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**FM 44-8**

**FIELD MANUAL  
44-8**

**Headquarters  
Department of the Army  
Washington, DC, 30 December 1981**

**FM 44-8**

**SMALL UNIT SELF-DEFENSE  
AGAINST AIR ATTACK**

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# PREFACE

Air Defense Artillery is a scarce commodity on the battlefield. Those resources that are available will be dedicated to the protection of assets deemed by commanders to be critical to the success of their tactical plan. This will leave critical assets that cannot protect themselves against air attack. These units and facilities ***must protect themselves***. This field manual is addressed to the commanders of these unprotected units. It explains the air threat to small units on the ground and places the threat into its proper perspective. It then explains how ground commanders can protect their units from air attack through the use of passive and active air defense measures.

Users of this manual are encouraged to submit recommended changes or specific comments to improve the publication. Comments should be keyed to the specific page and line of text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be prepared on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to:

**Commandant  
US Army Air Defense School  
Attn: ATSA-TDL  
Fort Bliss, Texas 79916**

## CHAPTER 1 Introduction

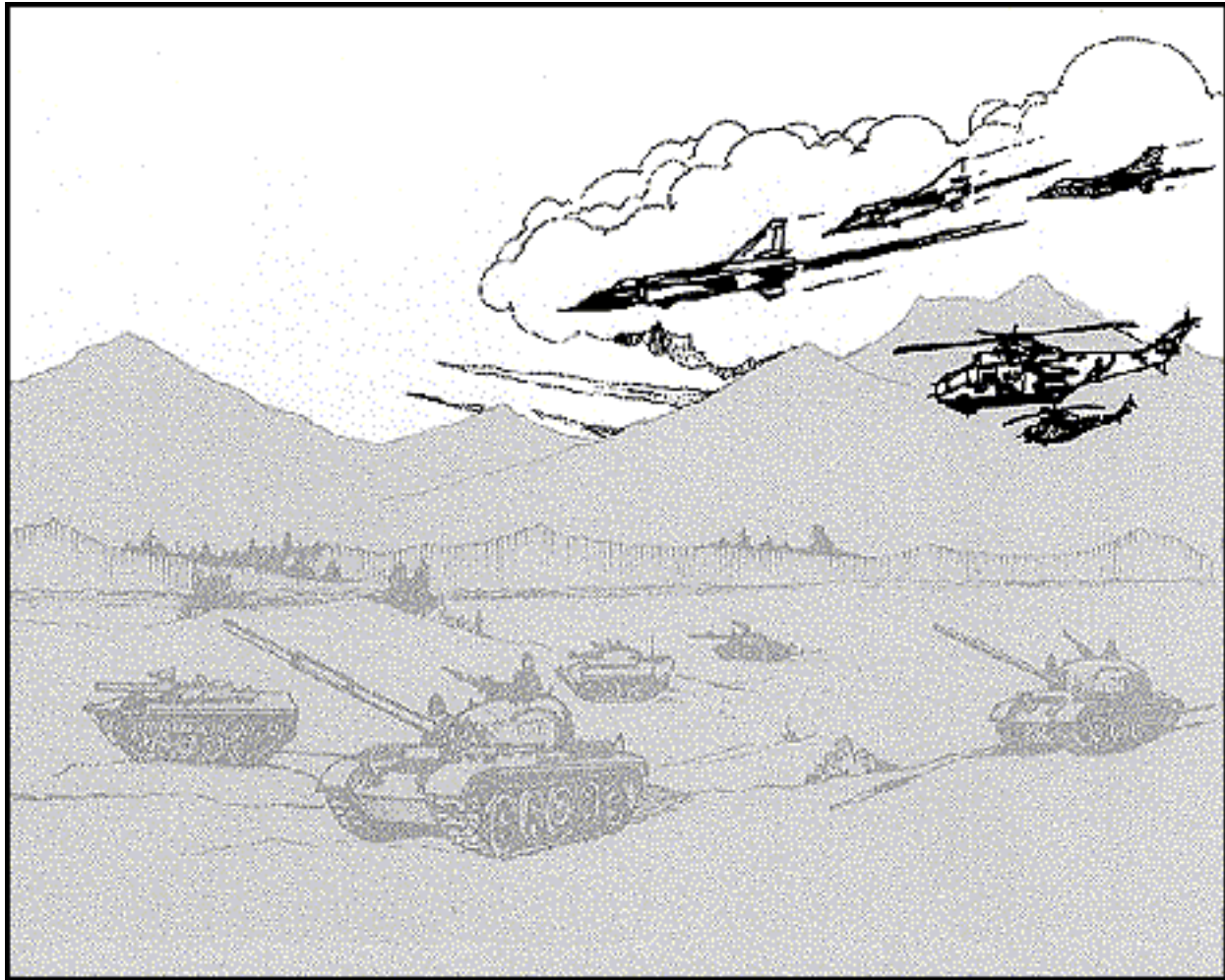


Figure 1-1.

In the past US Army forces have fought on the battlefield with little concern about attack from the air. Troops and convoys, were occasionally bombed or strafed with machinegun or cannon fire, and our forces enjoyed the luxury of air superiority most of the time.

The days of total supremacy are behind us. Our potential enemies could have more aircraft than we do, and we can expect that they will gain control of the airspace over sectors of the battlefield from time to time. When this happens, units will be attacked from the air as well as from the ground. Our potential enemies consider their air forces to be an extension of their field artillery. Their ground attack aircraft and attack helicopters operate as a part of the combat force and have the mission of supporting the attack by destroying the opposing force's maneuver units, lines of communications, command and control facilities, and logistical support means.

Ground commanders have naturally concentrated their attention toward winning the land battle and have left the job of controlling the air over the battlefield to the Air Force and air defense artillery. This is no longer possible. Ground commanders now must fight within the confines of an airland battle and their survival to win the land battle demands that they be prepared to counter the threat from the air. The first step in being prepared requires an understanding of the enemy's air attack doctrine and capabilities.

## CHAPTER 2 The Threat

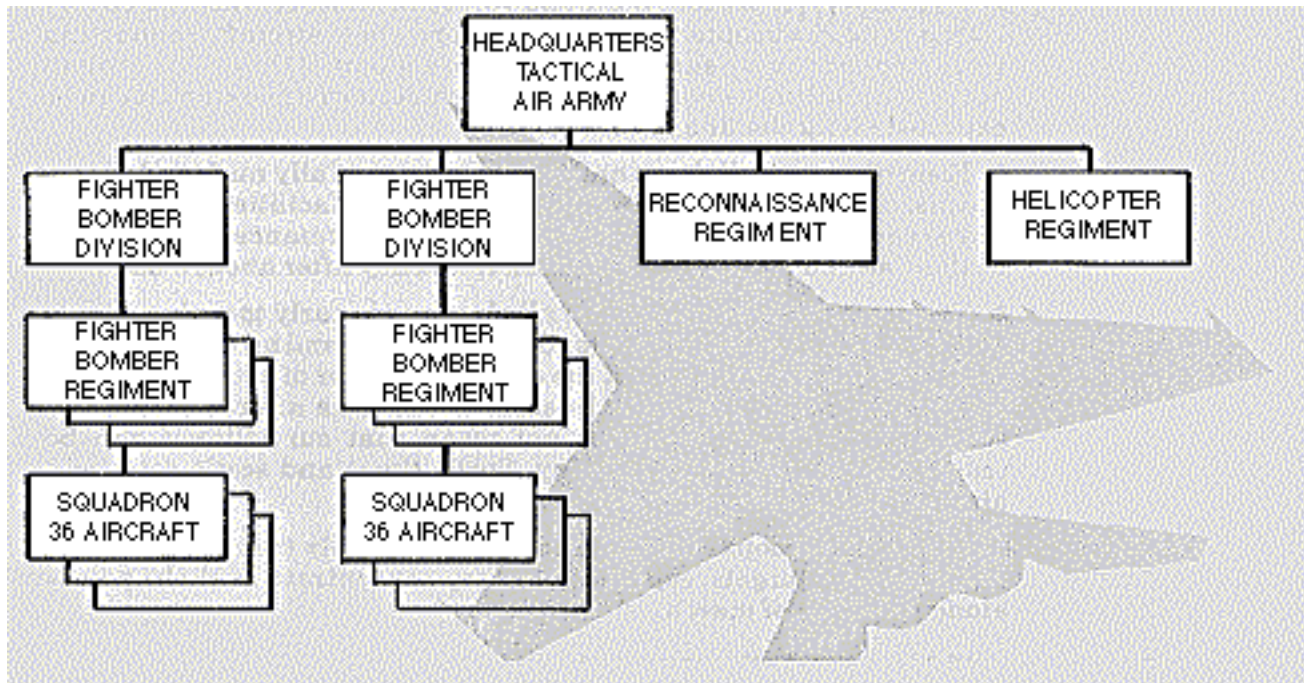


Figure 2-1. Tactical Air Army

In the Threat military scheme, air support of ground operations is provided by a Tactical Air Army consisting of two fighter bomber divisions, a reconnaissance regiment, and a helicopter regiment. Each fighter bomber division usually has fighter or fighter bomber regiments assigned to it. Each regiment normally has a complement of 36 aircraft organized into 3 squadrons. Each squadron has four flights of three aircraft. Their doctrine recognizes that highly organized coordination among air, ground, and naval forces is required to be successful on the modern battlefield. In this context tactical airpower is fully integrated into the task of supporting the overall mission, and air divisions or regiments may be placed under the command of ground armies for specific operations.

Threat fighter units furnish air cover for ground units and operational areas. Air strikes are considered an extension of artillery fire. The greatest emphasis is placed on *preplanned* strikes against control posts, tactical nuclear delivery systems, command and communications elements, artillery units, and reserve elements. It can be anticipated that attack helicopters and subsonic aircraft will be used along the line of contact, particularly on antiarmor missions. Although the importance of attacking targets of opportunity is recognized, this tactic is given less emphasis than it is in Western air forces. Rather than attacking targets of opportunity, armed reconnaissance usually has a primary purpose of locating and attacking enemy reserves and mobile targets not previously revealed by photography and visual observation.

Our potential enemies, theoretically, can sustain a sortie rate of four to five missions per day per aircraft. Actual sortie rates, however, are more a function of pilot stamina and logistical support than of aircraft characteristics. Tactical air armies expect to achieve about two to three sorties per day in the initial period of the war (estimated 3 days) and to sustain a rate of about one or two sorties per day thereafter.

From this doctrine emerges the following threat considerations which must be taken into account by the ground commander:

- The major threat to US ground forces in contact with the enemy comes from helicopters and



low-performance aircraft conducting antiarmor and troop support missions in support of the enemy ground operation. Only occasional attack by high-performance aircraft can be expected along the line of contact.

- Elements in the division and corps rear, especially nuclear delivery means, command and control facilities, logistic facilities, and reserve forces can expect repeated attacks by high-performance aircraft early in the war and a lessening of attack frequency after about 3 days.
- The most dangerous time for all elements is early morning. Pilots are rested and their aircraft are repaired, fueled, and armed. They will undertake their first sortie of the day. The danger of attack increases again near noon and again in early evening as aircraft depart on subsequent sorties. This does not mean that surveillance can be relaxed at other times of the day. Sortie times and sortie rates will always be a function of the battle in progress.
- Convoys of troops moving to contact and supply trains will always be vulnerable targets, especially as they concentrate at choke points along the route of march.

The threat will be attack helicopters and subsonic aircraft in the forward area near the line of contact and ground attack fighter bombers in the rear areas and against convoys. Because these two types of aircraft differ radically in their capabilities and in the manner in which they conduct tactical operations, they present distinctly different threats.

