a tactical instrument flight can be isolated. The following is a good method to use in planning the flight.

If weather service is available, check the current and forecasted weather conditions for takeoff, en route, and destination. If weather service is not available and the tactical situation permits, use radio reports from various unit locations along the planned route. Ceiling and visibility requirements will be subjective according to the urgency of the mission, the threat, availability and capability of NAVAIDs, type and number of aircraft, and pilot proficiency. In most cases, for helicopters operating near the front line of own troops (FLOT), tactical instrument flight should not be necessary. If ceiling and visibility conditions are so bad as to preclude nap-of-the-earth (NOE) flight, tactical instrument flight would not be a viable consideration. However, for our purposes, assume ceiling and visibility concurrently at our location is zero/zero but 200 1/4 is forecasted at our destination and at our location for the return flight.

Check available ATC facilities, frequencies, and terminal control procedures. ATC platoons operating forward airfields have the capability of nondirectional beacon (NDB) and ground-controlled approach (GCA) facilities. The FCC may be helpful in providing en route flight-following and advisories depending on altitude and distance factors. The reliability of a tactical NDB signal for navigational purposes also will depend on altitude and distance. For planning purposes, the information about NDBs in table 8-1 should be considered.

Table 8-1. AN/TRN-30(V)1 TACTICAL NDB.

POWER MODE	RANGE (KILOMETERS)	ALTITUDE (feet) ABOVE HIGHEST OBSTACLE (AHO))
Pathfinder (low)	15 to 25	200 to 500
	25 to 40	Above 500
Tactical (medium)	85	Above 500
Semifixed (high)	180	Above 500

For divisional airfields, the power mode will probably be no more than tactical, and usually pathfinder, to prevent enemy detection and jamming. Forward airfields may only activate NDBs on request.

The division aviation battalion has tac teams assigned for the purpose of extending the control and coordination of Army air traffic in forward battle areas. They provide advisory services and air traffic assistance at brigade and battalion command posts (CP), heliports, resupply points, or temporary landing areas. When requested, through operations or maneuver unit S3 operations, tac teams may be located in forward areas to provide navigational assistance (advisories/ NDB) for your mission. Check out your operations or supported unit S3 for tac team locations and frequencies, or request that they be positioned to support your mission.

NEARBY HAWK ADA UNITS MAY BE ABLE TO PROVIDE RADAR VECTORS

The tactical team also carries the manpack version of the AN/TRN-30(V)1 NDB. It should be positioned to mask radiating signals toward the threat and maximize usable signals toward your flight path. In forward areas, the normal power output for the NDB will be in the pathfinder mode; and normally you will be below 500 feet above ground level (AGL). To prevent enemy detection, the NDB may be available only on request. Check the frequencies of nearby Hawk ADA units. When all other navigational means have failed, they may be able to provide radar vectors.

Prepare your tactical map with time, distance, and heading information as a backup to NAVAIDs or use it as your primary navigational source with NAVAIDs (as requested) for backup. This also will reduce the possiblity of enemy jamming and meaconing. As a last resort, if NAVAIDs fail, plan FM homing techniques as another backup measure.

Study your tactical map with time, distance, and heading information in relation to terrain relief or elevations and man-made obstacles. From this, determine your en route altitudes. If possible, plan to decrease your altitude as you proceed closer to front lines. Terrain relief permitting, you may plan to descend at some point en route; break out VMC; and, then, proceed NOE from that point. However, this procedure may require extreme familiarity with the area to obtain your bearings once VMC.

Plan your takeoff and approach according to terrain relief and elevation and wind factors. The airfield ATC and tac team also will be able to advise on the approach path.

File your instrument flight rules (IFR) flight plan with the FCC or FOC before takeoff or in the air.

AS WITH WEATHER OPERATIONS, THE DECISION TO ACCEPT A MISSION IS SUBJECTIVE

Night/Reduced Visibility. Planning considerations for night/reduced visibility can be just as demanding as those for tactical instrument flight depending on ambient light level and visibility restrictions. For night operations, the effects of fog, haze, smoke, and overcast sky conditions will limit the aviator's visibility even with the aid of night vision goggles (NVG). As with weather operations, the decision to accept a mission is again subjective.

For our purposes, we will again assume that the threat and flight route have been considered, the flight route has been planned, and visibility requirements and basic flight safety requirements can be met. We can now isolate peculiar flight planning requirements.

> **NOTE**
>
> **For night operations, a detailed discussion is presented in FM 1-51. The *Preparation for Night Flight* series (TCs 1-27 and 1-29 through 1-33) discuss preparation of the aircraft.**

Prepare your tactical map with distance and heading tick marks and information. For night flight, insure clean, uncluttered lines and information, using colors that can be seen at night with a red lens. Select air control points (ACP) and use barrier landmarks on your map as backup orientation checks. During night/reduced visibility operations, visibility restrictions may not allow use of prominent terrain features. Also, other terrain features may appear different than during daylight.

Conduct a thorough map reconnaissance of your flight path and mark terrain and man-made obstacles.

Check unit locations at flight operations or maneuver unit S3 and note call signs and frequencies. You may need them for backup FM homing navigation.

Check frequencies and NAVAIDs of ATC facilities in the area of operations for use in case of inadvertent entry into IMC or to aid in visual navigation.

Plan for positive identification procedures of destination LZs and facilities.

TIME

Each mission should be evaluated in relation to time. At NOE altitudes, fuel and power requirements to cover distances will be greater than higher flight regimes. If time requirements cannot be met in relation to fuel, logistical support must be positioned to accomplish the mission. If threat or weather conditions dictate time separation requirements for multi-helicopter operations, can we mass enough troops and materiel at the right time to be effective? Can we get fire support at the right time to support the mission? As previously stated, in order to win while outnumbered, all elements of the combined arms team must function smoothly.

OPERATIONAL PLAN

The supported commander may not be thoroughly familiar with the capabilities and limitations of Army aviation. Therefore, the aviation unit commander or staff officer must be prepared to advise the commander on how or if aviation assets can be used for a given operation.

FRIENDLY SITUATION

The current friendly situation can be obtained from your unit operations, supported maneuver unit commander/S3, or division G3. When supporting a maneuver unit, the friendly situation will be briefed by the maneuver unit commander or S3 with the air mission commander. In preplanning the aviation mission in relation to the friendly situation, you must ask yourself, "who, where, when, what, and how?"

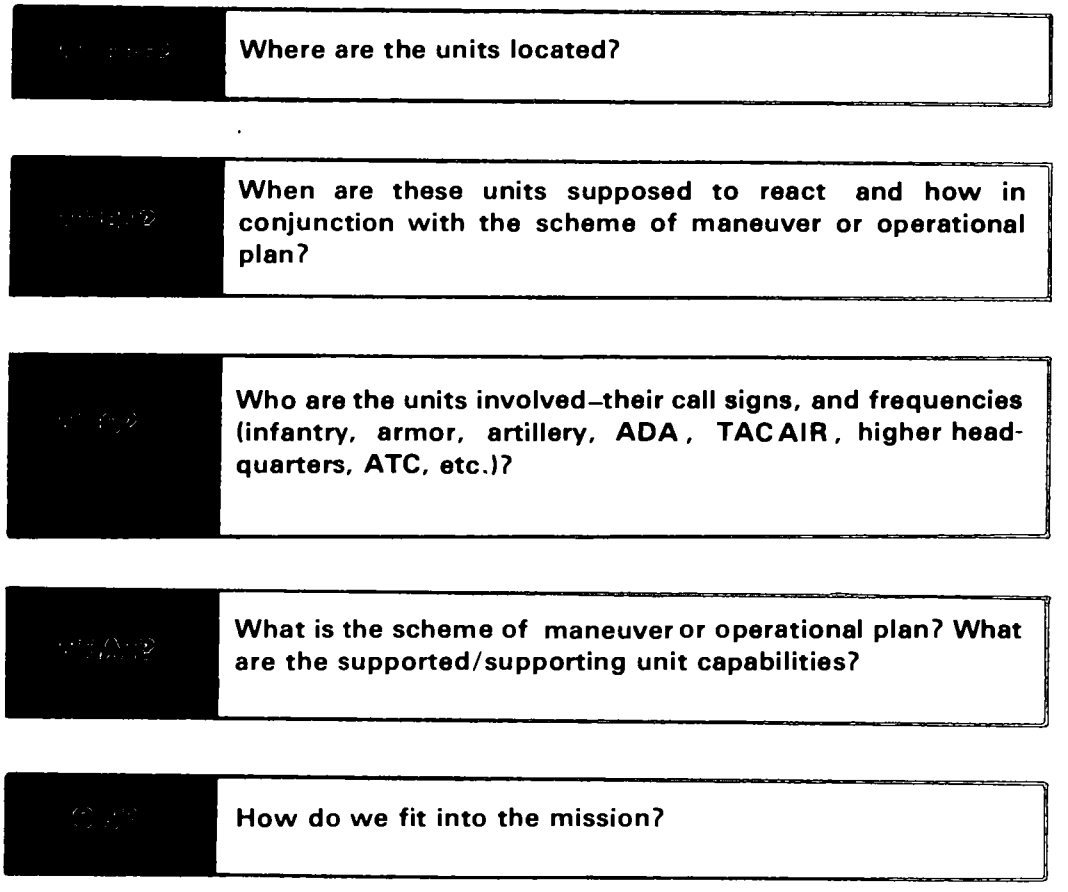


FIGURE 8-4. BASICS OF THE FRIENDLY SITUATION.

