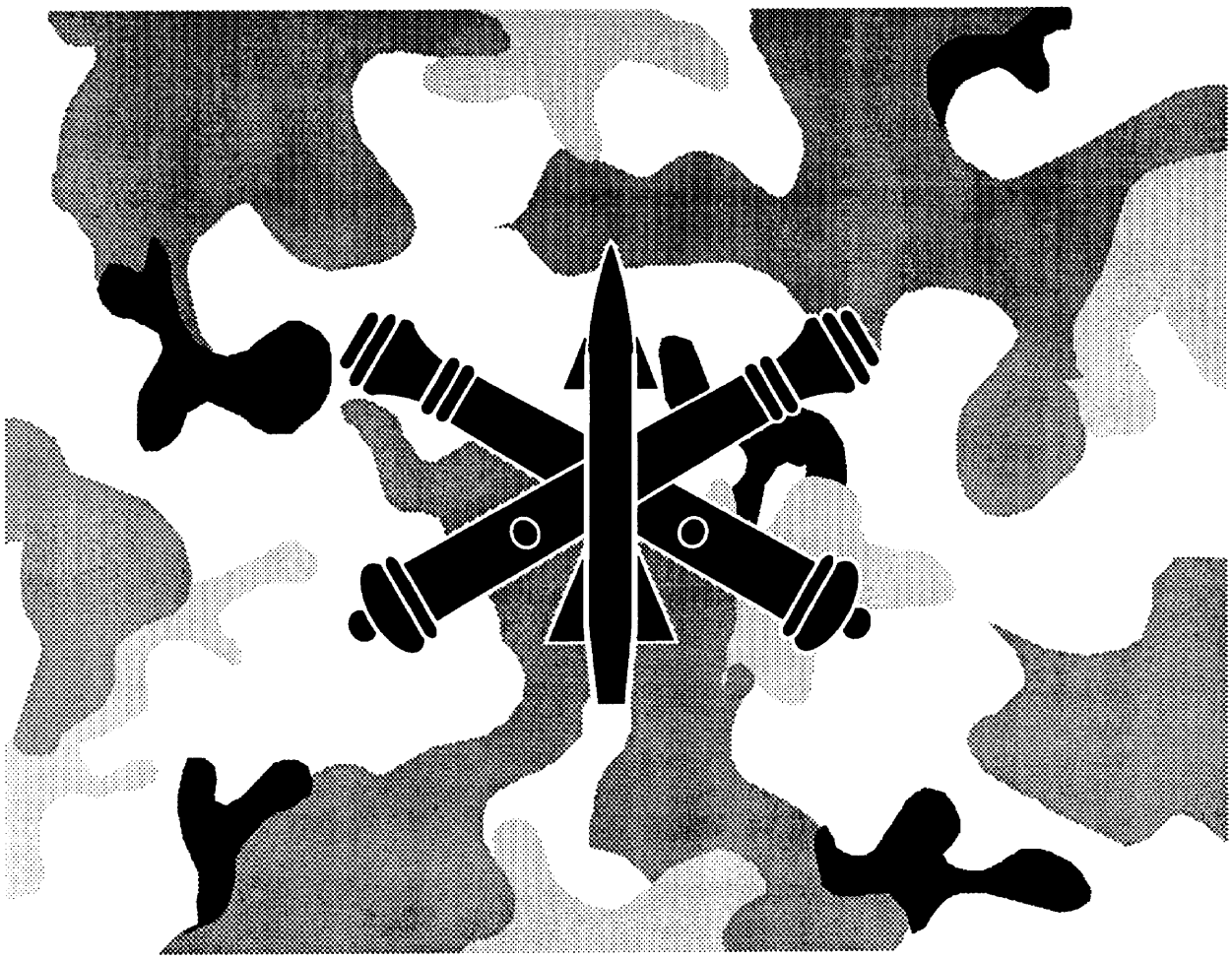
Field Manual 44-73

***FM 44-73**
HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 23 December 1992

TACTICS, TECHNIQUES, AND PROCEDURES FOR HAWK PLATOON OPERATIONS



*This publication supersedes FM 44-90-1, 30 December 1981.

Preface

To win on the AirLand Battlefield, the United States Army must make effective use of its personnel and weapons. Air defense artillery will ensure control of the airspace to permit decisive maneuver on land, and thus victory.

The Hawk weapon system can effectively engage very low- to medium-altitude enemy aircraft. The platoon is the basic unit at which Hawk can conduct an engagement. The platoon's mobility and system capabilities make it an effective air defense weapon throughout the entire spectrum of counterair operations.

This field manual is written for Hawk platoon personnel and, in particular, for the platoon leader and platoon sergeant. Consideration of the future battlefield and threat is imperative to the planning of platoon training by the platoon leader and platoon sergeant.

This FM is unclassified. It discusses threat information and system capabilities in general terms. Where precise information and details are necessary, consult classified publications such as (S) FM 44-100A (U) (TBP).