## THREAT HELICOPTER GROUND SUPPORT



Figure 2-2. Threat Helicopter Ground Support

Soviet helicopter forces supporting ground operations operate essentially the same as US helicopter forces. While relatively slow, they are agile and make good use of the cover and concealment offered by folds in the earth and by trees. They carry armament ranging from antitank guided missiles (ATGM) and 57-mm, free-flight, air-to-surface rockets (FFAR) to radar-directed, four-barrel, 12.7-mm nose or chin mounted machineguns or Gatling guns. Most enemy ATGMs are radio-controlled and can engage and destroy any armored vehicle at standoff ranges of approximately 3 kilometers. Using sneak-and-peek techniques and heavy armament, attack helicopters can deliver a devastating blow against exposed maneuver units. Their lethality, however, is somewhat softened by practical considerations. They must detect a target to engage it and must expose themselves long enough to aim and fire their weapons. In the case of some ATGMs, attack helicopters must maintain track on both the missile and the target throughout the missile's flight which can be as long as 23.2 seconds. The 57-m FFAR is an area weapon and is effective against exposed troops and

lightly armored vehicles at ranges greater than 1,0 meters. The 12.7-m Gatling gun is roughly equivalent to our .50 caliber machinegun in range and lethality.

High-performance aircraft, operating in a ground attack role, attack at relatively high speeds. They normally operate under centralized control and are directed against preplanned targets in the division and corps rear where they deliver ordnance selected to optimize destructive effects on the target to be attacked. If they have ordnance remaining after completing their primary mission, it may be released to attack targets of opportunity on their return flight. Whether against preselected targets or against targets of opportunity, the attack will usually include a high-speed, low-level penetration run to near the target area to avoid low- and medium-altitude air defense.

## POPUP ATTACK

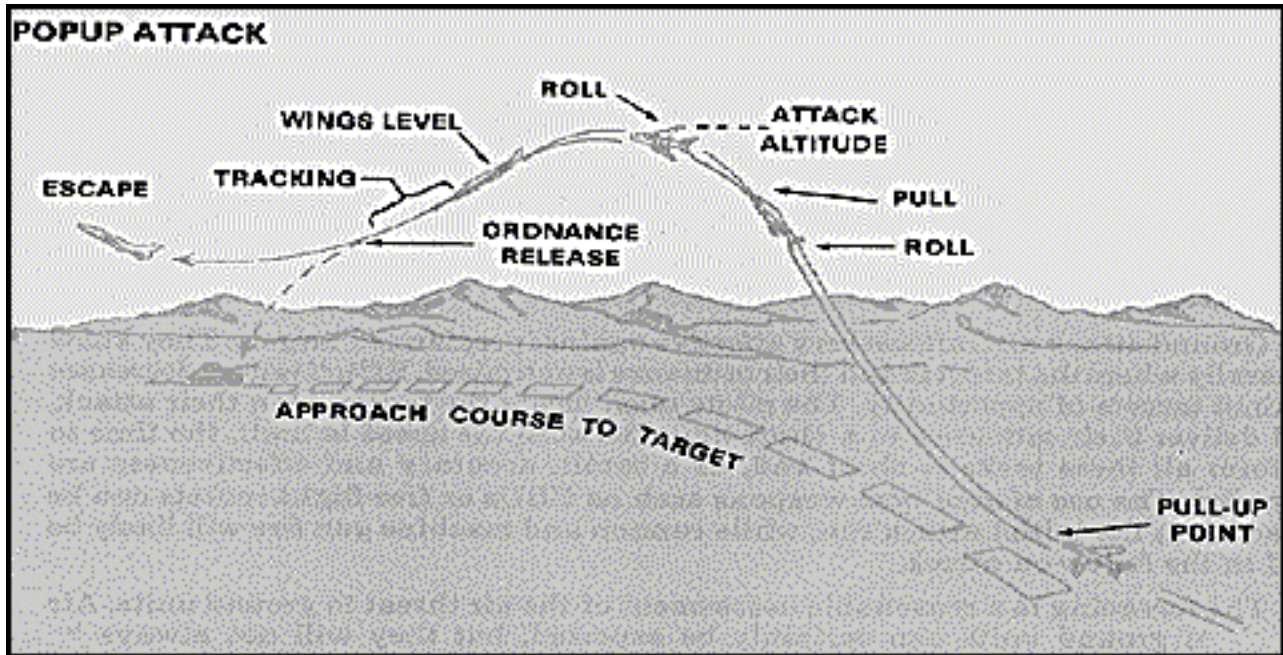


Figure 2-3. Popup Attack

On nearing the target, the aircraft pops up to acquire the target and then dives to the ordnance release point. Following ordnance release, the pilot pulls up and executes an escape maneuver or he may execute a reversing maneuver and come back over the target firing rockets or cannon.

## DIVERT ATTENTION

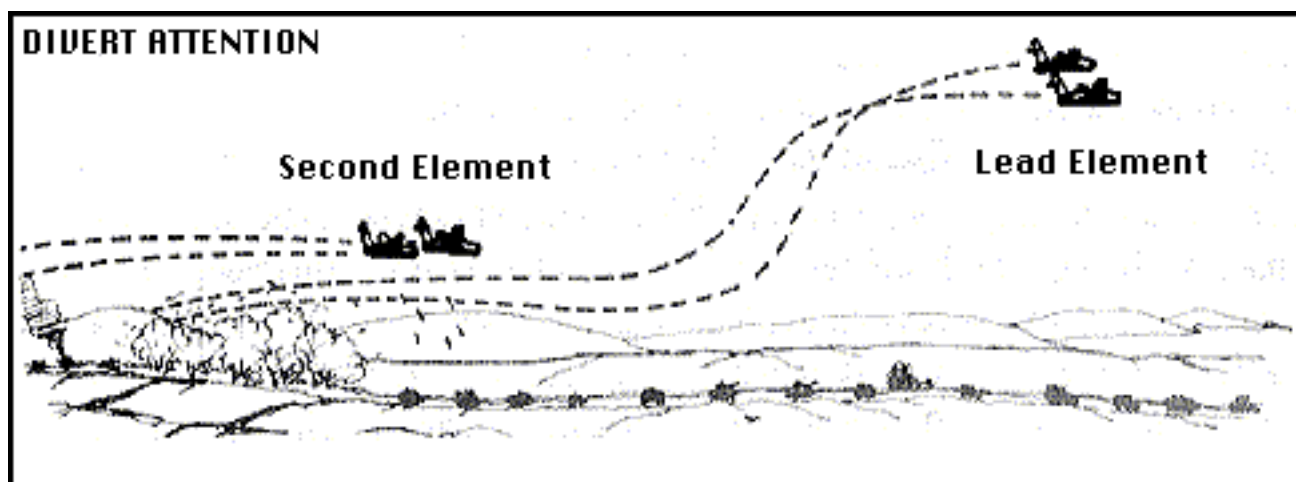


Figure 2-4. Divert Attention

The first element executes a popup maneuver. This popup is intended to divert attention until the second element attacks with a level, high-speed, low-altitude laydown of cluster bomb units (CBU) along the length of the convoy.

## REVERSING MANEUVER

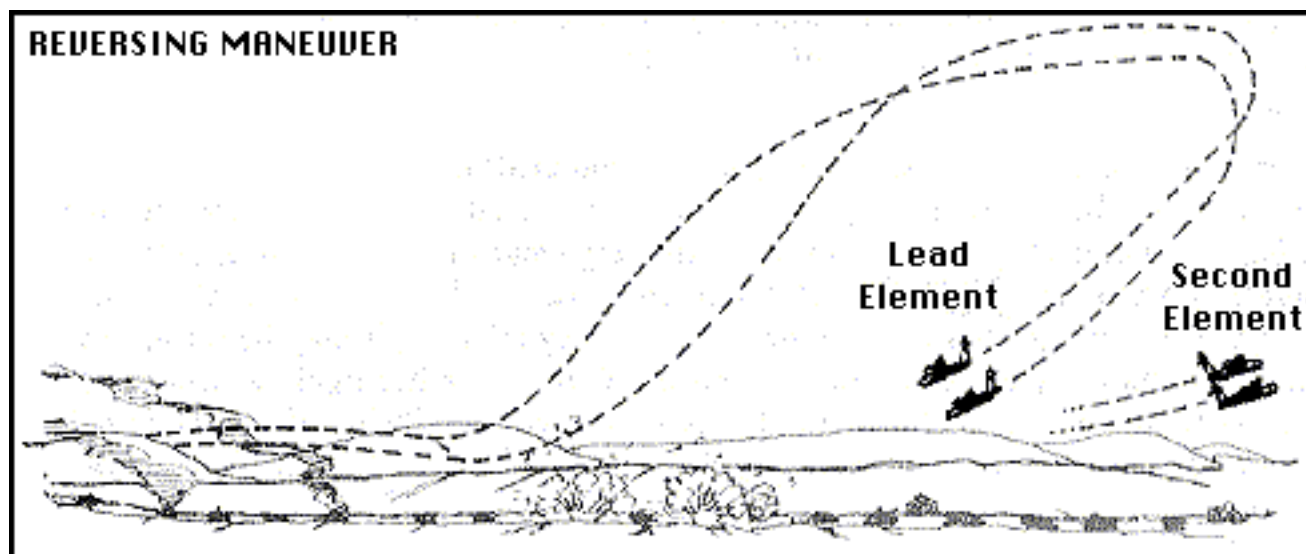


Figure 2-5. Reversing Maneuver

From the popup, the first element will have completed a reversing maneuver to come back over the column, firing rockets or machineguns or dive bombing, concentrating on undamaged vehicles.

Attacks are usually made by flights of two or four aircraft operating as a single or two pairs. The first element may pop up over the target to attract attention while the second element executes a level, high-speed, low-altitude laydown of cluster bomb units. Meanwhile, the lead element can reverse and attack the target to add to the destruction.

Ground attack aircraft are very effective against preplanned targets. They know generally where the target is



and their ordnance is optimized. Effectiveness decreases against targets of opportunity. The pilots must locate the target, plan their attack, and deliver their ordnance in a short time. Because the speed is high, the time to perform all these tasks is short and, as a result, accuracy and effectiveness are degraded. The use of area type weapons such as CBU's or free-flight rockets can be expected on the initial attack run, while cannon and machine gun fire will likely be used in the follow-on attack.

The foregoing is a reasonable assessment of the air threat to ground units. Air attack of ground units can certainly be expected, but they will not always be overwhelming. The pilots of these aircraft have problems in target acquisition, short reaction times, inaccurate deliveries, limited lethal effect, and survival. The dedicated observation of a few simple procedures outlined in the following chapters of this manual can reduce the effectiveness of enemy air attack to a point where failure to maintain friendly air superiority will not preclude, or even seriously hamper, operations on the ground.

## CHAPTER 3 Self-Defense Measures



Figure 3-1.

Air defense assets in the division are consolidated in the division's air defense battalion. These assets are allocated according to priorities established by the division commander and deployment based on guidelines for the employment of air defense artillery weapons. The commander's priorities for air defense spring from the scheme of maneuver, the character of the air threat, and the criticality, vulnerability, and recuperability of combat assets essential to the success of the ongoing or planned operation. Because air defense assets are scarce, many units and facilities will not receive dedicated air defense protection. These units and facilities must be prepared to protect themselves.

The first step in small unit self-defense against air attack is psychological. Commanders and their troops must accept as a foregone conclusion that the enemy has the capability to attack from the air and that doctrine prescribes that the enemy will exercise that capability. Air attack is not just a probability—it is a certainty. The unit, however, does not stand helpless before this threat. Many simple, commonsense measures can be taken by a small unit to avoid attack and to limit damage if attacked. If these measures fail, the unit can fight back. Passive air defense measures, if routinely followed, will reduce the probability of attack and will limit damage if attack cannot be avoided. Active air defense measures provide a technique for shooting back.

Because the action is fast (a few seconds) and because the response must be closely coordinated and tightly controlled, it is recommended that actual air defense measures be controlled at the platoon level. At company level, the number of troops involved is such that response is likely to be too slow while at section and squad level, the number of weapons involved is such that the volume of fire needed for an effective defense is difficult to achieve.