ENEMY SITUATION

The threat or enemy situation is one of the more important considerations in premission planning. The threat will determine how you will go about accomplishing the mission and the support you will need. The enemy situation also can be briefed at your unit operations, at the division G2/G3, or by the supported maneuver unit commander S2/S3.

Figure 8-5 shows planning considerations with reference to the enemy situation. With this information, you can plan your maneuver, command and control, communications procedures, needed equipment and armament, and how and when to use the equipment.

- Tactical Posture (Defensive, Offensive, etc.)
- Strength, Size, Type Units, and Locations
- Known or Suspected Air Defense (AD) Weapons (Type and Locations)
- Current EW Capability and Posture
- Current Tactical Air (TACAIR) Capability and Posture
- Current Nuclear, Biological, Chemical (NBC) Capability and Posture

FIGURE 8-5. BASICS OF THE ENEMY SITUATION.

TERRAIN

A good terrain analysis is necessary for a smooth, coordinated, and successful mission. If time permits, a reconnaissance of the mission area should be flown to determine the best primary and alternate flight routes, hazards, flight travel techniques, CPs, start points (SP), release points (RP), ACPs, LZs/PZs, and firing locations. If time does not permit, a thorough map reconnaissance should be made.

PROPER BRIEFING

To insure a smooth, coordinated, and successful operation, a thorough mission briefing should be presented to aviation personnel by the unit commander/air mission commander after coordination with unit operations or the supported unit commander. There will be many occasions when time and/or the tactical situation will not permit detailed briefings. When this occurs, participating personnel should be provided with a condensed version of the detailed briefing. The condensed briefing should follow the format of an operation order (OPORD). It should provide personnel with the minimum essential information to insure the successful accomplishment of the mission. However, the detailed briefing, as outlined below, will eliminate confusion and contribute more to a smooth and successful operation.

Situation provides the following information on the current tactical situation:

- Enemy forces—composition, disposition, location, movement, strength, identification, and capabilities.

• Friendly forces—information concerning locations and activities of the supported unit and other friendly forces that may directly affect the operation. (Information should be provided in order by higher, adjacent, supported, supporting, and reinforcing units.)

• Attachments and detachments—changes in organization together with time attachments and/or detachments are effective.

• Weather forecast—for duration of the mission.

Mission states clearly and concisely the task to be accomplished. Statement contains who, what, when, and, as appropriate, why and where.

Execution explains how the mission is to be performed.

• Concept of operation—a statement of the commander's tactical plan to include the *scheme of maneuver* and the *plan for fire support.* (If the operation is to be conducted in phases, address each phase separately.)

—Scheme of maneuver. Identify specific tasks to be accomplished by each element of the command. Include flight routes, method of travel, formations, SPs, ACPs, CPs, RPs, LZs, PZs, phase lines, firing points, and loading and landing plans.

—Plan for fire support. Provide field artillery (FA) and ADA organization for combat, assigned tactical missions, priorities, and weapon status.

• Combat and combat service support—identification of other combat and combat service support units.

• Reserve—identification of reserve composition, location, and instructions.

• Coordinating instructions—details for coordination and control applicable to two or more elements. Items to include are as follows:

—Troop safety measures and operational exposure guide for operations in a nuclear environment.

—Mission-oriented protection posture (MOPP) for operations in a chemical and/or biological environment.

—ATC procedures and priorities.

—Artillery support (locations, reference lines, preplanned fires, registrations, concentrations, and barrages).

—TACAIR support (coordinating procedures, preplanned targets, and routes).

—ADA support (locations, coordination procedures, and preplanned fires).

—Ground units at objective and methods of contact and recognition.

—Other (as appropriate for specific missions) ASE use, EW, and NBC support.

—Pickup point for downed crews and passengers.

—Reporting procedures.

Service support provides combat service support instructions and information on arrangements which support the operation. Information should include—

- Supply (petroleum, oils and lubricants (POL) and ammunition requirements; forward arming and refueling point (FARP) location; ground and air routes to FARP; procedures for rearming and refueling; and ration schedule; and other classes of supply as appropriate).

- Transportation (routes, movement tables, and control procedures).

- Services (laundry, bath, and decontamination; clothing exchange; and health services).

- Special equipment. (Identify special equipment required for the mission.)

• Maintenance. (Establish priority of maintenance, location of facilities, maintenance collecting points, and aircraft recovery procedures.)

• Medical evacuation. (Provide plan for evacuation of sick, injured, and wounded personnel.)

• Personnel. (Consider crew rest and crew rotation, especially for operations in a chemical environment when personnel are required to wear chemical protective garments. Also, include instructions for the handling and disposition of prisoners of war (PW)).

Command and signal provides instructions relative to command and the operation of communications-electronics (C-E).

• Command. Provide command and control procedures, chain of command, location of CP, designation of alternate CP, succession of command, and information concerning displacement of CP.

• Signal. Include air-to-air, air-to-ground, and ground-to-ground signals; index and issue number of Communications-Electronics Operation Instructions (CEOI), other frequencies, and call signs as appropriate; location, frequencies, and operational periods for NAVAIDs; IFF modes and codes; authentication, challenge, and password; and time check.

COMBINED ARMS SUPPORT

The support desired for mission accomplishment may not always be available. The available tactical support may affect the method of maneuver, communications procedures, command and control procedures, organic ordnance loading, and reconnaissance capabilities and methods. Premission planning, in relation to combined arms support, involves knowing what support can best be used in conjunction with the mission and where the support is located or can best be located.

For air assault operations, combined arms support will be distributed by the operational plan from corps and division.

The air mission commander, in this case, should be briefed by the task force commander or his S3 on—

- What support is available.
- Where the support is located.
- Call signs, frequencies, and codes and modes.
- How and when the support will be worked into the scheme of maneuver.

Based on the friendly and enemy situations, scheme of maneuver, and planned support, the air mission commander should then advise the task force commander on—

- How aviation elements can best be worked into the scheme of maneuver.
- Additional support needed to complement the mission and recommended locations for that support.

For reconnaissance, combat service support, or general support (GS) missions, premission planning for the air mission commander or individual aviator—in relation to combined arms support—involves coordination with unit operations on—

- Various support unit locations.
- Call signs, frequencies, and codes.
- Support requests with regard to the mission based on the friendly and enemy situations, the flight route, and meteorological conditions.

COMBINED ARMS SUPPORT FOR ARMY AVIATION PURPOSES CAN BE CLASSIFIED INTO FOUR CATEGORIES. THEY ARE—

- **Airspace management and control.**
- **EW support.**
- **Fire support.**
- **Logistical support.**

FIGURE 8-6. ARMY AVIATION COMBINED ARMS SUPPORT.

AIRSPACE MANAGEMENT AND CONTROL

Army airspace management begins at corps level. Responsibility for airspace management functions rests with commanders from corps level through battalion level. Each commander should be knowledgeable of airspace and airspace control requirements and incorporate them into all operational plans. The commander and staff arrange for all ATC support, fire support, and the interface between the two for coordinated use of airspace in conjunction with combat operations.

The corps/division tactical operations center (TOC) has organic and attached personnel who plan, coordinate, and manage airspace in conjunction with fire support (ADA, FA, TACAIR) for combined arms interface and combat operations. Members of the team include the corps/division AD officer, aviation officer, fire support coordinator, ATC liaison personnel, and G2/G3 staff members.

Members of this team are organized by the commander into what is commonly referred to as the airspace management element (AME). The Air Force provides interface at the corps/division level by collocating the division air support center (DASC) with the TOC.

The purpose of the DASC is to provide a capability for rapid response to immediate requests from Army forces for TACAIR support.

For our purposes, then, the TOC is the ultimate approval/disseminating agency for all actions involving the joint use of airspace, fire support, and rules of airspace utilization in conjunction with combined arms operations. Through subordinate commands (brigade, battalion) and ATC agencies, the TOC coordinates, plans, and disseminates—

- Flight corridors.
- Coordinating altitudes.
- Minimum risk routes.
- Standard-use Army aircraft routes.

- Airfield terminal control procedures.
- IFF codes.
- Fire control procedures (artillery, AD).
- EW control procedures.
- Pathfinder/tactical team operations.
- TACAIR support operations.

Subordinate ATC facilities are manned by assets from the ATC battalion (corps). These agencies include a system of manual FOCs, FCCs, approach/departure control facilities, airfield control towers, and NAVAIDs provided throughout the corps area for the control and coordination of Army air traffic.