This publication implements the following international agreements:

STANAG	QSTAG/ ASCC	TITLE	EDITION
2047	183	Emergency Alarms of Hazard or Attack (NBC and Air Attack Only)	6
2103	187	Reporting Nuclear Detonations, Biological and Chemical Attacks and Predicting and Warning of Associated Hazards and Hazard Areas--ATP-45	5
2112		Radiological Survey	3
3700	45/3A	NATO Tactical Air Doctrine (ATP-33 [B])	3
3805	45/6	Doctrine and Procedures for Airspace Control in the Combat Zone	2
3880	45/4	Counter Air Operations--ATP-42	1

The proponent for this publication is USAADASCH. Users of this manual are encouraged to submit recommended changes or comments to improve this publication. Key comments to the specific page and line of the text in which the change is recommended. Provide rationale for each comment to ensure understanding and complete evaluation. Prepare comments on DA Form 2028 and forward to Commandant, US Army Air Defense Artillery School, ATTN: ATSA-TAC-D, Fort Bliss, TX 79916-0002.

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

Contents

CHAPTER 1

The Battlefield, Mission, and Role of the Assault Fire Platoon in the AirLand Battle

This chapter describes the modern and future battlefield. It also discusses the mission of air defense artillery and the role of Hawk and the Hawk platoon in carrying out the mission. The platoon leader's ability to evaluate the battlefield environment will increase his platoon's success and survivability.

THE BATTLEFIELD

The modern battlefield force will consist of personnel trained in tactics and use of state–of-the-art weapons capable of unprecedented destruction. Both sides will use conventional weapons to achieve their goals. Nuclear, chemical, and directed-energy weapons may also be used on the modern battlefield. Threat forces may use sheer numbers, speed, and a variety of weapons to achieve their aims. We will use training, leadership, and a high degree of mobility and technology to counter the enemy.

Integration of ADA forces with the USAF, USN, USMC, and host nations, by means of voice and digital data links, will increase our capability to engage and destroy the air threat. This highlights the need for designing and exercising our rules of engagement and communications prior to hostilities to prevent conflicts between Army and Air Force assets.

THE ADA MISSION AND ROLE OF THE ASSAULT FIRE PLATOON

The mission of ADA is "to ensure the combined arms team retains the freedom to maneuver, to protect C3 nodes, to sustain the battle, and to kill enemy aircraft the first time." The role of ADA is to accomplish the ADA mission within the capabilities of the particular weapon system.

To retain the freedom to maneuver and to protect critical assets, the joint and combined forces must not only deter attacks, but also destroy the enemy's capability to attack. To achieve this goal, all members of the combined arms team must contribute to AD.

The Hawk battery mission is to provide very low- to medium–altitude air defense of critical assets in the corps and in the theater army areas. The AFP mission is to support the battery mission. The role of the AFP is to provide low– to medium–altitude AD of critical assets, both static and mobile.

To be successful, the Hawk platoons within a battery should coordinate and synchronize their mutually supporting missions. Coordination ensures unity of effort. Synchronization results in maximizing defense capabilities and destructive potential. Coordination is most important when a platoon is in a march order configuration and is most vulnerable. The battery commander is responsible for coordination and synchronization of platoons.

CONTENTS

CHAPTER 2

The Threat

The primary focus of this chapter is the ground and air threat facing a corps or echelon above corps Hawk battery in a nonmature, or contingency theater. The mature theater threat is also addressed. In the past, the Soviet Union and Europe have historically been viewed as the most likely areas of conflict for US forces. With the recent breakup of the Soviet Union, the collapse of communism in Eastern Europe, and the reunification of Germany, that threat has diminished. The threat is more diverse now than ever before, and includes almost all regions of the world. Regional powers continue to increase the sophistication and size of their military forces, and pose a significant threat to US interests. A detailed description of the threat is discussed in FM 34-130.

CONTINGENCY THEATER THREAT

The threat, in a contingency theater, may lack the capability to conduct a massive Soviet-style air operation. However, most regional power adversaries do have limited numbers of fixed-wing (FW) and rotary-wing (RW) aircraft. Many of these countries also have a significant tactical ballistic missile threat. It is important for the AD commander to take these threats into account because even a small air force can make it difficult to establish and maintain a successful lodgement operation. The AD commander will focus on RW, drones, missiles, and leaker aircraft as the primary threat. Since regional or third world threats are numerous, identifying each country, its tactics, its weapons systems, and its capabilities would be an overwhelming task for any S2. Therefore, identifying and defining the basic characteristics of the primary air defense threat in the contingency area is paramount. Combining the primary threat characteristics with a thorough intelligence preparation of the battlefield (IPB) is the starting point for identifying the threat in any contingency operation. IPB is discussed in Appendix H. Listed below are the primary threats to AD in a contingency operation. A working knowledge of these threats is needed to effectively counter them.

DRONES

A drone is a land, sea, or air vehicle that is remotely or automatically controlled. There are several categories of drones; however, the most common air threats are unmanned aerial vehicles (UAVs) and remotely piloted vehicles (RPVs). A UAV is a powered air vehicle that does not carry a human operator, uses aerodynamic force to provide air vehicle lift and is designed to carry a nonlethal payload. A category or subset of UAV is the RPV. An RPV is an unmanned air vehicle controlled by a person from a distant location (once it is in operation) through a communications link.

The missions of UAVs vary. Their primary use is to obtain intelligence on opposing forces in the form of reconnaissance, aerial surveillance, and targeting data. However, they have been used as decoys for aircraft and missiles. Using special ECM payloads, UAVs have been used to activate SAM radars. UAVs can also be used in laser designation, forward looking infrared (FLIR), harassment bombing, and NBC detection.