### PASSIVE AIR DEFENSE MEASURES

Passive air defense includes all measures other than active defense, taken to minimize the effects of hostile air action. They are your first line of defense, and they consist mostly of those same things that you do routinely to defend yourself against ground attack. Passive defense measures are of two types:



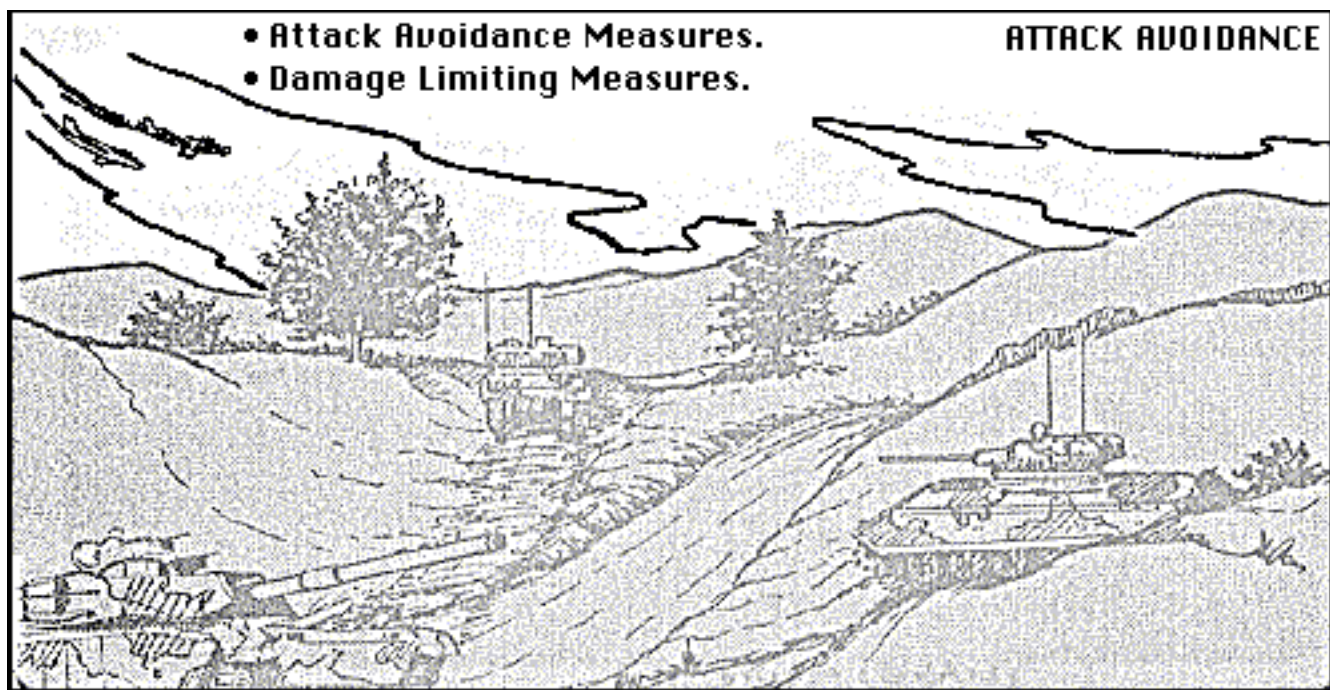


Figure 3-2.

Attack avoidance measures are those actions taken to avoid being seen by the enemy--concealment and, lacking concealment, camouflage. The philosophy is that what can be seen can be hit, and if you can't be seen, the probability of being hit diminishes to near zero. The techniques, procedures, and materials used for concealment from aerial observation are the same as used for concealment from ground observation. Only the perspective is changed.

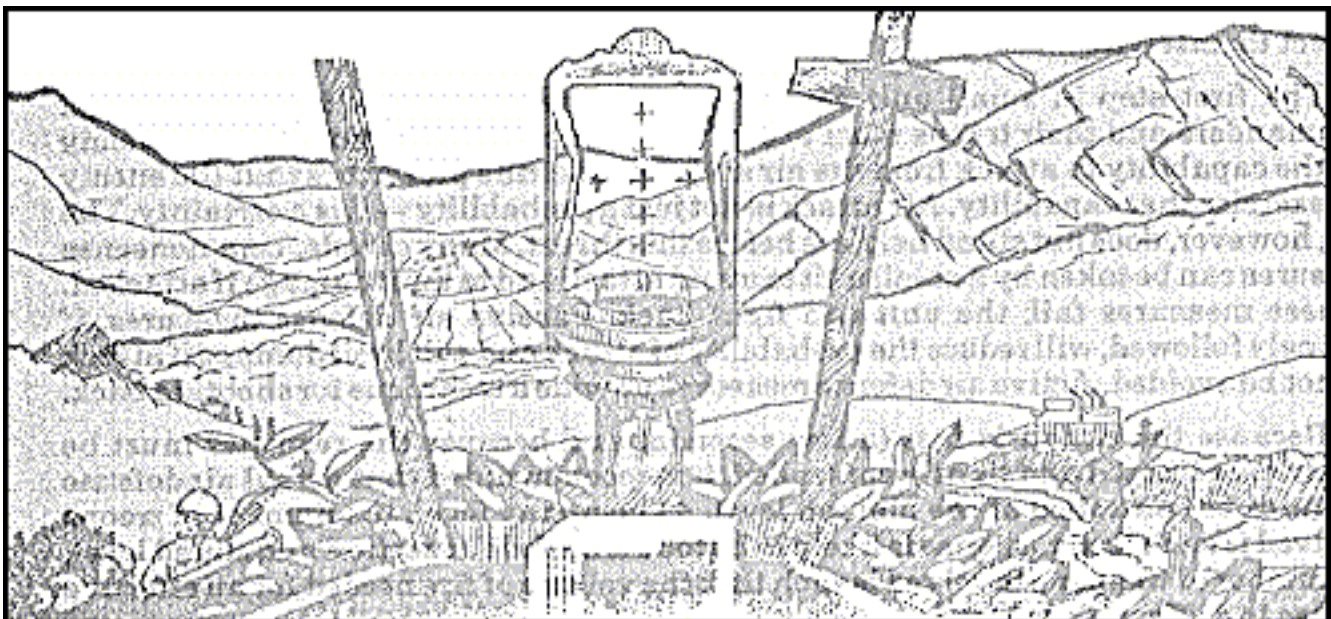


Figure 3-3.

Look at the preceding picture and place yourself mentally in the following situation. First you are an enemy helicopter pilot looking for a target. You have been directed to the target but you must pop up and acquire it visually to aim and fire your weapon. You also know, or believe, that if you expose yourself for very long,

you are going to be detected and engaged by an air defense weapon system.

Which of these objects is going to draw your fire? Or, consider yourself the pilot of a ground attack aircraft cruising along at 400 knots looking for a target of opportunity. Which of these possible targets is going to be attacked? Do any of these targets represent your unit?

The best self-defense measures against air attack come from concealment, camouflage, and deception. It would be redundant in this publication to attempt to tell you how to conceal yourself. Several excellent publications address the subject in great detail. Refer to FM 5-20, Camouflage; FM 5-15, Field Fortifications; TM 5-200, Camouflage Materials; TC 5-200, Camouflage Pattern Painting; and TRADOC Bulletin 6, Countersurveillance and Camouflage. Just remember that for counterair purposes, the point of view is from above.

## **DAMAGE LIMITING MEASURES**

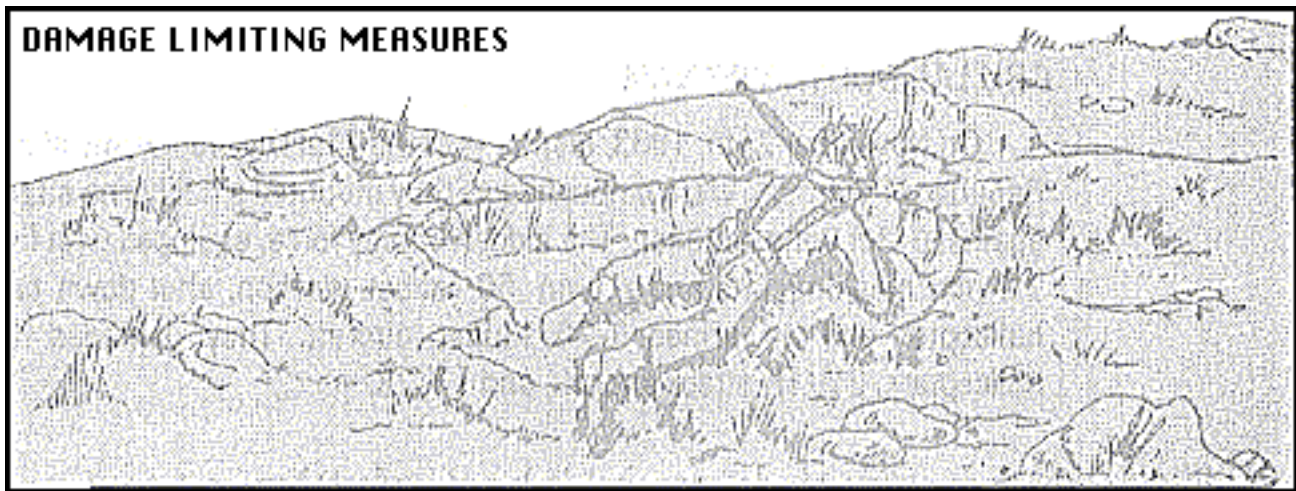


Figure 3-4.

Damage limiting measures are as simple to apply as are attack avoidance measures. They are exactly the same measures you take to limit damage from artillery attack--dispersion, protective construction, and the use of cover.

Large bombs will seldom, if ever, be used against troops on the ground. Most of the munitions that will be delivered by aerial vehicles must make a direct hit to be effective. Dispersing your troops, vehicles, and equipment will force the attacker to concentrate on a single small target that is very likely to be missed. The wider the dispersion, the greater is the potential for limiting damage. Even area weapons like the 57-mm free-flight, air-to-surface rockets and cluster bomb units become less effective if the unit is dispersed.

The use of cover, natural or manmade, acts to reduce damage and casualties. Cover can intercept the projectile before it strikes the target. It reduces the target area exposed to damage and it absorbs part of the blow. Folds in the earth, natural depressions, trees, buildings, and walls offer damage limiting cover and should be sought out and used habitually. If you are deployed on a flat plain lacking cover, digging in or sandbagging can offer some protection. If you are moving and cannot use natural cover or cannot build fortifications, try using smoke. It will make target acquisition much more difficult for the attacker.

The intent here is to emphasize the importance of passive defense against an air attack. Do everything you can to avoid the attack in the first place. Not succeeding in that aim, then at least use cover and dispersion to limit the amount of damage to your unit.



## ACTIVE AIR DEFENSE MEASURES

Active air defense is direct defensive action taken to destroy or reduce the effectiveness of enemy air attack. While your first line of defense against air attack is the constant application of passive air defense measures, you are not always master of the situation on the battlefield. You may find your unit exposed, bunched up, and in a situation where you are forced to take unnecessary casualties. If you should be attacked under these conditions, you have the option of fighting back.

This decision must consider your assigned mission and the tactical situation. It may be that your best bet is to seek cover. That way you will survive to fight again. However, you may decide to fight back by taking the attacking aircraft under fire with your organic small arms. You have the right to do this under US Army doctrine that the right of self-defense is never denied. You gain two things by fighting back. The morale and spirit of your troops will be improved by the act of shooting back at the attacker rather than standing helpless before this threat. Also, you may kill or drive the attacker off.

### CHU LAI, SOUTH VIETNAM

**On November 24th, 1963, members of the 21st Division, Army of the Republic of Vietnam, were ambushed as they mounted a heliborne attack against a Viet Cong battalion. The hidden enemy force, equipped with five 7.9-mm machineguns and a twin .50 caliber weapon, shot down one helicopter and an armed T-28 trainer aircraft. They damaged 10 helicopters, 2 A-1H attack aircraft, and 1 T-28.**

Fighting back is active air defense, but it is not undertaken as a one-on-one activity; i.e., one soldier acting independently against one aircraft. It is a coordinated group response undertaken on command and executed according to prelearned techniques. If your fires are not coordinated, you might just as well save your ammunition.