The FOC is a corps-level, en route ATC facility for Army air traffic in the rear operations area. In its area of operations, the FOC provides—

- Coordination for defensive/offensive operations.
- Navigational/flight-following assistance.
- Air rescue assistance.
- Hostile aircraft warning to friendly aircraft.
- Communications link with the tactical air control system (TACS), Air Defense Command Posts (ADCP), and subordinate FCCs.

The FCC in corps and divisional areas is an extension of communications for the corps FOC and insures continuity of the flow of information required for AD (ADA, TACAIR) and ATC operations. Normally, FCCs are located in each corps and division area and are manned or operated by corps assets from the ATC battalion.

THERE WILL USUALLY BE AN FCC IN EACH CORPS AND DIVISION AREA

The FCC provides—

- En route navigational/flight-following assistance.
- General airspace management and coordination.
- Air rescue assistance.
- Hostile aircraft warning to friendly aircraft.
- Communications link with division airfields, other tactical airfields and heliports, the division TOC, adjacent FCCs, and the corps FOC.

The ATC company (forward) is an element of the ATC battalion (corps) which normally is employed with its platoons placed in direct support (DS) of corps and division aviation units operating airfields and heliports requiring ATC services. The ATC platoon leader acts as a liaison officer with the airspace management element of the division tactical operations center (DTOC). The airfield or heliport ATC platoon provides—

- Terminal and en route flight-following.
- NAVAIDs (NDB/GCA).
- Air warnings.

Tac teams are assigned to the division aviation battalion to further extend the control and coordination of Army air traffic management in the forward divisional area. An additional tac team is found in the ATC platoon to assist in operating an additional heliport.

TAC TEAMS PROVIDE ADVISORY SERVICE AND ASSISTANCE

Divisional tac teams can be allocated on a permanent basis to each maneuver brigade or on an as-needed basis by the division commander. They provide advisory services and assistance at heliports, temporary landing areas, resupply points, CPs, and other locations, as requested. Each three-man tac team has the AN/TRN-30(V)1 NDB and AN/TSQ-97 control facility—both are man-portable. They can provide advisory service and navigational assistance in forward areas.

Army pathfinder units provide navigational assistance and aircraft control services, as necessary, during any phase of an operation that requires sustained employment of Army aircraft. Normally, pathfinders are used to select, improve, mark, and control LZs, PZs, and drop zones. They also are capable of providing assistance in PZ organization and rigging operations. In forward areas, pathfinders also may provide lighting and short-range NDBs, but radio communications will be minimized due to threat considerations.

Premission planning considerations with regard to ATC are a matter of—

- Knowing established airspace controls.
- Knowing locations, frequencies, and call signs of available ATC support.
- Requesting available ATC support.
- Checking terminal control procedures for available NAVAIDs.

FIRE SUPPORT

Outside agencies that can provide preplanned and immediate fire suppression include—

- Artillery and mortars.
- ADA.
- Tactical air.

Supporting artillery unit personnel are provided to each command level to advise, plan, and coordinate supporting artillery fires for the maneuver unit commanders in conjunction with combined arms operations. The individual artillery unit headquarters, in conjunction with artillery unit fire direction centers (FDC) and forward observers, controls supporting artillery fires.

DIVISION	REGIMENT	CORPS
Divisional artillery is organic to the division, and usually one subordinate battalion is assigned the tactical mission of DS to a maneuver brigade. Units not in DS may be assigned tactical missions of providing reinforcing or GS reinforcing fires or GS.	A field artillery battery is organic to each armored cavalry squadron in an armored cavalry regiment. The battery normally supports the squadron it is assigned to. However, the battery may be directed to augment other fires as directed by the regimental commander.	Nondivisional (group) artillery is assigned to the corps. Usually it is allocated to division commanders as additional artillery support on an as-needed basis or it augments divisional artillery fires as directed by the corps commander.

FIGURE 8-7. ARTILLERY.

Planned artillery fires and targets are developed by each coordinating level in relation to the operational plan or scheme of maneuver. These preplanned targets are then distributed throughout the system, higher and lower, to appropriate coordinating agencies and to appropriate artillery unit headquarters/FDCs.

Premission Planning. Premission planning in relation to combined arms operations or aviation unit operations involves—

- Air mission commander/maneuver unit commander/S3 coordination briefing on planned targets, targets and numbers, and call signs and frequencies for requesting them.

- Noting artillery unit, FDC and FIST locations, call signs, and frequencies.

- Requesting preplanned artillery fires through unit operations channels to support aviation unit missions.

- Establishing a direct means of communication between the air mission commander and supporting artillery unit to insure a timely response to requests-for-fires.

UNIT LEVEL SUPPORTED	COORDINATING AGENCY
CORPS	Fire Support Element (FSE) Provided and operates in the corps tactical operations center (CTOC).
DIVISION	FSE Provided and operates in the division tactical operations center (DTOC).
MANEUVER BRIGADE/ REGIMENT	FSE Provided and operates in the brigade/regiment operations center (S3).
MANEUVER BATTALION/ SQUADRON	FSE Provided and operates in the battalion/squadron operations center (S3).
MANEUVER BRIGADE/ REGIMENT	Fire Support Team (FIST) Company/troop/team commander, weapons platoon leader (81mm mortars), heavy mortar platoon observer (4.2-inch mortars), and FA observer. Operates as necessary on battlefield.

FIGURE 8-8. COORDINATING AGENCIES FOR ARTILLERY FIRE SUPPORT.

Preplanned Artillery and Mortar Fires. Calls for *preplanned artillery and mortar fires* include those items listed below.

- OBSERVER IDENTIFICATION:

  *Y5F47, *this is* D3L39.

- WARNING ORDER:

  Y5F47, this is D3L39; *immediate suppression/ suppress.*

- LOCATION OF TARGET:

  Y5F47, this is D3L39; suppress, *checkpoint 10 or 400 meters south of checkpoint 10.*

*After establishment of initial communication, full call signs are no longer required.

• TARGET DESCRIPTION:

Y5F47, this is D3L39; suppress, checkpoint 10, *enemy antiaircraft emplacement.*

• **METHOD OF ENGAGEMENT:

Y5F47, this is D3L39; suppress, checkpoint 10, enemy antiaircraft emplacement, *smoke and VT fuze.*

• METHOD OF FIRE AND CONTROL:

Y5F47, this is D3L39; suppress, checkpoint 10, enemy antiaircraft emplacement, smoke and VT, *(at my command) fire-for-effect.*

The request for fire can go to—

• Artillery unit FDC (fastest means).

• Maneuver unit FSE or FIST.

PRIORITY OF ARTILLERY FIRES IS ALLOCATED TO THE SUPPORTED UNIT

There may be times when artillery or mortar fire support is needed that has not been preplanned. If a trained forward observer (FO) is not available, you will have to be able to initiate the request-for-fire and adjust it onto the target. If artillery fire is needed on an individual basis, don't be surprised if the artillery unit is unable to fire your mission. Priority of artillery fires is allocated to the supported unit, reinforced unit, own observers, or force artillery headquarters according to the command relationship and tactical mission.

> NOTE
>
> Be prepared to authenticate on all requests for artillery and mortar fire support using your CEOI.

Immediate Fires. Artillery fires that are not preplanned are called *immediate fire requests.* Premission planning in regard to immediate artillery suppression involves—

**Not necessary in call-for-fire. Optional at observer's discretion.

• Coordination with unit operations, higher headquarters FSE, or supported maneuver unit commander/S3 with regard to artillery and mortar locations and FDC, FSE, and FO call signs and frequencies.

• Knowing weapon and munition capabilities.

• Knowing how to call for and adjust artillery fires.

Coordination of artillery and mortar locations, call signs, and frequencies is self-explanatory.

Accurate location of the artillery and mortar weapons locations on your tactical map is important, as you may have to adjust the impact of the rounds from the gun/target line of fire—an imaginary line extending from the guns to the target.

ARTILLERY AND MORTAR WEAPONS AND MUNITIONS CAPABILITIES

In order to plan for artillery coverage and to avoid flying into artillery coverage areas, you must know artillery unit locations, the type unit, and range capabilities.