CONTENTS

ROTARY-WING

RW aircraft in the hands of regional power adversaries are somewhat limited in numbers as well as in operational effectiveness. Because these countries have not yet developed a sophisticated doctrine for combined arms, their use of RW aircraft will most likely be limited. Most RW aircraft in the contingency threat originate from the former Soviet Union, France, or Germany. Many countries have RW equipment and tactics which come from several sources. This may inhibit their use over a prolonged period of time due to maintenance, repair, and resupply requirements. The most common RW aircraft within the third world regions are the Hip, Hind, Gazelle, and BO 105. There are many RW aircraft, now used for transport or liaison, that can easily be converted for combat missions. The avionics sophistication of most RW aircraft is also limited. Night operations are virtually nonexistent. Basic tactics such as flying nap of the earth and flying in pairs are to be expected.

MISSILES

There are two basic types of surface-to-surface missiles. They are ballistic and cruise. Ballistic missiles are rocket powered during the initial stages of flight only. Therefore, the missile follows a ballistic trajectory once gravity takes over. Long-range ballistic missiles fly much of their trajectories outside the atmosphere. Cruise missiles use a booster rocket during the launch stage, but during flight, the missile depends on an air-breathing engine similar to those used in airplanes. They may fly at low or very low altitudes. In the next decade, cruise missiles will pose an increasing challenge. More and more third world countries will have access to the land attack cruise missile technology. The guidance systems use navigational signals transmitted by satellites. A receiver costing only a few thousand dollars enables these missiles to have an accuracy within 100 meters. Cruise missile warheads include cluster munitions, intelligent submunitions, and fuel air explosives.

Ballistic missiles are perhaps the most alarming air threat in the third world regions. Commonly known as the "poor man's air force," their proliferation was rapid during the 80s and will continue through the 90s. Regional powers have access to several different types of missiles, some available with ranges extending to thousands of kilometers. Short-range ballistic missiles (SRBMs) are missiles with a range of 200 kilometers or less. The most common SRBMs in the third world are the free rocket over ground (FROG) and the SS-21. The Scud and SS-12 are also abundant. These are considered medium-range ballistic missiles (MRBM) with ranges from 200 to 900 kilometers.

A number of countries already possess the capability to manufacture their own rocket systems. These countries then deploy or export them to other countries. Presently, countries that have deployed ballistic missiles include Libya, North Yemen, Syria, Iraq, Israel, Egypt, Iran, Kuwait, South Yemen, Taiwan, Cuba, North Korea, Pakistan, Algeria, and South Korea. A correlation also exists with the acquisition of NBC programs. Three countries are believed to have nuclear weapons in stock or ready for easy assembly. They are India, Israel, and Pakistan. Argentina, Brazil, South Africa and Iraq have significant nuclear programs. Countries believed to have stockpiles of chemical weapons are Egypt, Iran, Iraq, Israel, Libya, North Korea, South Korea, South Africa, Syria, and Taiwan. The four countries alleged to have stockpiles of biological weapons are Iran, Iraq, North Korea, and Syria. Tables on pages 2-3 and 2-4 outline the third world countries that most likely have ballistic missiles.

Ballistic missiles can be used as political weapons or military weapons. In the third world, given a general lack of long-range targeting assets, it is likely that political, religious, and economic targets will be attacked, in addition to tactical and operational targets. Iraq's use of ballistic missiles during the Persian Gulf War is indicative of how these missiles might be used in the future. Attacking the enemy's population centers creates a psychological terror. Unless the missiles are countered, public support for US and allied efforts maybe weakened. If a targeting capability exists, ballistic missiles could be used in fire support or preemptive strikes. In this event, it is very likely they would target Hawk missile sites or vital assets being protected by air defense units. Ballistic missiles can be used in all weather and at night, and they maximize the advantages of speed, surprise, and disruption.

AIRCRAFT

FW aircraft will always be a priority for the Air Force. However, the AD community must stay abreast of third world aircraft imports and avionics developments. Since the Persian Gulf War, several Middle East countries have sought to replace or upgrade their aging aircraft. Most Middle East countries are turning to the US for imports. The former Soviet Union, France, and Great Britain are also exporters of aircraft and aircraft systems. It is less expensive and easier to improve aircraft by advanced avionics rather than purchasing new aircraft. Therefore, many older aircraft may be used with updated avionics and weapons.

THIRD WORLD MEDIUM-RANGE MISSILE 200 TO 900 KILOMETERS

COUNTRY	SYSTEM	STATUS	ORIGIN	RANGE (KM)	PAYLOAD (KG)
Afghanistan	Scud B	dep & emp	USSR	280	1,000
Brazil	SS-300	suspended?	Brazil	300	NA
	MB/EE-350	under dev	Brazil	350	NA
	MB/EE-600	under dev	Brazil	600	NA
Egypt	Scud B	dep & emp	USSR	280	1,000
	Scud 100	under dev	Egypt with tech asst from PRC, N. Korea	NA	NA
	Al-Kahir	canc in 1960s	Egypt with tech asst from FRG sources	370	NA
	Al-Kahir	canc in 1960s	Egypt with asst from FRG sources	600	NA
India	Privthi	tested 1988	India	250	1,000
Iran	Scud B	dep & emp	N. Korea, Libya, Syria	280	1,000
Iraq	Scud B	dep & emp	USSR	280	1,000
	Al-Hussein	dep & emp	Iraqi modified Soviet Scud	600	140-250
	Fahd	under dev	Iraqi with tech asst from Egypt, Brazil	500	450
	Baraq	under dev	Iraq	250	NA
Israel	Jericho 1	dep?	Israel with tech asst from France	480	250
	Jericho 2	dep?	Israel	750	450-680
Libya	Scud B	dep & emp	USSR	280	1,000
	OTRAG	under dev?	Libya with tech asst from FRG sources	500	-
	Al-Fatih	under dev?	Libya with tech asst from FRG	480-720	NA
North Korea	Scud B	dep	Missiles from Egypt, N. Korea reverse engineered	280	1,000
	Scud PiP	under dev	N. Korea modified Scud with tech asst from Egypt, Japan	500	NA
Pakistan	Hatf 2	tested 1989	Pakistan with tech asst from France	300	500
	Hatf 3?	under dev	Pakistan	600	NA
South Yemen	Scud B	dep	USSR	280	1,000
South Africa	Jericho 1?*	tested 1989	Israel	480	250
South Korea	Modified Nike Hercules	dep	S. Korea, modified US technology	240	NA
Syria	Scud B	dep	USSR	280	1,000
	OTRAG	canc 1981	Libya with tech asst from FRG sources	-	-