### THE RIGHT OF SELF-DEFENSE

Your right to fire at an attacking aircraft is derived from the doctrine of self-defense. You may defend your unit from direct attack but you do not engage aircraft not attacking you except on the command of the next higher authority. Even if you are under direct attack, practical considerations bear on your decisions to fire. It makes no sense at all to shoot at a helicopter attacking you from a standoff range of 3 kilometers, except perhaps with the main gun of a tank. Your decision to fire should be tempered by a consideration of the capabilities of weapons you have available to you. However, there is another side to the fire decision. While your intent in firing is to kill the attacking aircraft using small arms, it will result in a low kill probability. However, the use of coordinated group firing, using all organic weapons to make the pilots aware that they are under fire, can disturb their concentration and cause them to miss their target or abandon their attack. The pilots should be made aware that they are under fire from the ground. Nothing is more disturbing to a pilot's concentration than flying into a hail of tracers, and if practical, they should be used.

While the decision to fire is yours and is based on your judgement of the situation, the technique you should use in delivering fire is standard and must be learned beforehand.

## **VOLUME FIRE**

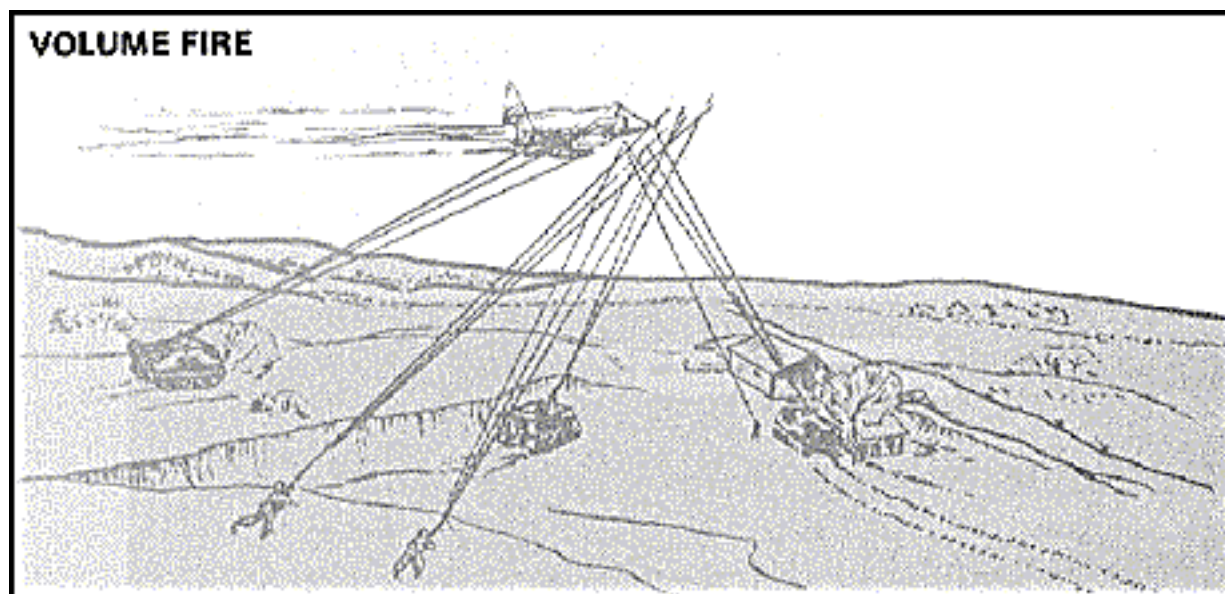


Figure 3-5.

Volume is the key to effective small arms fire at attacking aircraft. You fire every weapon you can bring to bear on the target with the idea of placing as many bullets as possible in its path. That does not mean everyone fires in some random direction. Instead, each individual selects an aiming point in front of this target and fires at that point. You do not attempt to track the target or estimate target range or target velocity.

## **JET AIRCRAFT**

Selecting the aiming point is an individual act but it is done according to a standard set of rules. The rules define the amount of lead to be taken for various classes of targets and angles of approach. Lead is taken in units of football field length. The theory is that just about everyone has played football or watched a great deal of football on television. Consequently, most soldiers have a concept of how long a football field is and can visualize a football field laid out in front of the target. When told to

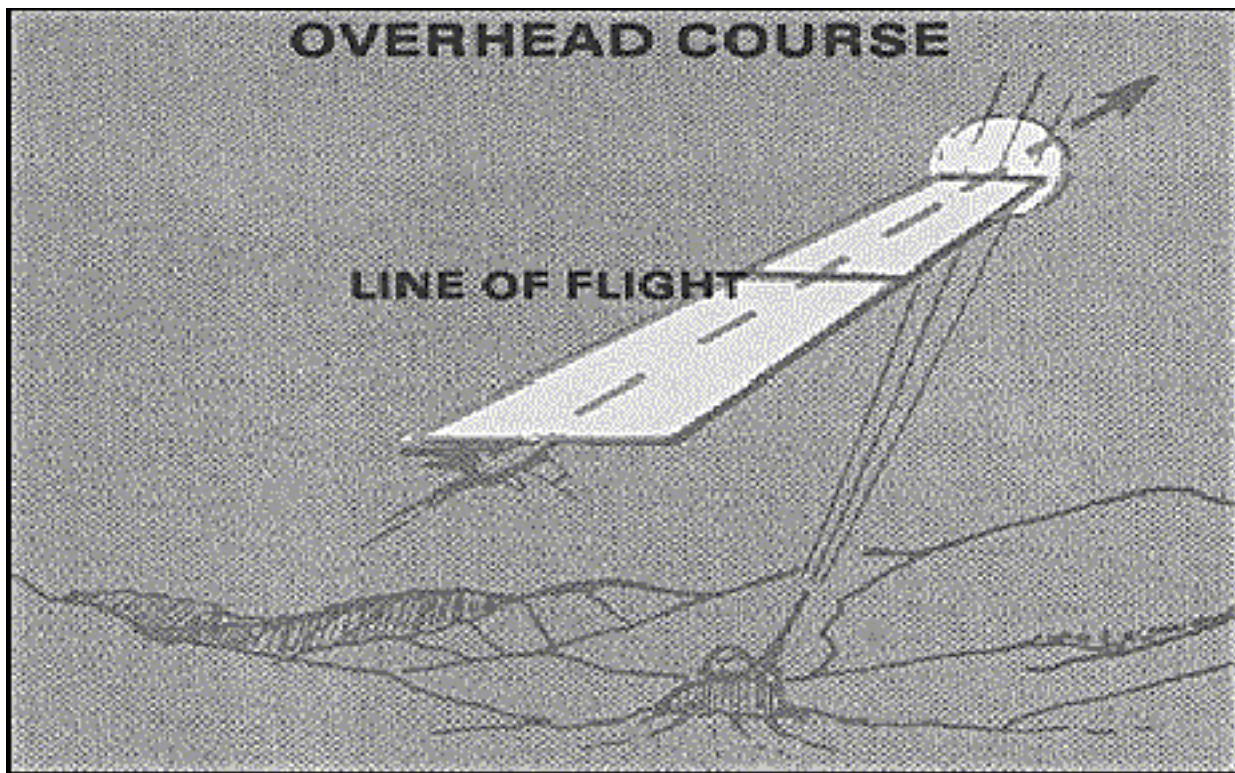


Figure 3-6.

lead the target by one football field, everyone will aim at approximately the same point in space. One person's error in making the football field estimate will be offset by another person's error, and the combination of errors will insure that fire is delivered into a volume of space in front of the target rather than on a small point. Also the differing perspectives from which the soldiers view the target will act to further distribute the fire over a volume of space.

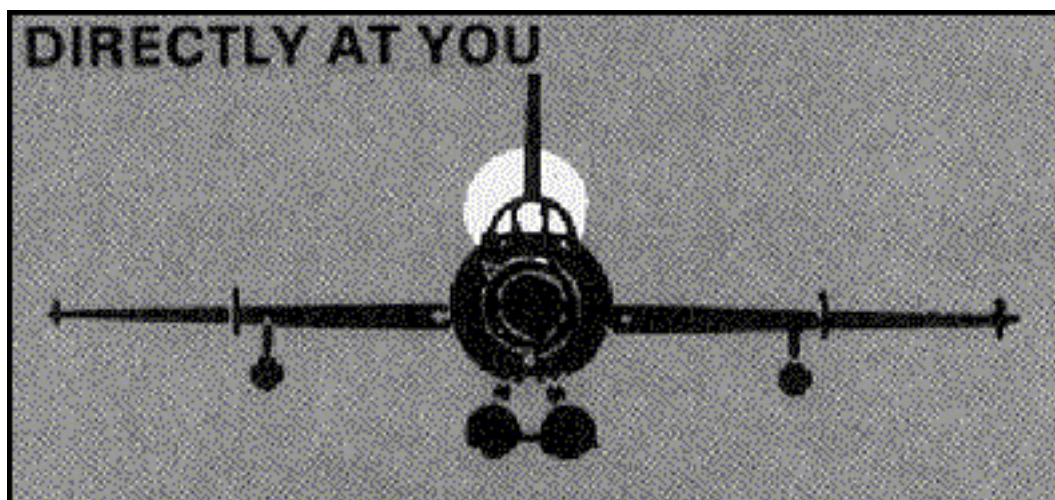


Figure 3-7.



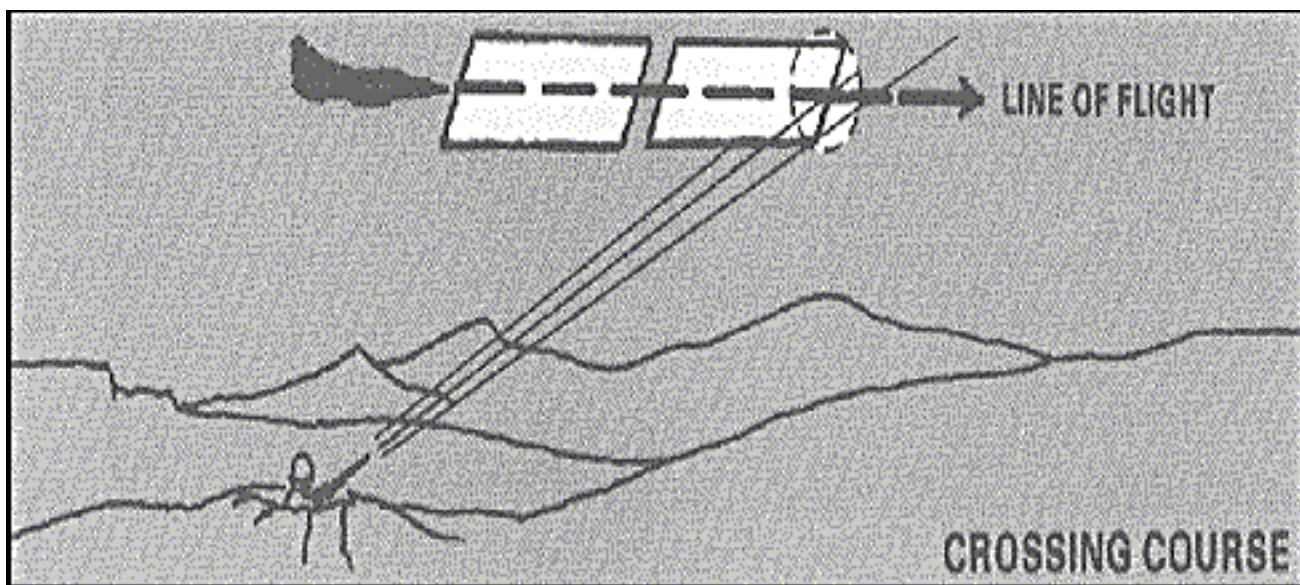


Figure 3-8.