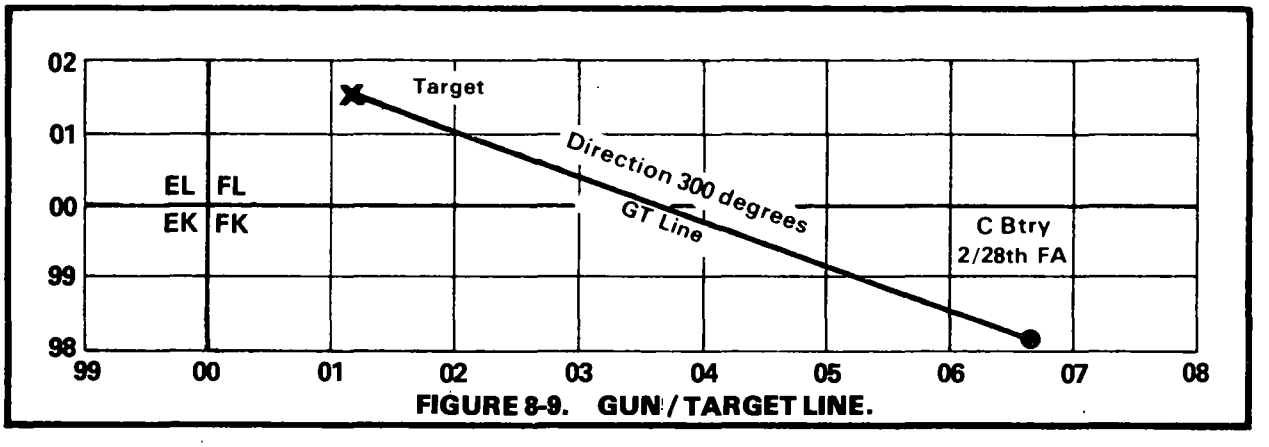


FIGURE 8-9. GUN/TARGET LINE.

Table 8-2. ARTILLERY AND MORTAR WEAPONS AND MUNITIONS CAPABILITIES.

WEAPON	MAXIMUM RANGE (METERS)	SHELL TYPES	FUZE TYPES
Mortar, 81mm	4,737	HE, WP, Illum	PD
Mortar, 4.2-inch	5,650	HE, WP, Illum	PD
M101A1, 105mm	11,000	HE, WP, Illum, HC, ICM	PD, Delay, Time
M102, 105mm	11,500	HE, WP, Illum, HC, ICM	PD, Delay, Time
M114A1, 155mm, towed	14,600	HE, WP, Illum, HC, Cml, ICM	PD, Delay, Time, VT
M109, 155mm, SP	14,600	HE, WP, Illum, HC, Cml, ICM	PD, Delay, Time, VT
M109A1, 155mm, SP	18,100	HE, WP, Illum, HC, Cml, ICM	PD, Delay, Time, VT
M110, 8-inch, SP	16,800	HE, WP, Cml, ICM, CP	PD, Delay, Time
M110E2, 8-inch, SP	20,700	HE, WP, Cml, ICM, CP	PD, Delay, Time
M107, 175mm, SP	32,700	HE, WP	PD

Cml--chemical
CP--concrete piercing
HC--smoke
HE--high explosive
ICM--improved conventional munitions
Illum--illumination
mm--millimeter
PD--point detonating
SP--self-propelled
VT--variable time
WP--white phosphorous

In an *immediate* suppression situation, it will be helpful to know which type shell and fuze combinations will be most effective against which type targets. The shell-fuze action desired *may be* included in the call-for-fire. If type shell-fuze combination is not specified in your call-for-fire, you usually will get shell HE and fuze PD, or the coordinating agency fire direction officer (FDO) may determine the best shell-fuze action from your target description.

Table 8-3. TYPE SHELL AND FUZE COMBINATIONS EFFECTIVE AGAINST TYPE TARGETS.

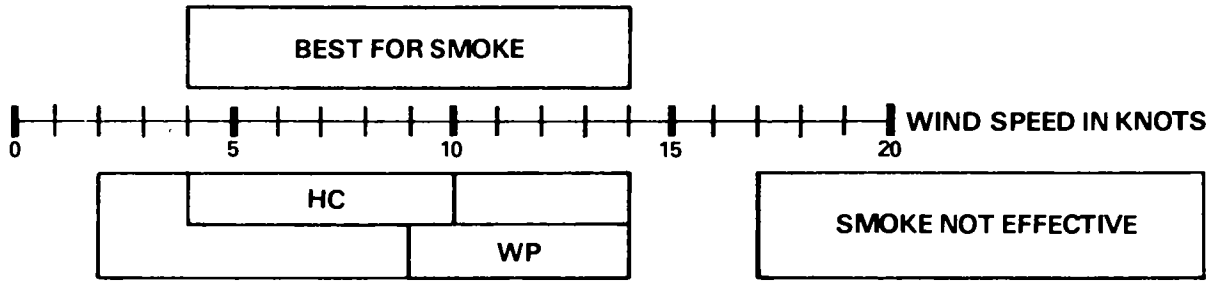
SHELL-FUZE	EFFECTIVE AGAINST
HE-PD	Hard targets (tanks), infantry, mechanized vehicles
HE-DELAY	Bunkers, dug-in targets, targets in tree line
HE-VT	Infantry artillery, air defense (AD) weapons, light armored personnel carrier (APC)
HE-TIME	Infantry, artillery, air defense light armor (APC)
ICM-PD	Infantry, towed artillery, and air defense weapons (open targets)
WP-PD	Incendiary and smoke screening action; open targets, POL and ammunition dumps; good against all targets for screening action
HC-PD	Good as a screen to deny visual acquisition.

HC--smoke ICM--improved conventional munitions VT--variable time
HE--high explosive PD--point detonating WP--white phosphorous

CONSIDERATIONS FOR USE OF WP AND HC SMOKE

The use of smoke can be highly effective as a means to deny enemy visual observation and acquisition of combat operations and maneuvers. Premission planning should include consideration of all smoke-producing means available. In addition to artillery, the M259 screening smoke warhead has been developed for attack helicopters armed with the 2.75-inch, folding-fin aerial rocket (FFAR). Some aviation units also may have utility helicopters equipped with the M52 smoke generator. However, smoke is affected by wind conditions and one must know how to employ smoke effectively. Smoke requires careful planning and control to allow for unfavorable conditions and to avoid interference with friendly operations. Adjustment of smoke rounds in relation to the target should be based on wind speed and direction.

Wind speeds ranging from 4 to 14 knots are best for the production of smoke screens.



TEMPERATURE: A rise in temperature causes smoke to dissipate more rapidly.

HUMIDITY AND PRECIPITATION: Enhance effectiveness of smoke.

FIGURE 8-10. EFFECT OF WIND SPEED ON SMOKE.

Table 8-4. EFFECTS OF WIND DIRECTION ON SMOKE.

DELIVERY TECHNIQUE		WIND DIRECTION				Target area that can be obscured (150 meters)
		Cross	Quartering	Head	Tail	
Quick (Small Area Suppression)	WP	200S-150UW	200S-75UW	100S	200S	Adjusting point with respect to area to be obscured
	HC	200S-200UW	200S-150UW	100S	400S	

S-Short UW-Upwind Data In Meters

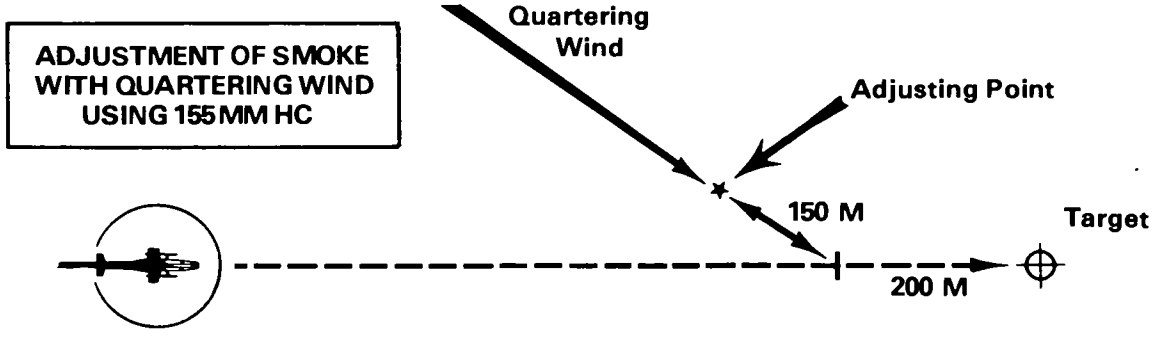


Table 8-5. SMOKE COVERAGE AND DURATION.

SMOKE COVERAGE				AVERAGE COVERAGE IN LENGTH (METERS)		
				Wind Direction		
Delivery System	Type Round	Time To Build Effective Smoke	Average Burn Time	Cross	Quartering	Head/Tail
81mm Mortar	WP	½ Min	1 Min	200	80	40
4.2-Inch Mortar	WP	½ Min	1 Min	100	60	40
105mm	WP	½ Min	1½ Min	75	60	50
	HC	1½ Min	3 Min	250	175	50
155mm	WP	½ Min	1½ Min	100	75	50
	HC	1½ Min	4 Min	350	250	75

HC--smoke WP--white phosphorous

THE CALL-FOR-FIRE

In order to achieve surprise and maximum effect on a target, consideration should be given to requesting a fire-for-effect (FFE) on the initial request for fire. This should be done only if you can accurately locate the target on your map within 100 meters. We will only be concerned with a sample call-for-fire, using coordinates as a target location method and entering the FFE phase on initial rounds. For detailed artillery observer techniques, consult FM 6-30 and TC 6-40-4. The below information shows what our call-for-fire will include.