*Some sources claim the missile to be a Jericho 2.

THIRD WORLD SHORT-RANGE MISSILE LESS THAN 200 KILOMETERS

COUNTRY	SYSTEM	STATUS	ORIGIN	RANGE (KM)	PAYLOAD (KG)
Algeria	FROG-4	deactivated	USSR	50	250
	FROG-7	dep	USSR	70	450
Argentina	Condor 1	under dev	Argentina, tech asst from Egypt, France, FRG, Iraq, Italy, Sweden, Switzerland	150	400
Brazil	MB/EE 150	under dev	Brazil	150	500
Cuba	FROG-4	dep	USSR	50	250
	FROG-7	dep	USSR	70	450
Egypt	Sakr 80	dep*	Egypt with tech asst from France	80	200
	FROG-5	dep	USSR	50	250
	FROG-7	dep & emp	USSR	70	450
India	Devil	canc in 1970s	India with tech asst from USSR	140	NA
Indonesia	RX-250	under dev	Indonesia with tech asst from France	100	NA
Iran	Oghab	dep & emp*	Iran, PRC	40	300
	Nazeat	dep	Iran, PRC	130	NA
	Shahin-2	under dev	Iran, PRC	110-130	NA
Iraq	FROG-7	dep & emp	USSR	70	450
	Laith	under dev	Iraq (modified Soviet FROG)	90	NA
	Nissan	under dev	Iraq	110	NA
	Kassir	under dev	Iraq	150	NA
Israel	Lance	dep	USA	120	200
	Flower Project	canc in 1970s	Israel	200	NA
Kuwait	FROG-7	dep	USSR	70	450
Libya	FROG-7	dep	USSR	70	450
North Korea	FROG-5	dep	USSR	50	250
	FROG-7	dep	USSR	70	450
North Yemen	SS-21	dep	USSR	120	250
Pakistan	Hatf 1	tstd 1989	Pakistan with tech asst from French sources	80	500
South Korea	Honest John	dep	USA	37	580
South Yemen	FROG-7	dep	USSR	70	450
	SS-21	dep	USSR	120	250
Syria	FROG-7	dep & emp	USSR	70	450
	SS-21	dep	USSR	120	250
Taiwan	Honest John	dep	USA	37	580
	Ching Feng	dep	Taiwan, Israel	120	NA

*May be classified as artillery rockets. Other countries with artillery rockets are Brazil, Iraq, Israel, and Saudi Arabia.

INTELLIGENCE PREPARATION

To effectively counter the regional threat, a thorough evaluation of the threat's capabilities, strengths, and weaknesses must be conducted. The Hawk battalion commander should ensure that intelligence information on regions and countries which may become areas of deployment or conflict for the battalion is continuously gathered, evaluated, and disseminated. The battalion's intelligence officer should keep abreast of this information and be able to address the following questions immediately following alert notifications.

General

❑ What country has most influenced the tactics of the threat force (such as US, former Soviet Union, France, and Great Britain)?

❑ What is the size of the military the Army will face?

❑ Is equipment modernized or outdated?

❑ Do terrorist or special forces pose a viable threat to ADA units?

❑ What are local populace attitudes about US forces?

Air Force

❑ Do threat pilots have combat experience?

❑ What types of air-to-ground tactics and ordnance does the threat most often use?

❑ What is the threat sortie generation capability?

❑ How many aircraft are fully operational?

❑ Do they possess air refueling capability?

❑ Do they possess and effectively use ASMs and ARMs?

❑ What is the combat radius of each type of threat aircraft?

❑ Where are the operating bases and secondary airfields located?

❑ What type of ordnance delivery techniques and attack profiles are used?

❑ Do the aircraft have night flight capability?

❑ How proficient are the pilots at navigation?

❑ Are the aircraft equipped with sophisticated avionics?

❑ What types and numbers of RW aircraft does the threat possess?

Electronic Countermeasures

❑ Does the threat possess ECM or ESM capabilities? What are they?

❑ How is ECM most commonly employed against radars and communications?

❑ Can the threat use chaff, flares, smoke, or jamming vehicles?

Tactical Ballistic Missiles

❑ What types and numbers of TBMs does the threat have?

❑ What are the ranges and accuracies of these TBMs? What is the relationship of range to accuracy?

❑ What types of ground support requirements do specific types of TBMs require? Do they have specialized launchers, or can these be easily fabricated? Do they have special fuel requirements?

❑ How many TBMs can be placed on one target simultaneously?

❑ With what types of warheads can the TBMs be armed?