## HELICOPTER

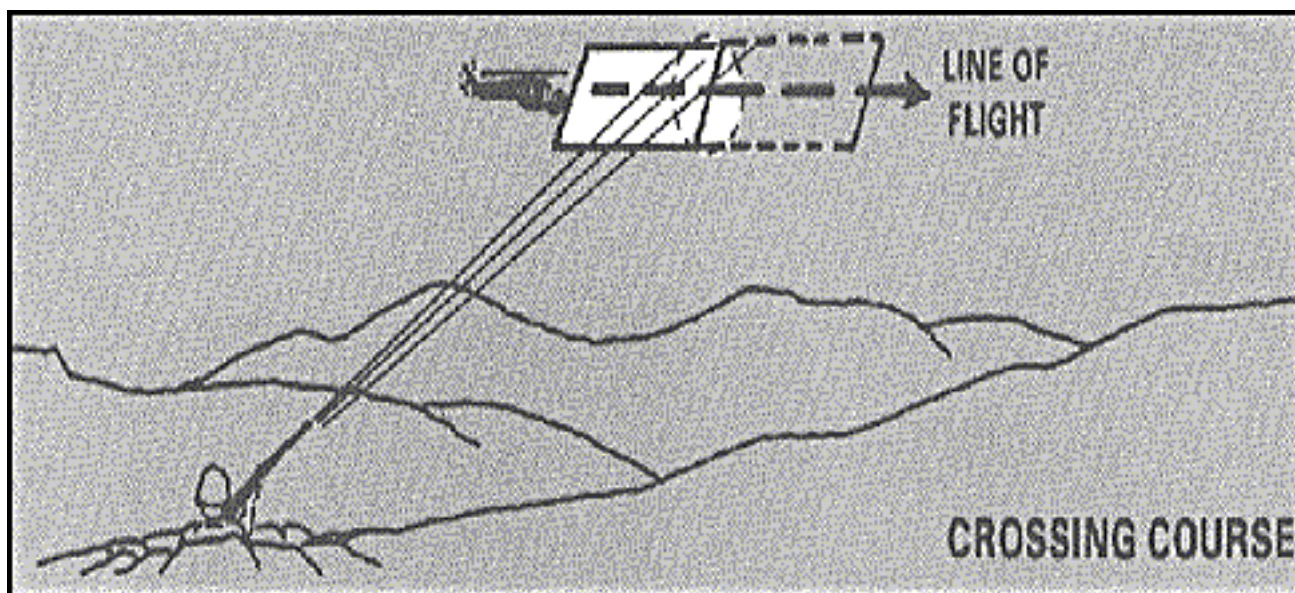


Figure 3-9.



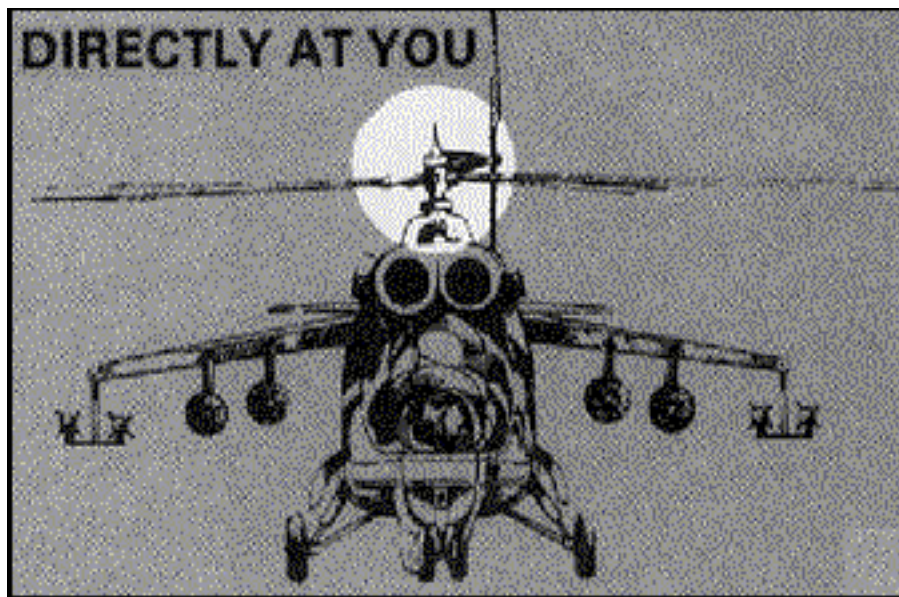


Figure 3-10.

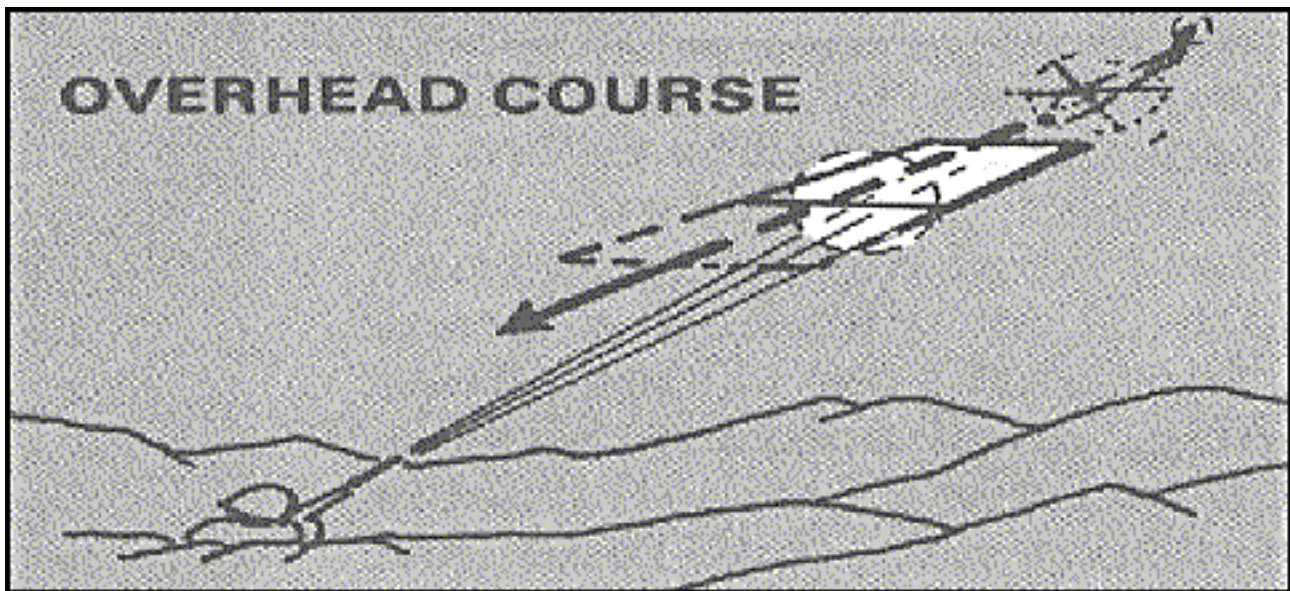


Figure 3-11.

The rules for selecting the aim point are listed in Table 3-1. They are simple, logical, and easily learned and retained.

TYPE ACFT	COURSE	AIM POINT
Jet	Crossing	Two Football Fields in Front of Nose
Jet	Overhead	Two Football Fields in Front of Nose
Jet	Directly at you	Slightly above Aircraft Nose
Helicopter	Crossing	One-Half Football Field in Front of Nose
Helicopter	Hovering	Slightly above Helicopter Body
Helicopter	Directly at you	Slightly above Helicopter Body

Table 3-1.

Precision is not important; a coordinated, high-volume fire will get results. That fire is delivered on command and not at the option of the individual. The sequence of the engagement could be as follows:

- An aircraft commences an attack on your unit.
- You, or your air sentries, spot the attacker. In either case you are alerted to the attack and decide to engage the target.
- You alert the unit. AIR ATTACK, INBOUND 5 O'CLOCK, PREPARE TO FIRE. (Methods of giving alarms are listed in table 5-1, page 5-3.)
- Each member of the unit prepares his weapon to fire by placing the weapon in full automatic mode. He locates the target, and waits for your command to fire.
- You estimate the right moment and command, FIRE.
- Each individual finds the aim point as determined by the rules (Table 3-1) and fires at that aim point until he expends his ammunition or you order CEASE FIRE.
- Everyone immediately reloads and prepares to engage follow-on attackers.

## FIRING POSITIONS

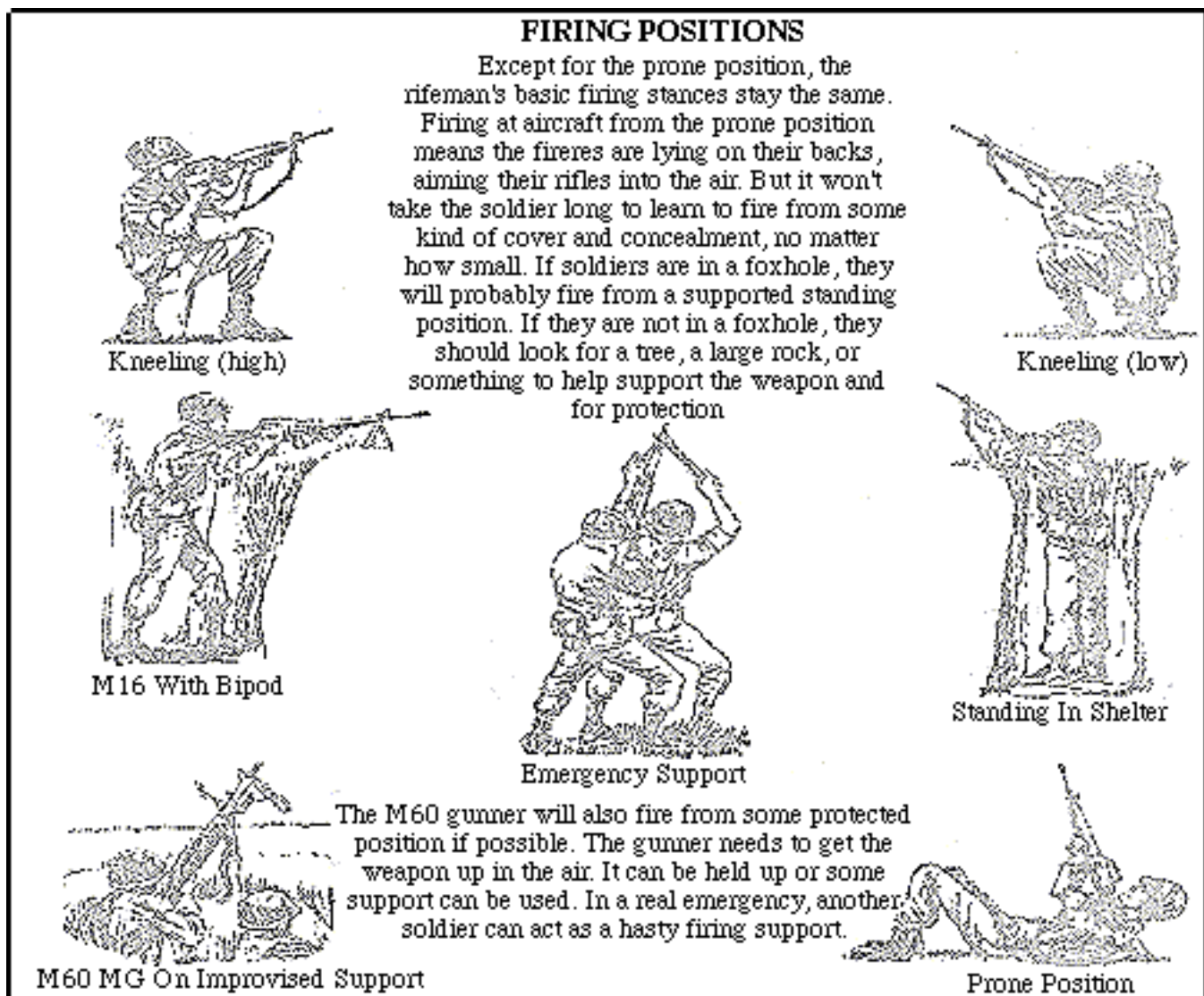


Figure 3-12.