CALL-FOR-FIRE ELEMENTS	OBSERVER	FIRE DIRECTION CENTER
OBSERVER IDENTIFICATION, and WARNING ORDER	"D3H46, this is L4M36; fire-for-effect, over."	"L4M36, this is D3H46; fire-for-effect, over."
LOCATION OF TARGET (six-place grid coordinate)	"Grid 426839, over,"	"Grid 426839, over."
TARGET DESCRIPTION, METHOD OF ENGAGEMENT, end METHOD OF FIRE AND CONTROL	*"SA-9 battery in the open fuze VT, over."	"SA-9 battery in the open, fuze VT, authenticate Bravo Lima, over."
AUTHENTICATION	"I euthenticate Echo, over."	**"Bravo, two rounds, over."
	"Bravo, two rounds, out."	

*In this case, we are asking for standard aree engagement with shell-fuze combinatlon of HE-VT.
**Indicates battery "B" will fire two rounds per tube.

US ADA assets are classified into three categories based on weapon range and altitude capabilities.

● Short-range gun and missile systems	● Medium-range ADA missile systems	● Long-range AD missile systems

FIGURE 8-11. ADA CATEGORIES.

Short-Range Gun and Missile Systems. Short-range gun and missile systems include the Vulcan 20mm gun, the Chaparral infrared heat-seeking missile, and the Redeye and Stinger infrared heat-seeking missiles. Ranges are 1,200, 5,000 and 3,000 meters, respectively. These systems are designed to provide AD protection against hostile aircraft operating in low-altitude flight regimes. The SP Chaparral-Vulcan battalion is organic to infantry, armor, and mechanized infantry divisions. It has two Chaparral and two Vulcan batteries for a total of 48 gun and missile squads. The towed Vulcan battalion is organic to airborne and air assault divisions. It has four batteries of 12 towed Vulcans each. Non-divisional Chaparral-Vulcan battalions have the same number of guns and missiles as divisional battalions, but their Vulcans are towed.

The Redeye section is organic to maneuver battalions and squadrons and FA battalions. Each Redeye section consists of a headquarters element and three to six Redeye teams. Usually, the teams are allocated on the basis of one team per company/troop/battery size unit.

Medium-Range ADA Missile Systems. The medium-range ADA missile system is the Hawk radar-guided missile. Range of the missile is 40,000 meters. This missile system provides area AD coverage of the low to medium hostile air threat. Redeye missile teams are organic to Hawk battalions to provide an increased self-defense capability.

Hawk battalions allocated for the protection of assets in the corps rear normally will be assigned GS missions. Hawk battalions allocated for AD in the forward area normally are

assigned tactical missions in direct support (DS) of committed divisions.

Long-Range AD Missile System. The long-range AD missile system is the Nike-Hercules radar-guided missile battalion. Range of the missile is 140,000 meters. Nike-Hercules provides theater AD coverage against the high to medium hostile air threat.

Coordinating Agencies. Divisional ADA assets provide liaison personnel to the supported unit commander to help plan, coordinate, and effect AD coverage tailored to the tactical situation. At corps level, the commander of the ADA group is the principal advisor to the corps commander on ADA matters. The group commander may use the chief of the AD element as his representative at the corps tactical CP. The group's AD element joins with the corps aviation element to form the corps airspace management element (CAME). In addition to its airspace management duties, it provides an ADA planning/advisory service to the corps commander/G3.

Within a division, personnel from the Chaparral-Vulcan battalion CP join with Army aviation personnel to form the division airspace management element (DAME) which is an integral part of the division main CP. An ADA element also is positioned with, and forms part of, the division tactical CP. In addition, a DS mission requires the Hawk battalion to establish liaison and communications with the supported division. Accordingly, it sends a liaison officer to the division main CP to work closely with the Chaparral-Vulcan and aviation personnel in the DAME. As an aid to airspace management, the division also may collocate an element from the aviation battalion or company FCC with the Hawk battalion operation center (BOC).

A HAWK BATTALION LIAISON OFFICER WORKS WITH DIVISION AIRSPACE PERSONNEL

The BOC's communication tie-in with Air Force control and reporting center or control and reporting post (CRC/CRP) and Hawk battalion's organic radars can provide valuable advisory or assistance data to Army flight leaders. This arrangement facilitates the exchange of radar, Air Force, and Army aviation information. AD remains the Hawk's first

priority mission; but, when asked or in an emergency, the Hawk-associated FCC element can—

- Provide aircraft position-fixing and directional assistance service.
- Assist in IFF transponder checkouts.
- Help aircraft avoid known hazard areas.
- Distribute aircraft location and identification data to requestors.

The division and friendly aircraft also will be warned by ADA of observed hostile air incursions. Conversely, aviation units operating forward of the FLOT may frequently observe hostile air incursions. When observed, aviation personnel should provide direction of flight and altitude data to an ADA unit.

WHEN YOU OBSERVE HOSTILE AIRCRAFT, YOU SHOULD PROVIDE DIRECTION OF FLIGHT AND ALTITUDE DATA TO AN ADA UNIT

The DAME and AD element at the division tactical CP serve as the focal point for coordination of AD operations with other division staff elements as well as performing airspace management functions. The DAME plans and coordinates the immediate use of airspace behind brigade rear boundaries and the future use of airspace over the division as a whole. The AD element at the tactical CP coordinates the immediate use of airspace and ADA operations in the brigade areas. Close coordination between the AD element at division tactical CP is essential to insure awareness of—

- Army aviation and Air Force operations.
- Enemy air activity and Threat data.
- Changes in ADA rules of engagement.
- Changes in AD warnings and status of alerts.
- Airspace control measures and restrictions.
- IFF codes.
- ADA unit plans, activities, and status.

- Corps and division plans and activities.

- Corps and division priorities of protection.

Below division level, the ADA battery commander, platoon leader, or section leader will most likely be the advisor to the maneuver commander to whom his unit is organic or in DS.

Command and Control. All AD forces must follow certain rules and procedures that provide for centralized management of the total air battle but permit each AD unit to respond to the needs of the element it supports. It is with this flexibility in mind that the area AD commander, normally the Air Force component commander, divides the theater into regions for AD. The region AD commander is responsible for, and has full authority in, the AD of his region. He normally delegates authority for employment of organic Army AD means to the commanders of the major Army elements; e.g., divisions within his region.

AD rules and procedures give the ADA unit commander the criteria he will use to determine if an aircraft is hostile and to establish the degree of control placed on the firing of his weapons.

Hawk and Hercules battalion commanders exercise command and control of their batteries through a BOC. Control of fires of batteries or platoons is accomplished through either the semiautomatic or manual control element of the BOC. Control of fires of Chaparral, Vulcan, and Redeye weapons differs from that of the longer range, more sophisticated Hawk and Nike-Hercules systems in that the elapsed time from target detection and identification until target flyover is measured in seconds rather than minutes. In addition, Chaparral, Vulcan, and Redeye weapons are manned and fired by squads and teams rather than by batteries or platoons. Each squad or team is individually positioned and separated from all other squads in the same defense. To be effective, the firing decision must be made at the weapon; and authority to engage must be delegated to the weapon commander (Chaparral, Vulcan, or Redeye squad leader or team leader) subject to prescribed rules of engagement.

TO BE EFFECTIVE, THE FIRING DECISION FOR CHAPARRAL, VULCAN, OR REDEYE WEAPONS MUST BE MADE AT THE WEAPON

Command and control of the Redeye section is exercised by the Redeye section leader from his CP. He positions his Redeye teams to defend units or other assets and to support the scheme of maneuver of the supported ground unit commander. The region AD commander controls Redeye fires by issuing AD rules and procedures that Redeye teams must follow.

Premission Planning. Premission planning in relation to ADA involves knowing—

- Locations of AD assets within your area of operations.
- How AD assets fit into the scheme of maneuver.
- ADA unit radio frequencies, appropriate AD rules of engagement, and IFF codes and modes.
- Airspace control procedures and restrictions in the area of operations.

All of the above information is made available to maneuver unit commanders and aviation commanders and operations sections. IFF codes and modes are distributed by theater to corps and division via classified information channels. It is up to the corps or division AME to see that IFF codes and modes are distributed to all concerned user units.

Remember, IFF use plays a large part in the AD rules of engagement because NONUSE or MISUSE of electronic IFF normally is designated as a major criterion for declaring an aircraft hostile. Make sure you know the IFF codes and modes and how to operate your IFF equipment. If IFF codes and modes have not been distributed, check with—

- **Your unit operations or supported unit operations.**
- **AME or TOC.**
- **Army Air Defense Command Post (AADCP).**
- **FOC or FCC.**

FIGURE 8-12. USE OF IFF.

Knowing appropriate AD weapon locations, frequencies, and call signs may provide a protective suppression capability against the hostile air threat.

Remember, one quick call to the local AADCP, FCC, or maneuver unit with organic Redeye missile teams may save your life and the lives of others.