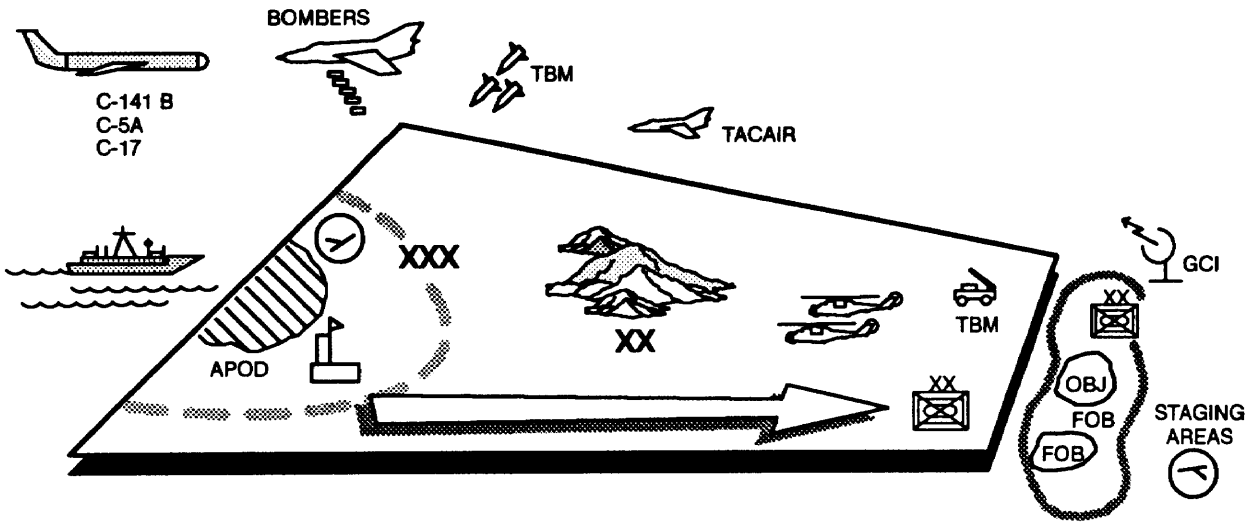
❑ What types of emanations are associated with the launch of TBMs?

THREAT DURING LODGEMENT

During the lodgement phase of a contingency operation, friendly heavy forces will normally enter an area secured from ground attack by light and special operations forces. This may involve a forced entry by US and coalition forces or an entry invited by the host nation. However, long-range air attacks and missile strikes remain a major concern. Generally, ADA forces will not deploy in a contingency operation unless the potential air threat is present. During disembarkment procedures into the lodgement, heavy forces are most likely to be attacked by enemy missiles, FW aircraft, and artillery.

The defense of the lodgement is critical because it is the base of operations for US forces. Targets within the lodgement area include seaports, airports, lines of communications, command and control headquarters, ammunition and fuel supply points, or assembly areas. Sabotage and terrorist actions remain a threat and commanders must ensure that their soldiers stay alert to this threat as well as the sentiments of the local populace. See the following illustration on page 2-6.

AERIAL THREAT DURING LODGEMENT OPERATIONS



THREAT AS THE LODGEMENT EXPANDS

Should friendly forces begin combat operations or move beyond the lodgement, the enemy is likely to employ RW and FW aircraft and TBMs against friendly maneuver units and their support mechanisms. TBMs or aerial delivery of persistent chemical or tactical nuclear weapons in the lodgement after expansion could cut off the forward forces from support. AD of the lodgement area remains critical because the threat against the lodgement may remain viable throughout the operation.

MATURE THEATER THREAT AIR SUPPORT OF OFFENSIVE OPERATIONS

The most lethal air threat to the corps or division in the mature theater is the enemy attack helicopter. The enemy may commence offensive operations by jamming radio and radar transmissions with aerial EW platforms. Next, the enemy commander will begin his reconnaissance of friendly deployments of the FLOT. Once friendly unit locations have been identified, the enemy commander will begin his artillery preparation, with his fires concentrated in the vicinity of his anticipated main attack. Until the time of the artillery barrage, FW aviation will begin attacking targets forward of the main attack. This attack will be concentrated, attempting to eliminate logistics facilities, command and control nodes, reserves, and artillery which might impede the advance of enemy ground forces that have penetrated the FLOT The first echelon enemy forces will then commence their assault. Given a successful penetration, coincident with the commitment of the second echelon force of the first echelon forces which is conducting the main attack, the enemy commander will commit the bulk of the attack helicopters assigned to him, just forward of the direct fire zone. The attack helicopters will attack maneuver units, command and control nodes, artillery, logistics facilities, and especially reserve formations moving forward to close the penetration. The employment of the helicopters will generally be in mass, with attack helicopters potentially being used in a wide zone. Some attack helicopters will be used with supporting enemy attacks, to perform reconnaissance and to deceive reserves as to the location of the main attack. A successful penetration might be allocated to a squadron (20 attack helicopters).

MATURE THEATER THREAT
AIR SUPPORT OF DEFENSIVE OPERATIONS

There are two primary missions for the threat FW and RW aircraft in the defense. The first mission is to attrit attacking enemy armored forces. The second is to act as a reserve to prevent the penetration of the defensive network.