If your soldiers are trained to apply a sequence for aircraft engagement based on the rules for selecting an aim point and can respond automatically upon command, you will have an effective air defense capability using the small arms available to you in your unit.



## CHAPTER 4 Convoy Self-Defense



Figure 4-1.

In terms of vulnerability to air attack, the convoy probably presents the most dangerous situation. Convoys are easily visible from the air. Movement along a road is hampered by shoulders, ditches, and embankments. This restricts freedom of maneuver. Additionally, since vehicles are stretched out in a long, thin line, the convoys make an excellent target. This linear array also makes command and control of a convoy difficult. Convoys represent high-value, hard-to-defend, easy-to-hit targets to enemy ground attack aircraft on armed reconnaissance missions. A high probability of air attack must be assumed in planning any convoy, and each soldier must know exactly what to do if an attack materializes.

It is not likely that all convoys will be provided dedicated air defense assets. Some convoys, therefore, must rely on organic passive and active air defense measures for protection. Passive air defense includes attack avoidance and damage limiting measures. Active air defense involves shooting back in the hope of killing or driving the attacker off.

Attack avoidance requires that you reduce your visible signature to the point where the enemy can't find you. While it is not possible for you to become invisible, every step you take in that direction decreases the likelihood that the enemy will spot you. You can do many simple, commonsense things to reduce your visible signature:

- Use the cover of darkness. If it is in any way possible, convoy only at night and under strict blackout conditions. This is by far your best defense against air attack.
- Travel during periods of inclement weather. Low clouds, rain, snow, and fog limit pilot visibility and offer good concealment. This is probably your second best means of reducing your visible signature.
- Try to eliminate the dust plume that invariably accompanies a convoy. If possible, plan your route along hard surface roads; try to avoid unpaved secondary roads. If you must travel on unpaved roads, reduce speed to reduce dust.
- Use routes that offer natural concealment. Trees and the shadows they cast are concealing. So are the shadows cast by mountain ridge lines in the early morning and late afternoon. If you must cross open



country, travel when the sun is high to avoid casting long, highly visible shadows.

## ELIMINATE GLARE

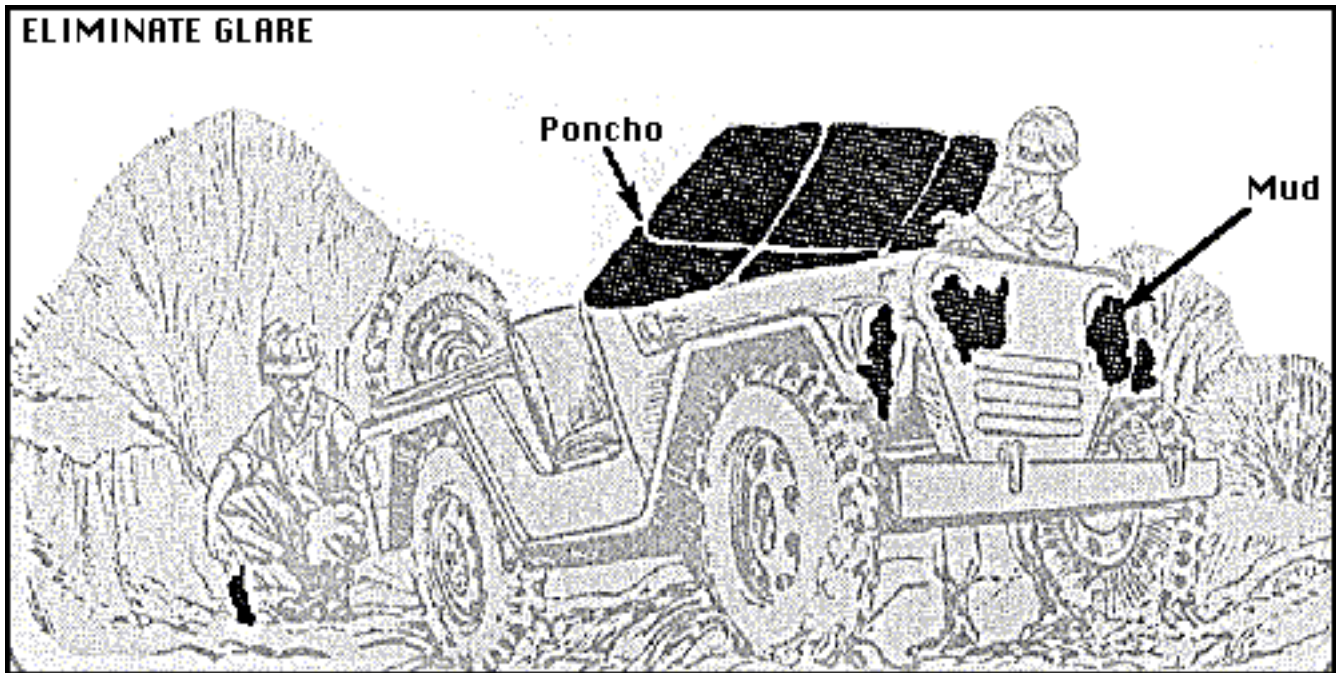


Figure 4-2.

- Be sure that every vehicle in the convoy is camouflage painted. A camouflage-painted vehicle is not easily detected from the air. Also, a vehicle reflecting light from glossy surfaces and window glass provides an easy target.

The measures listed above will help you avoid attack by making you harder to find. Even so, a convoy is a pretty visible thing, and you should plan the convoy to limit damage just in case your signature reduction efforts are not wholly successful. Cover is, of course, the best damage limiting factor.

## SELECT NATURAL COVER

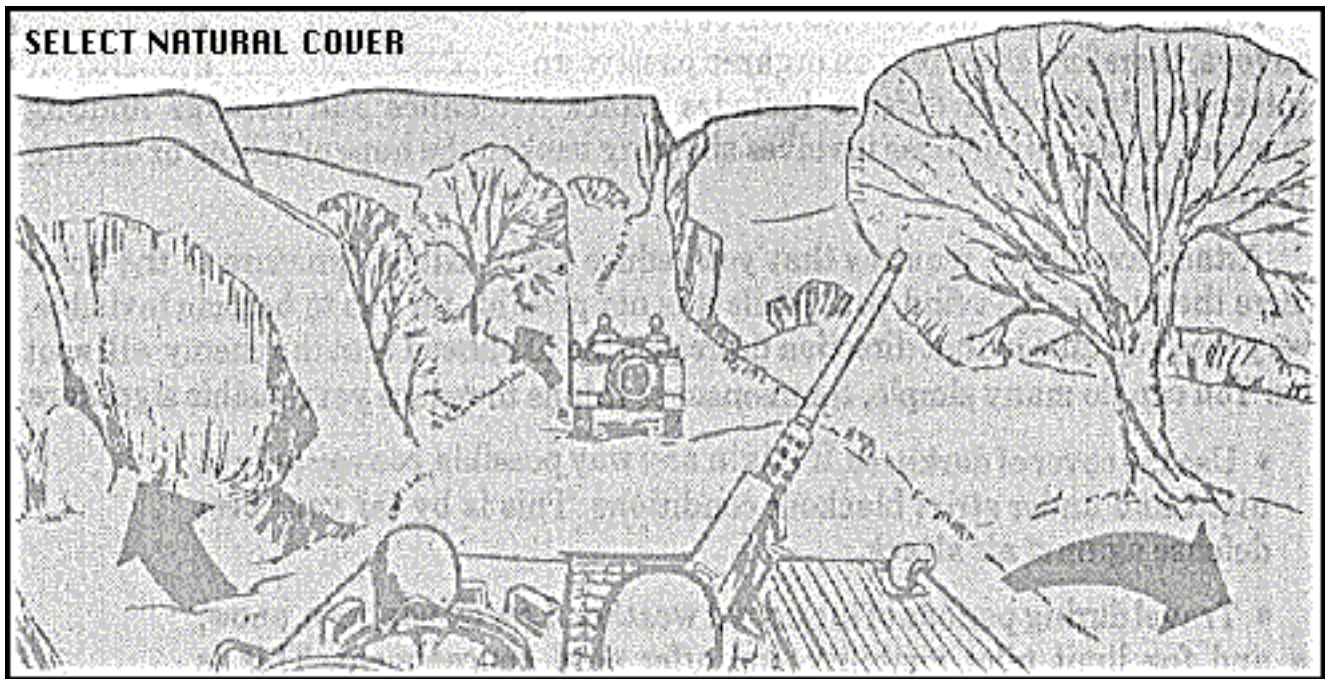


Figure 4-3.

Cover, however, is seldom available in the middle of a road. Ditches and embankments to the sides of the road offer some cover and should be used if you are attacked. Your best damage limiting measure lies in the use of dispersion to dilute target density and reduce the lethal effect of the ordnance used against you. To achieve dispersion:

- Travel in an open column with 80 to 100 meters between vehicles.
- Break the convoy into small units of about platoon size and dispatch the units separately with at least 1,000 meters between units. This procedure provides a very diluted target and increases the level of local control over each convoy element.



## USE DISPERSION

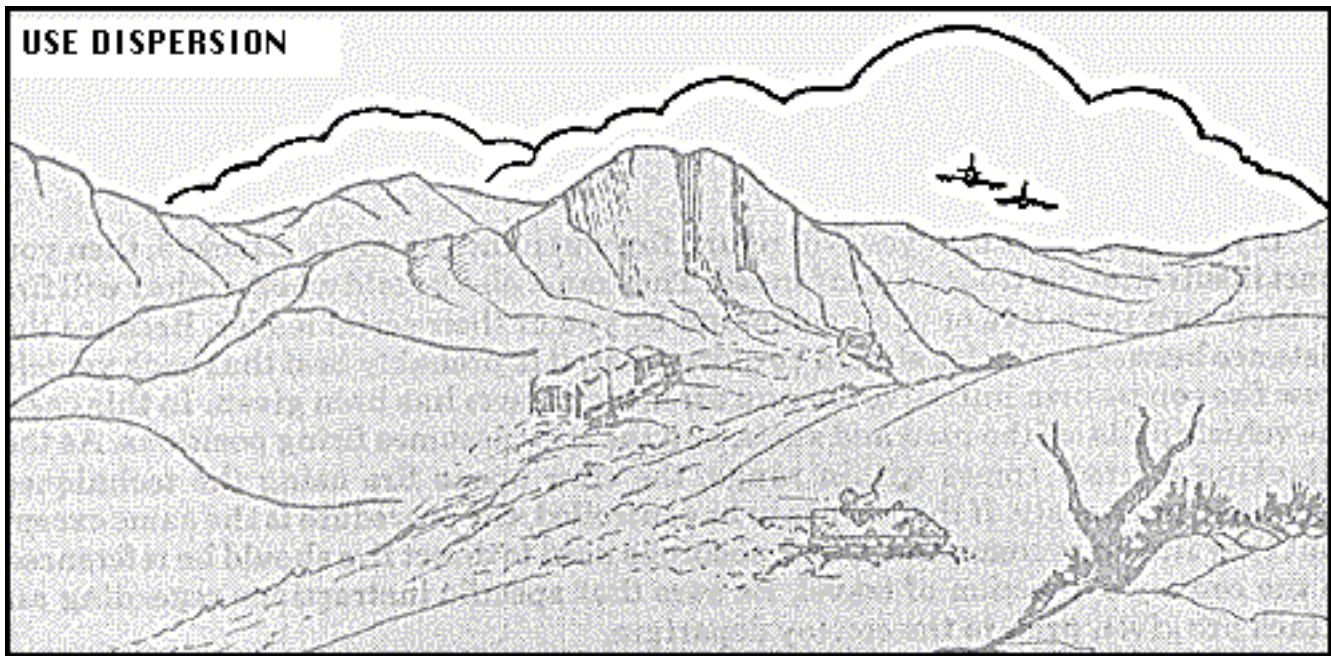


Figure 4-4.