TACTICAL AIR

In joint Army-Air Force operations, the Air Force Component Commander/Commander, Air Force Forces (AFCC/COMAFFOR) is responsible to the joint force commander or tactical air support operations. In addition, the AFCC/COMAFFOR is designated the area air defense commander (AADC) and the airspace control authority (ACA) with the responsibility for operation of the area airspace management system.

To help coordinate and control tactical air support and airspace management in the corps area of operations, a system of Air Force/Air Force liaison agencies is employed to support the joint effort. This system includes—

- ***Tactical air control center (TACC).**
- ***Control and reporting center (CRC).**
- **Control and reporting post (CRP).**
- **Forward air control post (FACP).**

***Army liaison provided.**

FIGURE 8-13. PURE AIR FORCE COORDINATING AGENCIES.

The TACC is responsible for airspace management, Air Force ground sensor surveillance systems, air support coordination and control, and air strike coordination and control.

The CRC conducts radar control and warning operations within its area of responsibility. The CRC supervises the activities of subordinate radar units and collects, displays, evaluates, and disseminates information on air activities throughout the system. It provides defensive and offensive mission control, navigational and air rescue assistance for friendly aircraft, and threat warning for friendly aircraft.

The CRP augments the CRC by extending radar surveillance and control capabilities.

The FACP is a subordinate facility of the CRC and CRP. It consists of lightweight surveillance and control radar to extend system coverage, fill gaps, and provide limited extension of control capability.

In addition to the above coordinating and control agencies, the Air Force provides coordinating and planning agencies to each command level to advise, coordinate, and control tactical air support for the maneuver commander as follows:

- Corps.....DASC.
- Division.....*TACP.
- Brigade.....TACP.
- Battalion.....TACP.

*Tactical air control party.

FIGURE 8-14. OTHER AGENCIES.

The DASC is a mobile, air-transportable facility designed to operate with a corps TOC or independent division TOC. The DASC operates in conjunction with the G2/G3 Air and AME. They aid in advising, planning, and coordinating with the TACC for tactical support in conjunction with combined arms operations. The DASC also provides a fast-reaction capability to satisfy immediate requests from Army forces for tactical air support.

The TACP is a forward operations element attached to each cavalry squadron, maneuver battalion, brigade, regiment, separate brigade, division, and corps. The TACP

consists of the air liaison officer (ALO), one or more forward air controllers (FAC), and radio operators, as appropriate. The ALO works in conjunction with the commander, his staff, and the supporting FSE and assists in planning for the integration of combined arms fires. The FAC is a tactical fighter pilot assigned to the TACP to control air strikes in support of maneuver forces. He also is capable of adjusting mortar, FA, and naval gun fires. He may operate on the ground or in the air and maintains contact with the strike pilot(s), requestor, and fire support coordinator.

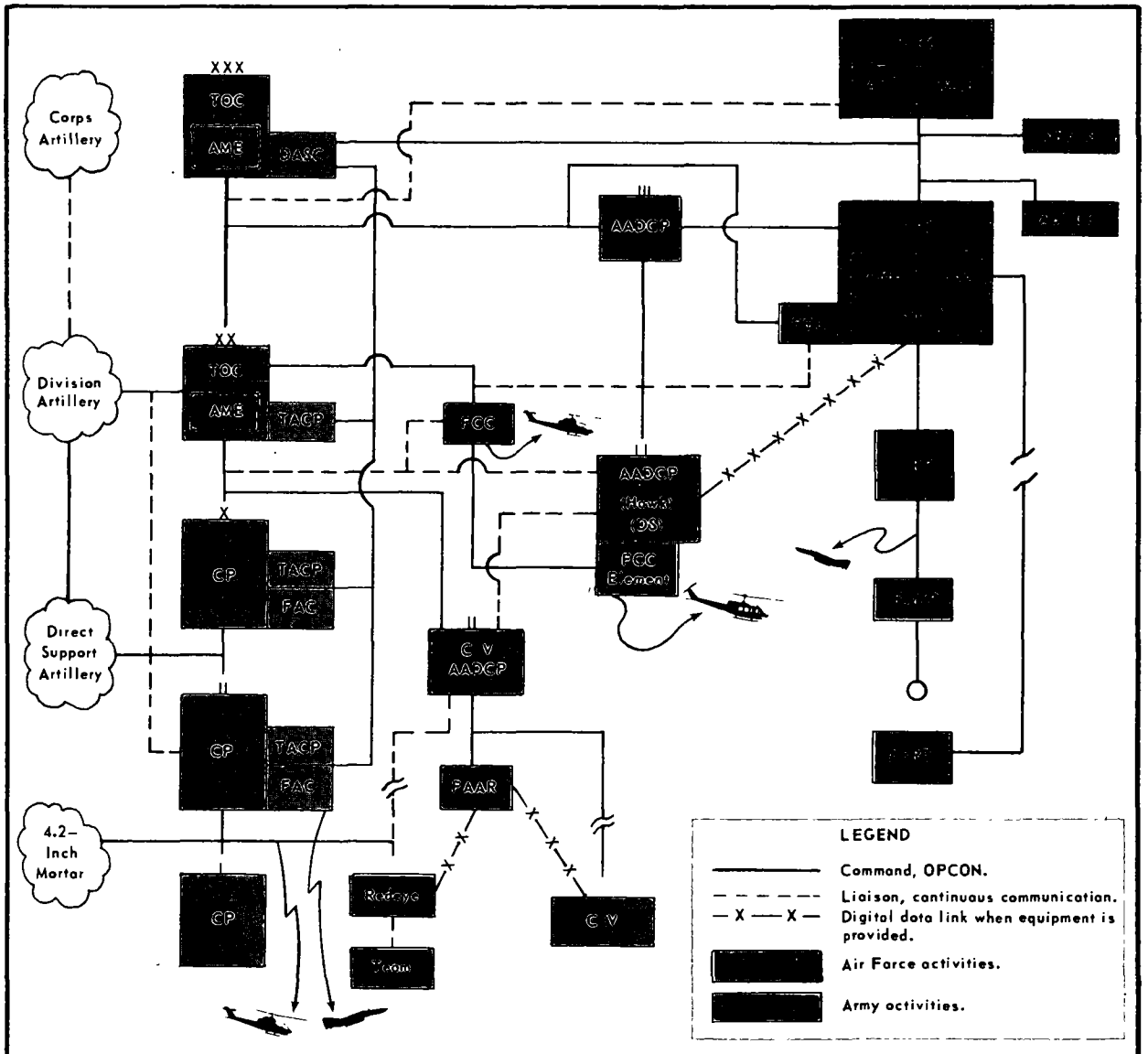


FIGURE 8-15. ATC, MANEUVER UNIT, FIRE SUPPORT DIAGRAM.

Premission planning in relation to tactical air support involves knowing—

- Planned air support and ATC plans in relation to the combined arms operation. This involves coordination with unit operations, division G3 Air, or supported maneuver unit commander and S3 Air.

- How to coordinate and request immediate tactical air support. In order to coordinate and request immediate tactical air support, you must know CEOI frequencies and call signs of supported unit G2/S3 Air agencies.

Remember, all requests for tactical air support must include—

- Target description and situation.
- Target location.
- Desired results.
- Latest allowable time for the air strike.

ELECTRONIC WARFARE SUPPORT

Combat EW support requires the efforts of each unit, team, and individual, in combined arms operations, to combat Threat EW efforts and, at the same time, render Threat Forces ineffective through employment of our own EW resources. So, when we talk about EW support, we are not only talking about G2/S2 and organic/attached combat electronic warfare intelligence (CEWI) assets but also what you can do to render the Threat EW effort ineffective and support our EW effort at the same time.

Chapter 5 has already outlined Threat EW doctrine and capabilities. This chapter also provided countermeasures/ counter-countermeasures to render the Threat EW effort ineffective and to help our own EW effort.

Responsibility for Army EW is divided between the G3 and G2, but overall responsibility belongs to the G3. Normally, the EW assets are organic to the CEWI organizations of corps and division.

For the most part, CEWI unit support will be directed at division level and above in conjunction with combined arms operational plans. At times, CEWI units may be assigned support missions at brigade level.

Premission planning in relation to EW support involves—

- Knowing the current EW threat and activities in the area of operations.
- Knowing the EW support plan for combined arms of operations.
- Planning the flight in relation to the EW threat and available EW support.

Threat EW operations will affect flight route, command and control, and communications procedures.

Threat EW activities may be obtained from the unit S2, division G2, or supported maneuver unit commander/S2. CEWI units support instructions also should be included in the operation order (OPORD).

Flight routes must be planned to take advantage of masking offered by the terrain to render enemy jamming, intrusion, and meaconing ineffective. Command and control communications procedures may have to be altered to fit the situation.

Conversely, friendly EW support may free command and control/communications procedures and allow flight routes to be selected that can better support the mission.

Whether or not the enemy EW threat and friendly EW support plan are known, good communications security (COMSEC) and timely intelligence reporting should be part of a well-planned mission.