The threat may establish its main battle defensive positions with a security zone. FW and a few RW aircraft will attack the flanks as friendly forces maneuver through this security zone. Attack helicopters may be used if the terrain allows for undetected flank access to the opposing forces. Normally, this means that attack helicopters are employed in the area separating divisional defensive positions, when divisions are employed in depth. If the threat commander perceives that his final defense is about to be penetrated, he will commit his attack helicopters and any tank reserves to the battle simultaneously. Like the penetration in the offensive situation described above, the attack helicopter units will be employed in mass.

Many potential regional adversaries have forces which are large, well organized, well equipped, and well trained. The air battle in a mature theater against these adversaries may encompass the full range of threat aircraft, electronic warfare, and TBMs engaged in well–synchronized operations. The threat facing ADA units in contingent theaters is diverse and capable. Tactics, weapons systems, training, and capabilities vary from region to region. The threat may possess weapons which are in some ways superior to ours. The key to winning is through intelligence preparation and detailed planning.

CHAPTER 3

Planning

This chapter implements STANAG 3700.

This chapter discusses the elements and procedures used to plan and design a defense to accomplish the ADA mission. It also includes the different lateral liaisons that the Hawk unit must consider.

The Hawk AFP is the lowest echelon at which HIMAD fights. Hawk defense design is the application of AD employment principles, ADA employment guidelines, and weapon design capabilities to determine the positions of individual AFPs. A good defense design will increase the effectiveness of air defenses and Hawk survivability. Yet the focus of any AD operation must be the protection of the critical assets. (S) FM 44-100A (U) (TBP) provides classified data on system capabilities and planning, and Appendix A of this FM provides unclassified information.

Planners foresee the Hawk platoon in support of a maneuvering force, in a contingency or a mature theater operation. Under these conditions, the platoon leader will plan and deploy his platoon to support the mission. Therefore, the platoon leader should let sound judgment, initiative, and flexibility govern his actions along with the prescribed TSOP and employment guidelines.

ADA EMPLOYMENT GUIDELINES

In conjunction with the AD employment principles (see FM 44-100), the six ADA employment guidelines apply when planning and positioning AD resources. The ADA employment guidelines are mutual support, overlapping fires, balanced fires, weighted coverage, early engagement, and defense in depth.

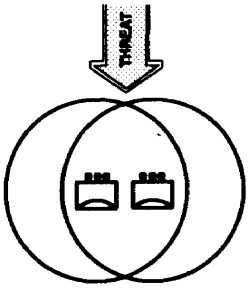
They are used for positioning individual AFPs when designing a specific defense. Applying all of the guidelines in any tactical situation is seldom possible. The ability to satisfy all the guidelines will be limited by the size and shape of the asset, the number of AFPs available, the adequacy of terrain for coverage and emplacement, and numerous other tactical factors. In the fluid, dynamic, high-intensity operations expected in future battles, rigidity, lack of originality, and lack of initiative can contribute to defeat. There can be no substitute for the exercise of common sense, flexibility, and initiative to ensure that Hawk units successfully accomplish the mission of protecting ground operations from air attack. Planners should always strive to achieve mutual support and balanced fires in their AD plans.

CONTENTS

MUTUAL SUPPORT

Mutual support is achieved by positioning weapons so that the fires of one weapon can engage targets within the dead zone of the adjacent weapon systems. For gun systems, this dead zone is usually small and the need for mutual support in minimal. For missile systems, especially command guided systems, the dead zone can be large and the need for mutual support is great.

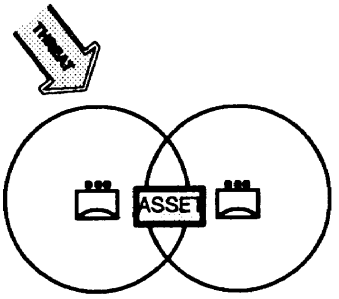
MUTUAL SUPPORT EXAMPLE



OVERLAPPING FIRES

Overlapping fires are achieved by positioning weapons so their engagement envelopes overlap. Because of the many altitudes from which the air threat can attack, the defense planner must apply mutual support or overlapping fires vertically and horizontally.

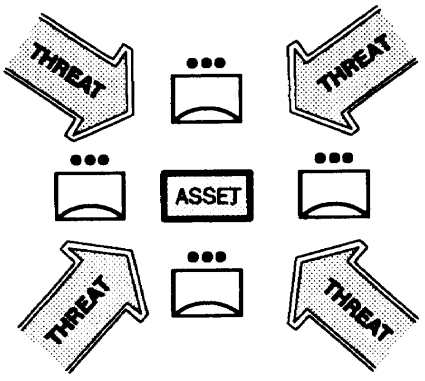
OVERLAPPING FIRES EXAMPLE



BALANCED FIRES

Balanced fires are achieved by positioning weapons to deliver an equal volume of fire in all directions. This may be necessary when air defense is used in an area where the terrain does not canalize the attacker, or when the air avenues of approach are not predictable.

BALANCED FIRES EXAMPLE



WEIGHTED COVERAGE

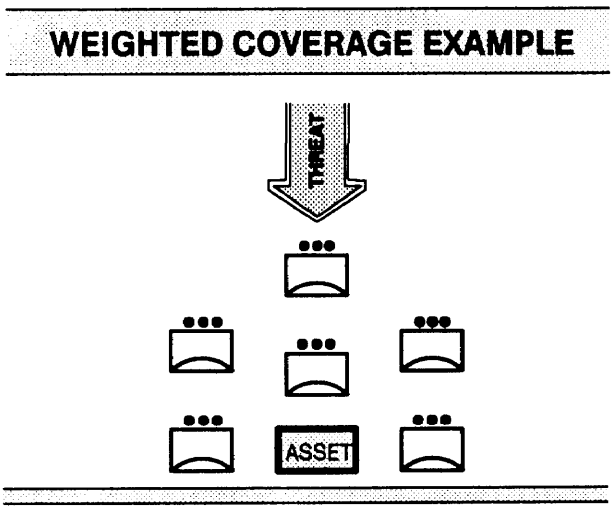
Weighted coverage is achieved by combining and concentrating fires toward the most likely enemy air avenues of approach or direction of attack. Based on the tactical situation, a commander may risk leaving one direction of attack unprotected to weight his coverage toward another direction.