- Make arrangements so that if an attack occurs, the vehicles move to opposite sides of the road to seek cover; i.e., the lead vehicle goes to the right, the second vehicle pulls off to the left, and so on.

The question of whether or not to use active air defense measures when a convoy comes under attack is one for local resolution. The decision must be made before the convoy hits the road so that the response can be automatic--either return fire or do not fire.

### *Reasons favoring a decision to fire are:*

- The attacking aircraft may be damaged or killed by small arms fire.
- The pilot's awareness of being under heavy fire may cause the attack to be abandoned or, through lack of concentration, cause the ordnance to be delivered inaccurately.
- Personnel take a great deal of satisfaction in being able to shoot back at an attacking foe.

### *Reasons against firing include:*

- Attack speeds will be around 300 to 400 knots so that the time during which the attacking aircraft might be within range is very short, probably not more than 1 or 2 seconds.
- In an open column, the distance between vehicles is such that a volume of fire cannot be achieved. Consequently a one-on-one situation results and effectiveness is decreased.
- It is not likely that the attacking aircraft will pass over the convoy within small arms range. The maximum effective range of the types of weapons available for convoy defense will probably not exceed 500 meters. A pilot is simply foolish if he flies to within 500 meters of his target. If he does, he is probably at the bottom of his attack dive and has released his ordnance and is executing a high-speed, high-G escape maneuver.

If your decision is that you will return fire when the convoy is attacked, then you must insure that the troops are informed. They must also be told whether they will fire on their own initiative or upon command by you or their serial leader. Because the distance between vehicles should be quite great, it is probably best that each vehicle crew fires on its own initiative once an air attack alarm has been given. In this case, the vehicle pulls

off the road and stops, and the crew assumes firing positions. As the attacking aircraft comes within range, the crew opens fire using the techniques explained previously. If their fire is to be controlled, the procedure is the same except that they fire upon command. Clock positions used to direct fire should be referenced to the convoy's direction of travel. Be sure that specific instructions regarding air attack are given prior to the convoy departure.

Because of equipment and personnel differences in small units it is inappropriate to state specifically what procedures should be followed for convoy control. Commanders should prepare an SOP for convoy control based on their own particular needs and available resources.



## CHAPTER 5 Air Attack Warning



Figure 5-1.

Your defense will be much more effective if you know beforehand that an air attack is imminent. The initial warning may come from higher headquarters, but you increase the likelihood of timely alerting if you establish an air attack warning system within your unit. This means assigning airwatch personnel and setting up a system of alarms to warn your unit of an impending attack.

Personnel performing airwatch are those individuals you detail to be on the lookout at all times for enemy aircraft. A map reconnaissance of your unit's area of operations will help locate likely areas from which aircraft can attack. Assign air sentries to watch the back sides of woodlines, ridgelines, and significant folds in the terrain out to 3,000 meters--where attack helicopters can lie in wait at the maximum range of their weapons. Your local observation post (OP) personnel will have air watch as part of their duties. If an OP does not have a good view of the airspace in its area, position a special air sentry to search that sector. A systematic procedure for searching all sectors should be established. Air sentries should be rotated frequently because scanning for long periods of time dulls the ability to spot aircraft.

In a convoy, every vehicle should have at least one individual assigned as an air sentry. Anyone on the vehicle other than the driver may perform this duty. Check your map. Mark narrow valleys and any other terrain features that may force your unit to pinch together. Then assign specific search sectors to each air sentry, keeping those trouble spots in mind. If the road march lasts more than an hour, have the troops take turns so that they remain alert.

Two techniques are used in searching for hostile aircraft--one for flat terrain and one for hilly terrain.

## FLAT TERRAIN



Figure 5-2.

When searching in a flat terrain area, the air sentry starts about 20° above the horizon. Using short eye movements, the sentry works up and across, then down and across the sky. This scan pattern is continued below the horizon to detect aircraft flying nap-of-the-earth.

## HILLY TERRAIN

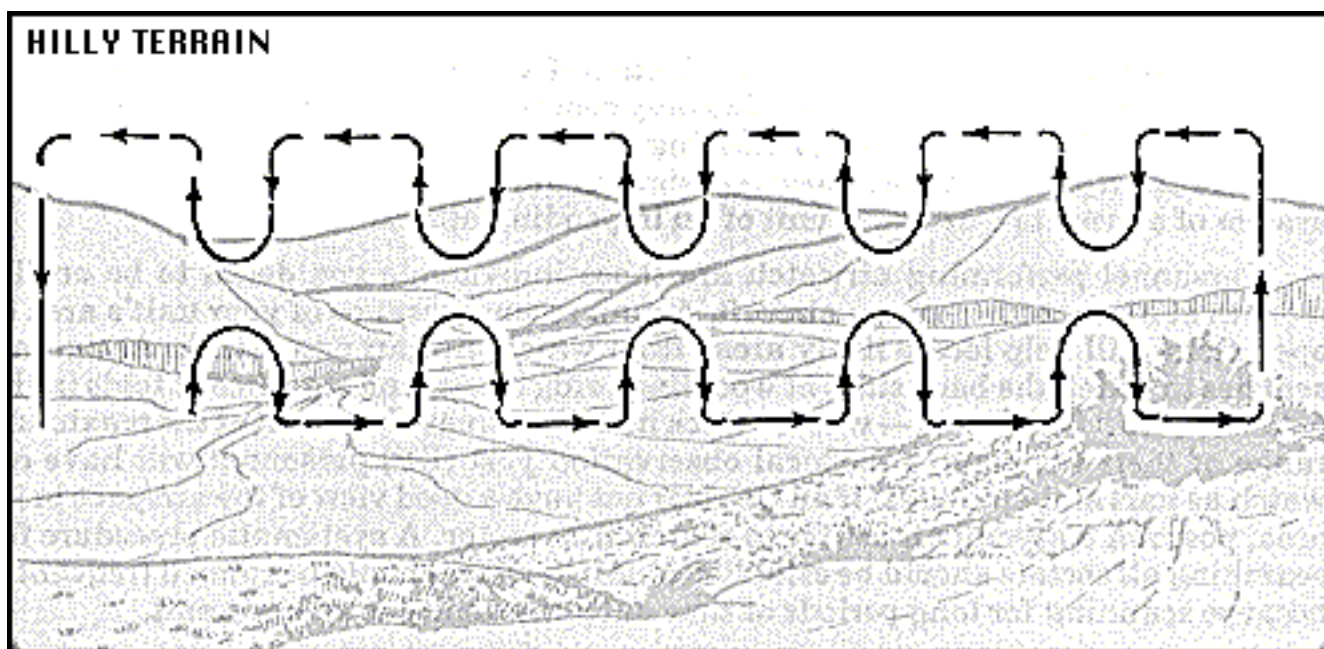


Figure 5-3.

In hilly terrain, the air sentry uses the horizon as the starting point and prominent terrain features as reference points. The sentry's eyes search in short movements up the sky, over, then down, and continue this

movement across the terrain and also below the horizon.

Air sentries will be looking for sun reflections from aircraft canopies or cockpit windows; blade flash from rotating helicopter blades; smoke trails from jet aircraft, missiles, or rockets; dust or excessive movement of tree tops and bushes in a particular area; and noise from helicopter blades or aircraft engines. It is likely that these indications will be detectable before the aircraft is plainly visible. The sooner the aircraft is detected, the more time your unit will have to react to an air attack warning.

To provide a standard method of dissemination emergency warnings within NATO forces operating on land, the United States Armed Forces have concurred in the provisions of STANAG 2047 Emergency Alarms of Hazard of Attack (NBC and Air Attack Only). Pertinent extracts from STANAG 2047 suitable for use are listed in Table 5-1.

<b>VISUAL WARNING</b>	<b>AUDIBLE WARNING</b>
<b>All Clear. Removal of appropriate warning sign.</b>	<b>1. Vocal "All Clear Air Attack" or corresponding national term when only one nation is involved.</b> <b>2. Steady siren note for one minute or sustained blast on a vehicle horn, whistle, bugle or other wind instrument to indicate absence of all NBC and air attack hazards.</b>

Table 5-1.

As a unit of a NATO force, you are bound by this agreement. The actual form of a visual signal and method of display are left to the discretion of the local commander. Only the "red" visual warning in Table 5-1 is mandatory. Be certain that everyone in your unit is familiar with the signals you decide to use and their meanings. Include your air attack warning system in your unit TSOP.

Air attack will be sudden and swift. Air sentries must be able to quickly recognize aircraft performing hostile acts, and must give the air attack warning immediately to allow maximum reaction time. Only then will your soldiers have the time they need to run for cover and concealment and to prepare their weapons in the event you give the order to fire.



## CHAPTER 6 Training



Figure 6-1.

Because self-defense against air attack is closely related to the defensive measures you take against ground attack, training can be conducted merely by varying the perspective--attack from the air as opposed to attack from the ground. This is especially true for training in the application of passive air defense measures--camouflage, concealment, and the use of cover. Training in the application of active air defense measures presents a special problem, however. Soldiers must learn the techniques for delivering volume fire in the path of attacking aircraft. They must also be trained to overcome their natural tendency to track the target, not to fire directly at crossing targets, and not take Kentucky windage. The recommended leads have been computed to give the highest probability of engulfing the target with fire, and the soldier must adhere to the rules if the system is to be effective. Training in passive air defense measures is continuous and is integrated with other field training undertaken by the unit. The training exercise should be varied occasionally by proclaiming an air attack situation. The unit should immediately disperse, seek cover, and prepare to engage the attacker. Aircraft, if available, should be used to fly simulated attack missions so that the troops can get a feel for what a real aircraft in a ground attack posture looks like and to get an idea of the time element of an attack. Before and during the attack, the trainer should check the following:

## PASSIVE AIR DEFENSE TRAINING CHECKLIST

### PASSIVE AIR DEFENSE TRAINING CHECKLIST

#### BEFORE THE ATTACK

Action	Yes	No
Is an airwatch being maintained?	<input type="checkbox"/>	<input type="checkbox"/>
Are vehicles and equipment camouflaged?	<input type="checkbox"/>	<input type="checkbox"/>
Do the troops know the air attack warning signals?	<input type="checkbox"/>	<input type="checkbox"/>
Is dispersion the maximum permitted by the terrain and the tactical situation?	<input type="checkbox"/>	<input type="checkbox"/>
Is the available cover used for maximum advantage?	<input type="checkbox"/>	<input type="checkbox"/>

#### DURING THE ATTACK

Action	Yes	No
Was the warning disseminated in time for the unit to take damage limiting measures?	<input type="checkbox"/>	<input type="checkbox"/>
Did all elements of the unit receive the warning?	<input type="checkbox"/>	<input type="checkbox"/>
Was dispersion used effectively?	<input type="checkbox"/>	<input type="checkbox"/>
Was the available cover used effectively?	<input type="checkbox"/>	<input type="checkbox"/>
Did the commander maintain close control during the attack?	<input type="checkbox"/>	<input type="checkbox"/>
Could the unit have engaged the aircraft had the order been given?	<input type="checkbox"/>	<input type="checkbox"/>

**Note:** If the trainer must mark a "No" in any "Before the Attack" item, the training exercise should be stopped and corrective action taken. If a "No" is marked in any "During the Attack" item, the unit should be assessed accordingly.

Figure 6-1a.

Training in active air defense measures assumes that the individual soldier knows how to fire his personal weapon. Training should concentrate on coordination of fire and on correct lead estimation.

Fire coordination consists simply of insuring that the unit acts as a group and in response to command and/or air attack alarms. This means that each individual knows what he is going to do in response to the command "air attack" and that he does it without further instruction. It also means that he holds fire until the command "fire" is given.