LOGISTICAL SUPPORT

In relation to logistical support, premission planning involves—

- Determining logistical requirements in support of the assigned mission.
- Knowing locations of available logistical support, frequencies, and call signs.

Logistical requirements should be considered with mission requirements which partially will dictate flight altitudes, modes, speeds, routes, distances, time on station, ammunition requirements, and desired turn-around times.

The mission may not necessitate POL and ammunition requirements over and above those provided at your home base. In another case, prior coordination with aviation units/airfields in the mission area may satisfy logistical requirements. For air cavalry and attack helicopter operations, mission requirements may necessitate establishment of FARPs to satisfy quick turn-around requirements. Generally, a FARP will be established to support one air cavalry troop or attack helicopter company. This is necessary to eliminate bottlenecks and to decrease the probability of enemy detection. Generally, a FARP will be highly mobile, air-transportable by utility or medium lift helicopters; and it will operate in one area for a limited period of time (3 to 6 hours).

Maintenance and aircraft recovery procedures/coordination must be planned and disseminated to complement the mission.

Knowing locations, call signs, and frequencies of available logistical support requires a check or briefing with unit operations and/or the supported unit. Frequencies and call signs are in your CEOI.

After reading this chapter, one thing that should be clear is the need for combined arms teamwork in a high threat environment. Coordination and planning with support agencies and the supported unit are essential to mission success, maximum effectiveness, and survivability. It will require proficiency; professionalism; and knowledge to plan, coordinate, and execute the mission.

The combat situation will be fast moving. It will require the aviation commander and his operations and intelligence personnel to keep abreast of the friendly and enemy situations. Aviation unit personnel, in turn, must be updated as the situations change. Unit SOP, training proficiency, and a good information system in the aviation unit will reduce the time required for premission planning and briefings.

APPENDIX A

REFERENCES

NOTE. Department of the Army pamphlets of the 310-series should be consulted frequently for latest changes or revisions of references listed and for new publications on subjects covered in this manual.

ARMY REGULATIONS (AR)	TITLE
AR 95-1	Army Aviation: General Provisions and Flight Regulations
AR 310-25	Dictionary of United States Army Terms (Short Title: AD)
AR 310-50	Authorized Abbreviations and Brevity Codes (Microfiche)

FIELD MANUALS (FM)	TITLE
FM 1-5	Instrument Flying and Navigation for Army Aviators
FM 1-50	Fixed Wing Flight
FM 1-51	Rotary Wing Flight
FM 1-80	Aerial Observer Techniques and Procedures
FM 1-88	Aviator's Recognition Manual
FM 1-103	Airspace Management and Army Air Traffic in a Combat Zone
FM 1-105	Aviator's Handbook
FM 3-8	Chemical Reference Handbook

FM 3-12	Operational Aspects of Radiological Defense
FM 3-22	Fallout Prediction
FM 3-87	Nuclear, Biological, and Chemical (NBC) Reconnaissance and Decontamination Operations (How to Fight)
FM 5-20	Camouflage
FM 6-20	Fire Support in Combined Arms Operations (How to Fight)
FM 6-30	Field Artillery Observer
FM 6-50	The Field Artillery Cannon Battery
*FM 17-40	Attack Helicopter Gunnery
FM 17-47	Air Cavalry Combat Brigade (ACCB) (How to Fight)
FM 17-50	Attack Helicopter Operations (How to Fight)
FM 17-95	Cavalry (How to Fight)
FM 21-2	Soldier's Manual of Common Tasks
FM 21-40	NBC (Nuclear, Biological and Chemical) Defense
FM 21-41	Individual Defense: Nuclear, Biological, Chemical
FM 21-60	Visual Signals
FM 24-1	Combat Communications (How to Fight)
FM 24-18	Field Radio Techniques
FM 30-5	Combat Intelligence
FM 30-102	Opposing Forces, Europe
(S)FM 32-1	Signal Intelligence (SIGINT) (U)
FM 32-6	SIGSEC Techniques
(C)FM 32-20	Electronic Warfare (EW) (U)
FM 32-30	Electronic Warfare, Tactics of Defense
FM 44-1	US Army Air Defense Artillery Employment (How to Fight)
FM 44-3	Air Defense Artillery Employment—Chapparal/Vulcan (How to Fight)
FM 44-23	US Army Air Defense Artillery Employment, Redeye (How to Fight)
FM 44-90	Air Defense Artillery Employment—Hawk (How to Fight)
FM 71-1	The Tank and Mechanized Infantry Company Team (How to Fight)

*To be published

FM 71-2	The Tank and Mechanized Infantry Battalion Task Force (How to Fight)
FM 71-100	Armored and Mechanized Division Operations (How to Fight)
FM 71-101	Infantry, Airborne, and Air Assault Division Operations (How to Fight)
FM 90-1	Employment of Army Aviation Units in a High Threat Environment (How to Fight)
FM 90-2	Tactical Deception (How to Fight)
FM 90-3	Desert Operations (How to Fight)
FM 100-5	Operations (Capstone—How to Fight)
FM 100-10	Combat Service Support
FM 100-26	The Air-Ground Operations System
FM(J) 100-42	USAF/USA Air Space Management in an Area of Operations
FM 101-5	Staff Officers' Field Manual: Staff Organization and Procedure

TRAINING CIRCULARS (TC)	TITLE
TC 1-16	Employment of Aircraft Flares From Army Aircraft
TC 1-27	Preparation of the UH-1M for Night Flight
TC 1-29	Preparation of the UH-1 for Night Flight
TC 1-30	Preparation of the AH-1 for Night Flight
TC 1-31	Preparation of the OH-58 for Night Flight
TC 1-32	Preparation of the CH-47 for Night Flight
TC 1-33	Preparation of the OH-6 for Night Flight
TC 3-50-2	Small Unit Smoke Operations
TC 6-40-4	Fire for Effect: How To Be Your Own Forward Observer
TC 30-22	Battlefield Survival and Radioelectronic Combat
TC 44-30	Aircraft Recognition Training for Ground Observers
TC 100-32-1	Electronic Warfare, A Weapons Qualification Course
TC 100-33	Division Electronic Warfare Operations (How to Fight)

TRAINING MANUALS (TM)	TITLE
TM 3-4240-280-10	Operator's Manual: Mask, Chemical-Biological: Aircraft, ABC-M24 and Accessories and Mask
TM 3-220	Chemical, Biological, and Radiological (CBR) Decontamination (to be replaced by FM 3-5)
TM 10-277	Chemical/Toxicological and Missile Fuel Handlers Protective Clothing

MISCELLANEOUS REFERENCES	TITLE
(C)TRADOC Bulletin 4	Soviet 2SU-23-4, Capabilities and Countermeasures (U)

APPENDIX B

GUIDE TO WRITING AN ABCS ANNEX TO THE UNIT SOP

(Classification)

Annex—(Aircraft Battlefield Countermeasures and Survivability) to SOP # _____

—Assault Helicopter Company

—Attack Helicopter Company

—Air Cavalry Troop

1 Jan 198__

1. Purpose: The purpose establishes aircraft battlefield countermeasures and survivability procedures applicable to the conduct of air missions in a tactical environment.

2. Scope: This annex is applicable to all unit aircrew personnel.

3. Concept: Procedures in this annex are established to provide countermeasure and survivability techniques to be adhered to in the conduct of aircrew combat missions. Specific countermeasures will be dictated by the situation and are inappropriate for inclusion in the SOP.

4. Procedures: Procedures in this portion of the annex should be designed with the unit mission, threat, and combat environment (climate and terrain) in mind. Some procedures applicable to modern warfare that should be established in an annex of this nature are listed below.

a. *Premission planning and coordination.* Included should be minimal safety and coordination measures necessary to insure the aircrew starts the mission with a reasonable chance of completion and also to insure the mission is tied into the combined arms team concept of combat operations.

(Classification)

(Classification)

ANX—(ABCS) to SOP #_____

(1) Weather forecast and check.

(2) Operations (S3) and intelligence (S2) briefings.

(3) Safety requirements and survivability equipment (survival vest, protective mask, etc.).

(4) Coordination with supported unit commander/S3.

(5) Route reconnaissance and planning procedures.

(6) Support requirements (fire support, air traffic control (ATC), logistics, etc.) and planning.

(7) Airspace management coordination (IFF codes and modes, air corridors, altitude and airspace restrictions, etc.).

(8) Aircrew briefing procedures.

b. *Flight procedures.* Included should be general procedures that optimize aircraft survivability based on the terrain and threat.

(1) Flight altitudes and modes in relation to the front line of own troops (FLOT) and threat tactical situation. For example, the flight altitudes might be no higher than 500 feet from 20 to 40 kilometers from the FLOT; low-level from 10 to 20 kilometers from the FLOT, contour level from 5 to 10 kilometers from the FLOT; and nap-of-the-earth (NOE) 5 kilometers and closer to the FLOT. Flight modes might be traveling mode when enemy contact is not likely, traveling overwatch when contact is possible, and bounding overwatch when enemy contact is imminent.

(2) Standoff distance in relation to Threat weapon systems.