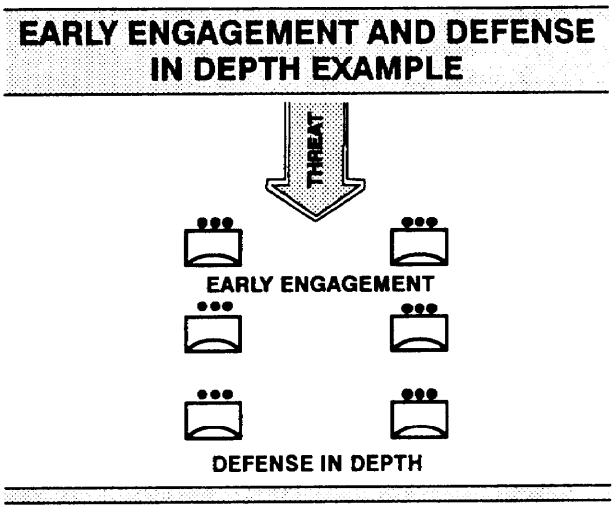
EARLY ENGAGEMENT

Early engagement is achieved by positioning weapons so they can engage the threat before ordnance release. Ideally, weapons should engage and destroy the enemy before he can fire on the defended asset.

DEFENSE IN DEPTH

Defense in depth is achieved by positioning weapons so the air threat will come under an increasing volume of fire as it approaches the protected asset. Defense in depth lowers the probability that threat aircraft will reach the defended asset.





PLATOON CONFIGURATIONS

Doctrinal employment of the Hawk weapon system is dependent on many factors such as METT-T, commander's intent, priorities, and communications resources. The following examples are just some of the ways that the Hawk battalion can be deployed.

Four types of platoons are described below: heavy, light, biad, and sniper. Each type of AFP is suited to a different mission or circumstance. The commander can adjust his unit to suit his needs.

HEAVY AFP

Heavy AFP refers to a platoon that is collocated with the battery administrative area and facilities. A section of the DSMC called a slice may also be present. The heavy AFP is within walking distance of the battery trains and collocates its CP with the battery CP (BCP). This AFP has the advantage that the battery support for motors, food, supply, and NBC is located on its site. Also, because the commander is usually present on this site, C2 of the battery is facilitated. However, because of the increased number of personnel, vehicles, and facilities, the site requires more area, and is harder to disperse adequately. An AN/TRC-145 from battalion assets is required to relay the UHF shot to the light AFP when used in a base configuration.

LIGHT AFP

Light AFP is a platoon with no battery administrative support collocated. It mayor may not have a DS slice. The light AFP must have motor, administrative, and ration support supplied by the heavy AFP. This platoon requires a smaller site area, is easier to disperse and conceal, and is quicker to move because it has fewer vehicles.

BIAD AFP

Biad AFPs are identical in organization and both have internal motor, administrative, and rations support. They are capable of deploying widely separated from each other, and are the best suited for task force operations or missions that require extreme fire unit dispersion. The advantages of this type of platoon are that each platoon has some capability for sustainment. The disadvantage is that the current TOE does not support the true biad AFP organization. For example, there is only one water trailer and wrecker, and the motor PLL is consolidated for a battery. In this type of organization, each platoon receives a UHF link directly from the battalion.

SNIPER AFP

Sniper AFP is task organized for a temporary mission. It consists of minimum launch equipment and relies on a remote air picture for acquisition. A UHF link directly from the battalion or relayed from the other AFP is required for the ADL link. However, the AFP could also be controlled by a remote source such as the CRC of AWACS with the proper communications linkages. The AFP mission is to ambush aircraft well forward in the division area. The planning distance may be as close as 10 kilometers from the FLOT As soon as the HIPIR radiates and missiles are fired, the AFP must move to avoid artillery fires and enemy ground and air forces. Because of the proximity to the FLOT ground defense security and site discipline

are extremely important. The only way for this site to survive to fire its missiles is to stay hidden until it can fire. Since the sniper platoon carries only a few missiles and usually does not have the capability to reload, it must move as soon as it fires. Extended operations are not possible due to limited rations, fuel, etcetera. The following table outlines some of the planning considerations for each type of platoon.