Lead estimation is simple to learn if one studies table 3-1. At incoming targets you aim slightly above the target. For crossing targets you lead jets two football field lengths and helicopters a half football field length. One method of training your soldiers to estimate lead distance is to use the following exercise.

**1** Select an object on the ground, such as a tree, 300 to 400 meters from your position. This object will be reference point 1 (RP1).

**2** Imagine that an aircraft is flying a crossing path over RP1. Compute an aim point that will be 200 meters (approximately two football fields) away from RP1 and along the imaginary crossing path of the aircraft.

## REFERENCE POINT 1

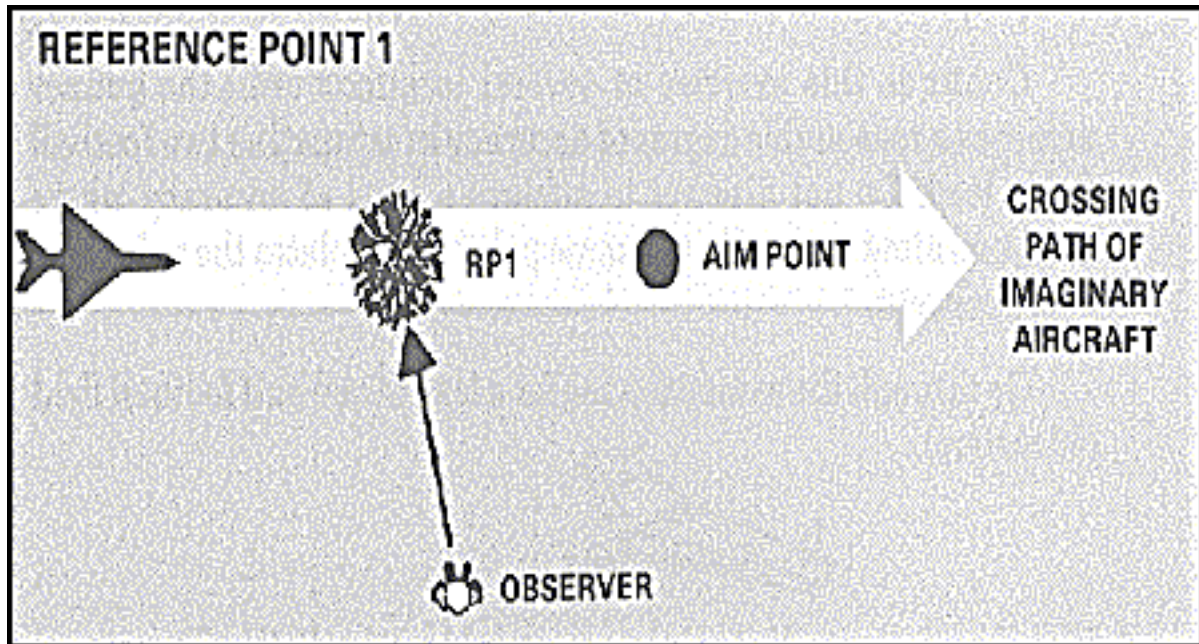


Figure 6-2.

**3** Use the following formula to compute the angle to the aim point.

Angle (mils) = Distance From RP1 to Aim Point (Units) / Range From Observer to RP1 (K Units).

Using the example of a tree 300 meters from your position as RP1 and aim point 200 meters from the tree, the angle to the aim point is 667 mils as shown below:

$$\begin{aligned}\text{Angle (mils)} &= 200 \text{ meters} / (300 \text{ meters} \times .001) \\ &= 200 / .3 \\ &= 667\end{aligned}$$



## REFERENCE POINT 2

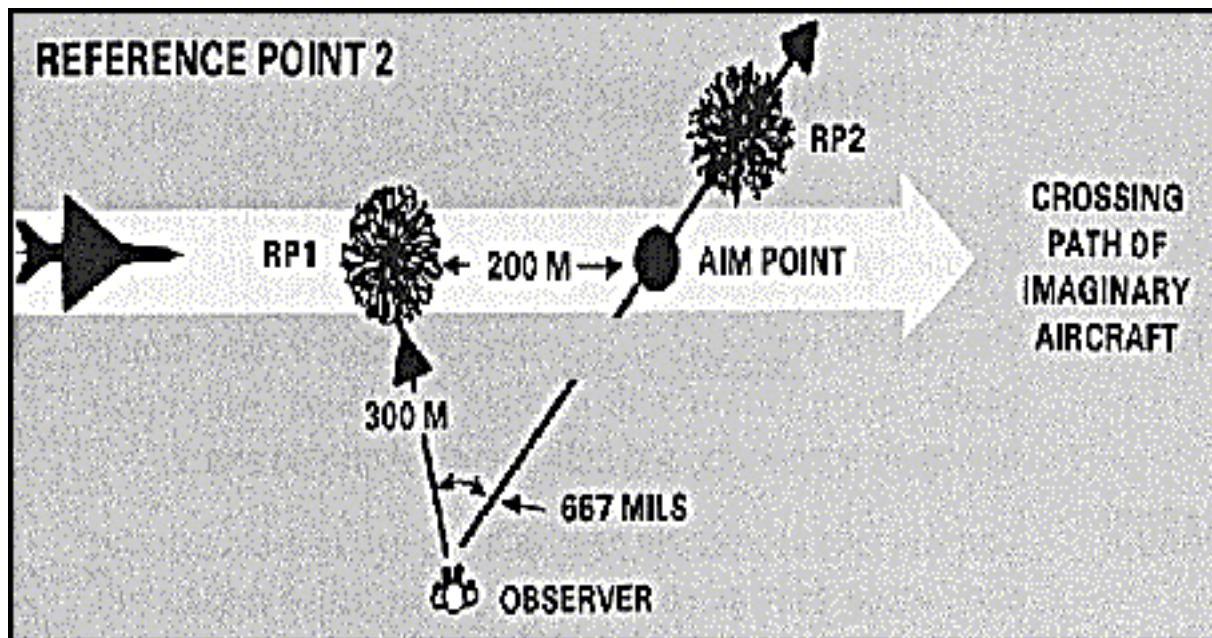


Figure 6-3.

**4** Now that you have calculated the angle, select another object anywhere along the axis from the observer to the aim point to serve as a reference. This object will be RP2.

**5** Have the gunner approach your position, shoulder the weapon, and aim at a point considered to be two football fields from RP2. The gunner does not fire. You will get a good idea of how accurate the gunner's aim is by looking over the gunner's shoulder, across the weapon, and out to RP2. Point out any errors.

Continue this exercise in several locations until the gunner achieves a reasonable degree of accuracy in estimating two football fields lead. Do not attempt to achieve a level of accuracy where everyone aims at exactly the same point and violates the volume of space concept.

Go through the same exercise for a lead of one half football field (50 meters).

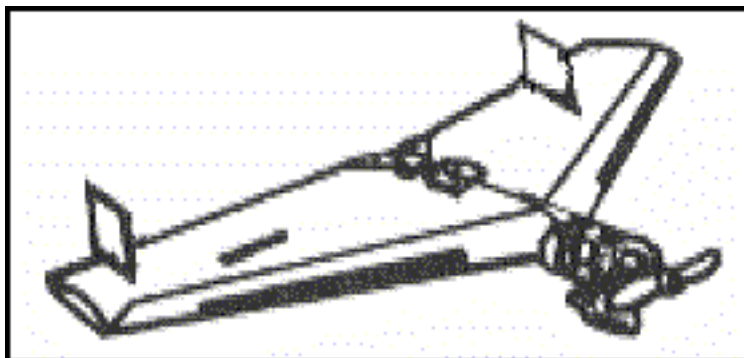


Figure 6-4.

**6** Use of radio-controlled miniature aerial targets (RCMAT) provides an excellent means for training personnel in active air defense measures. A discussion on tracking and simulated engagements using RCMATs is contained in FM 44-18-1. Live firing exercises using RCMATs will both stimulate troop interest in the

training and provide a means to judge its results.

## **HOW TO TRAIN**

Field Manual 21-6, How to Prepare and Conduct Military Training, explains the performance-oriented approach to training. The highlights of the approach are (1) what is the soldier expected to do in combat, (2) what are the expected conditions, and (3) how well is the soldier supposed to do it. Thus, a training objective consists of a task, conditions, and standards.

We've taken some of the key points of small arms air defense and put them into training objectives. These will serve as examples only. You will have to refine, modify, and expand them to meet your particular training problems and situation. But they should be a good starting point. The examples may be taken separately for a training objective of a larger training objective. For example, the overall training objective might look something like this:

### **TRAINING OBJECTIVE**

***TASK:*** *Team Alpha will move in column formation from point A to point B (approximately 10 km).*

***CONDITIONS:*** *The column will travel during daylight, over a road through gently rolling terrain with medium vegetation, with enemy having air superiority, and little chance of ground attack.*

***STANDARDS:*** *Unit will take appropriate passive measures to avoid detection and reduce damage possibility, and take active measures to engage attacking aircraft.*

If such an overall training objective is used, the following examples would aid training toward that end. They are by no means all the inherent tasks. The commanders will have to analyze all facets of getting the job done and insure their soldiers can perform.

### **TRAINING OBJECTIVE**

***TASK:*** *The rifleman will employ active small arms air defense measures at an attacking aircraft.*

***CONDITIONS:*** *The aircraft will attack coming straight on, during daylight. The rifleman will use the kneeling position, having been alerted to the attack.*

***STANDARDS:*** *The rifleman will take available cover (tree, vehicle fender, etc.) providing support for the weapon.*

***Note:*** *Similar objectives would cover the tasks of the M60 and .50 caliber gunners on both straight on and crossing views. If a method of actual firing is possible, training and evaluation would be even better.*

### **TRAINING OBJECTIVE**

***TASK:*** *Vehicle drivers will take passive measures against air attack.*

***CONDITIONS:*** *The vehicles will be in column formation, on a road, during daylight, traveling over gently rolling terrain with adequate trees and vegetation.*

***STANDARDS:*** *Driver will drive to a location to gain concealment from air observation. Vehicular-mounted weapons must be able to fire at aircraft. Vehicle must follow SOP for dispersion against air attack. Vehicles will not be aligned with others.*

*Note: Even though it is difficult to state measurable performance standards for this task, the training is imperative.*

#### **TRAINING OBJECTIVE**

**TASK:** *Air guards will scan and search for approaching aircraft.*

**CONDITIONS:** *Air guards in vehicles will be riding in a column, observing assigned sector, during daylight.*

**STANDARDS:** *Air guards will scan and search using the proper techniques. Air guards will alert the vehicle commander of any sighting by calling out "plane" and point at the airplane.*

#### **TRAINING OBJECTIVE**

**TASK:** *Unit will move in column formation.*

**CONDITIONS:** *Organic vehicles will travel 10 km over a road from point A to point B, enemy contact not likely.*

**STANDARDS:** *Vehicles will be camouflaged appropriately. Drivers will maintain vehicular interval of approximately 100 meters and a speed of 15-20 mph.*

*Note: It is important that drivers learn to maintain distance and speed without commands from the vehicle commander. When the condition states "enemy contact probable," the standards and techniques of movement will vary.*



# **APPENDIX**

## **References**

### **Field Manuals (FM)**

FM 5-15 -- Field Fortifications  
FM 5-20 -- Camouflage  
FM 21-6 -- How to Prepare and Conduct Military Training  
FM 44-18-1 -- Stinger Team Operations

### **Technical Manuals (TM)**

TM 5-200 -- Camouflage Materials

### **Training Circulars (TC)**

TC 5-200 -- Camouflage Pattern Painting

### **TRADOC Bulletins**

TRADOC Bulletin 6 -- Countersurveillance and Camouflage

### **STANAGs**

STANAG 2047 -- Emergency Alarms of Hazard or Attack

30 DECEMBER 1981

By Order of the Secretary of the Army:

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