(3) Targeting, hand-off, and engagement procedures.

(4) Exposure times.

(5) Decoy techniques during engagements.

c. *Flight routes.* Included should be procedures that optimize survivability in relation to the tactical situation. Examples might be—

(Classification)

(Classification)

ANX—(ABCS) to SOP #_____

(1) No closer than _____ kilometers to known enemy antiaircraft artillery (AAA) emplacement, if possible.

(2) Should include, as a minimum, a start point (SP), _____ checkpoints (CP), and _____ release points (RP).

(3) No closer than _____ kilometers to friendly air defense artillery/artillery positions.

(4) Will not use prominent terrain features or built-up areas for flight paths/checkpoints, if possible.

(5) Will not make approaches/ascents from/to altitudes direct to/from friendly positions.

(6) Will designate primary and alternate pickup zones (PZ) or landing zones (LZ) and firing positions.

d. *Communications.* Specific communications procedures should be referred to and included in a separate communications annex. Procedures should—

(1) Include communications security (COMSEC) principles in relation to use or nonuse of radio communications.

(2) Emphasize good premission planning and briefings to lessen communications requirements.

(3) Emphasize teamwork.

(4) Illustrate alternate codes, signals, and methods for communications when operating under radio silence or in an electronic warfare (EW) environment.

e. *Nuclear, biological, chemical (NBC) operations.* Specific procedures should be referred to and included in a separate NBC annex. Procedures should include—

(1) Use and wearing of protective equipment.

(Classification)

(2) Decontamination of personnel and equipment.

(3) Protective countermeasures to be employed while conducting a flight mission.

(4) Monitoring requirements.

(5) Maximum dose rates in relation to time in a nuclear environment.

f. *Reduced-visibility operations.* Included might be procedures for—

(1) Visibility and ceiling requirements for safe flight operations.

(2) Required equipment and its use and care.

(3) Flight planning requirements such as air traffic control and navigational aids (NAVAID), maps, charts, navigation techniques, and approach and departure procedures.

(4) Aircraft formations and flight separation requirements.

(5) Inadvertent instrument meteorological conditions (IMC) procedures.

(6) Reduced-visibility flight time limitations and rest requirements.

(7) Aircraft lighting procedures and preflight requirements.

(8) IMC emergency procedures when engaged by Threat AAA systems.

g. *ASE.* Included should be procedures for the use and care of ASE. Training requirements should be referred to and included in the unit training SOP. User procedures might include—

(1) Operational requirements and restrictions in relation to COMSEC and an EW/nuclear environment.

(2) Maneuver procedures in response to radar warning receiver (RWR) indications.

(3) Aircraft survivability equipment (ASE) countermeasure procedures in relation to RWR indications and various Threat weapon systems.

(Classification)

ANX—(ABCS) to SOP #_____

h. *Threat AAA and missiles.* Included might be—

(1) Engagement parameters and procedures for various Threat weapon systems.

(2) Engagement restrictions for certain Threat weapon systems.

(3) Maneuver countermeasure procedures applicable to detection avoidance or evasion when being tracked or engaged.

(4) Required reports or coordination procedures upon locating or being engaged by Threat weapon systems.

i. *Air-to-air combat.* May include—

(1) Rules of engagement such as "only in self-defense" or "defense of friendly forces."

(2) Maneuver procedures when being engaged by Threat aircraft.

(3) Support coordinating procedures and requirements.

5. Responsibilities.

a. *Unit commander.* The unit commander is responsible for advising his immediate commander or the supported unit commander, as appropriate, on procedures and restrictions as set forth in this annex. He is responsible for unit aircrew countermeasure and survivability training. Also he is responsible for insuring that these personnel are aware of established procedures and that these procedures are adhered to during combat flight operations.

b. *Platoon leaders.* Platoon leaders are responsible to the unit commander for—

(1) Insuring subordinates read, understand, and comply with procedures set forth in this annex.

(2) Advising him on training requirements to support procedures as set forth in this annex.

(3) Keeping him current on countermeasure and survivability training proficiency.

(Classification)

(Classification)

ANX—(ABCS) to SOP #_____

(4) Recommending changes to the procedures set forth in this annex.

c. *Aircrew personnel.* Aircrew personnel are responsible to platoon leaders for—

(1) Compliance of procedures as set forth in this annex.

(2) Recommending changes, as required, to procedures contained in this annex.

(Classification)

GLOSSARY

AAA—antiaircraft artillery
AAD—area air defense
AADC—area air defense commander
AADCP—Army Air Defense Command Post
AAG—Army artillery group
AAH—advanced attack helicopter
ABCS—aircraft battlefield countermeasures and survivability
ACA—airspace control authority
ACP—air control point
AD—air defense
ADA—air defense artillery
ADCP—Air Defense Command Post
ADF—automatic direction finder
AFCC—Air Force Component Commander
AGL—above ground level
ALO—air liaison officer
AM—amplitude modulated
AME—airspace management element
ANVIS—aviator's night vision imaging system
APC—armored personnel carrier
ASE—aircraft survivability equipment
ASH—advanced scout helicopter
ATC—air traffic control
ATGM—antitank guided missiles
BIT—built-in test
BOC—battalion operation center (AD)
CAME—corps airspace management element
CAS—close air support
cml—chemical
C-E—Communications-Electronics
CEOI—Communications-Electronics Operation Instructions
CEWI—combat electronic warfare intelligence
COMAFFOR—Commander, Air Force Forces

COMSEC—communications security
CP—command post/checkpoint/concrete piercing
CRC—control and reporting center
CRP—control and reporting post
CRTA—chief of rocket troops and artillery
CTOC—corps tactical operations center
CW—continuous wave
DAG—division artillery group
DAME—division airspace management element
DASC—division air support center
DF—direction finding(er)
div arty—division artillery
DS—direct support
DTOC—division tactical operations center
ECCM—electronic counter-countermeasure
ECM—electronic countermeasure
EMP—electromagnetic pulse
est—estimate
EW—electronic warfare
FA—field artillery
FAC—forward air controller
FACP—forward air control post
FARP—forward arming and refueling point
FCC—Flight Coordination Center
FDC—fire direction center
FDO—fire direction officer
FFAR—folding-fin aerial rocket
FFE—fire-for-effect
FIST—fire support team
FLIR—forward looking infrared radar
FLOT—front line of own troops
FM—frequency modulated
FO—forward observer
FOC—flight operations center
FSE—fire support element
GCA—ground controlled approach
GS—general support
HC—smoke

HE—high explosive
HELLFIRE—helicopter-launched, fire-and-forget (modular missile)
HF—high frequency
hr—hour
IAW—in accordance with
ICM—improved conventional munitions
IFF—identification, friend or foe (radar)
IFR—instrument flight rules
IFV—infantry fighting vehicle
Illum—illumination
ILSAA—improved lighting system for Army aircraft
IMC—instrument meteorological conditions
INS—inertial navigation system
ir—infrared
kg—kilogram
km—kilometer(s)
Kmph—kilometers per hour
KT—kiloton
LZ—landing zone
m—meter
MCLOS—manual command line-of-sight
MEDEVAC—medical evacuation
MIJI—meaconing, intrusion, jamming, and interference
mm—millimeter
MOPP—mission-oriented protection posture
MPSM—multipurpose submunition
MWO—modification work order
NAVAID—navigational aid
NBC—nuclear, biological, chemical
NDB—nondirectional radio beacon
NH—night hawk
NM—nautical mile
NOE—nap-of-the-earth
NVG—night vision goggle(s)
OP—observation post
OPCON—operational control
OPORD—operation order
OWL/D—optical warning laser detector

PD—point detonating
PDDA—power-driven decontaminating apparatus
PGM—precision-guided munitions
POL—petroleum, oils and lubricants
psi—pounds per square inch
PW—prisoner of war
PZ—pickup zone
RADIAC—radiation, detection, indication, and computation
RAG—regimental artillery group
rd—round
REC—radio electronic combat
RF—radio frequency
RP—release point (ground traffic)
RWR—radar warning receiver
S—short
SACLOS—semiautomatic command line-of-sight
SAM—surface-to-air missile/send-a-message
SIGINT—signal intelligence
SLAR—side looking airborne radar
SOP—standing operating procedure
SOTAS—standoff target acquisition system
SP—self-propelled/start point
STB—supertropical bleach
STRIKEWARN—warning of a friendly nuclear strike
tac—tactical
TACAIR—tactical air
TACC—tactical air control center
TACP—tactical air control party
TACS—tactical air control system
TEL—transporter-erector-launcher
TOC—tactical operations center
TOW—tube-launched, optically tracked, wire-guided (missile)
TV—television
UHF—ultra high frequency
unk—unknown
UTTAS—utility tactical transport aircraft system
UW—upwind

VHF—very high frequency
VMC—visual meteorological conditions
VT—variable time
WP—white phosphorous

FM 1-101

5 FEBRUARY 1982

By Order of the Secretary of the Army:

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General, United States Army
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