TASK ORGANIZATION OPTION MATRIX

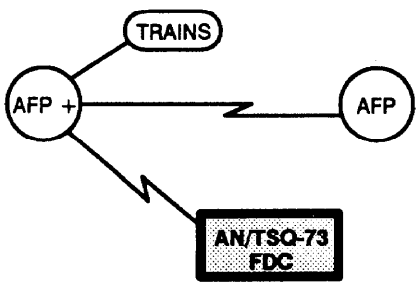
AFP	HEAVY	LIGHT	BIAD	SNIPER
EQUIPMENT	AFP + BTRY ADMIN ± DSU SLICE	AFP ± DSU SLICE NO ADMIN SLICE	AFP + BTRY ADMIN ± DSU SLICE	AFP - (PCP, HPI, LCHR, 3 MSLS, LSCB, GEN) LDR UNLOADS MSLS THEN RETURNS TO HIDE AREA 4 TRUCKS (PCP, HPI, LCHR, GEN)
PERSONNEL	AFP ± DSU SLICE BTRY ADMIN (BC, 1SG, FOOD, MOTORS, MEDICS, ADMIN)	AFP ± DSU SLICE	AFP + 1/2 BTRY ADMIN (BC OR 1SG) FOOD, MOTORS, ADMIN ± DSU SLICE	AFP - (TO, RO/HPIO, 3 LCHR, 1 COMM, 2 SEC) 2 LCHR RETURN W/LDR 8 - 10 PRSL
COMM	AN/GRC-103(UHF)AN/TRC-145 FM CMD FM ADC FM A/L BN CMD AM WIRE ± TELEPHONE	AN/GRC-103(UHF) FM CMD FM ADC AM WIRE	AN/GRC-103(UHF) FM CMD FM ADC FM A/L BN CMD AM WIRE ± TELEPHONE	AN/GRC-103(UHF) FM CMD AND FM ADC RECEIVE ONLY
C^2	PCP - AN/TSQ-73 CP - BCP - MPC	PCP - AN/TSQ-73 CP - MPC	PCP - AN/TSQ-73 CP - MPC	PCP - AN/TSQ-73 CP - MPC CP IS IN PCP
CSS	PUSH SUPPORT TO LIGHT AFP	NEED MOTORS SUPPORT NEED DSU SUPPORT	LIMITED ORGANIC	NO RESUPPLY ORGANIC MRES AND WATER FIELD SANITATION NO MAINTENANCE SUPPORT
LIMITATIONS	MOBILITY CONVOY SIZE SITE SIZE	CSS COMMAND SUPPORT RESUPPLY MAINT - PLL	NEED 2D MOTOR PLL NEED 2D WATER BUFFALO NEED 2D MESS	SURVIVABILITY EXTENDED OPERATIONS NO MAINT OR PLL SILENT MODE CHECKS EMCON SILENT ONLY NO REFUEL CAPABILITY EARLY WARNING REQ
ADVANTAGES	CSS SUPPORT C^2 SUPPORT	MOBILITY SITE SIZE CONVOY SIZE	SELF-SUFFICIENT TASK FORCEABLE	SURPRISE/AMBUSH SHOOT AND MOVE FORWARD DEPLOYED
TASK FORCE	IF FULL BATTERY IS TF'd BC NEEDS TO COMMAND AFPS	MISSION DEPENDENT CSS LIMITS COMMAND LIMITS	BEST OPTION	NOT ADVISABLE NO CSS NO SUSTAINABILITY
COMMENTS	ADMIN WITHIN 2 KM OF AFU SLEEPING AREA IN ADMIN. MSL RELOAD ADJACENT AFU DSU SLICE IN ADMIN.	MSL RELOAD ADJACENT FU SLEEPING AREA OFFSET FU DSU SLICE OFFSET FU MUTUAL SUPPORT REQUIRED.	SLEEPING AREA OFFSET FU ADMIN & DSU SLICE OFFSET. MUTUAL NOT REQUIRED.	REST OF PLT IN HIDE AREA. AFTER FIRING GO TO HIDE AREA. REJOIN AFP IN NEW SITE. MUTUAL SUPPORT NOT REQUIRED.

Four possible ways to organize the platoons described above in the battery are: static trains and or mobile AFPs, biad AFPs, heavy and or light or base and or leg AFPs, and sniper AFPs. Each battery is task organized to the commander's needs. These are only some examples of ways to task organize a Hawk unit. The heavy and or light, biad, and sniper batteries are made up of the platoons of the same name, and are shown in the following illustration.

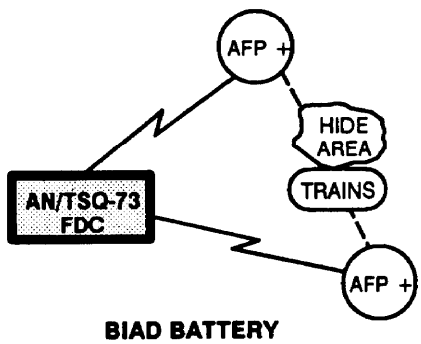
Static trains batteries consist of a battery administrative and logistics area or trains in a centrally hidden location with the AFPs moving around the trains area. See Static Battery, Trains Area/Mobile AFPs illustration on page 3-6. The AFPs can be any of the configurations mentioned above. Since the trains area does not radiate, it can stay in one location, while the platoons move after their positions have been compromised or the tactical situation dictates relocation. This configuration is best used during the defense due to the static nature of the battery. The trains area is concealed and is able to consolidate operations. This minimizes the disruption of support and maintenance functions of the battery during tactical operations when the platoons relocate. The communications network can be set up several ways. The battalion can shoot UHF directly to the platoons and use FM/AM radios to communicate with the battery trains or one platoon can relay the shot to the other. One way to employ this concept is to give each battery a zone or section of the battalion area to cover. Another way is to assign areas by the units that are supported. This method is most secure when the battery trains have no electronic emitters and are well concealed. Communications should be by wire or land lines.

The following illustrations, on pages 3-6 through 3-8, show battalions task organized with these types of batteries. Although these examples are of one type of platoon for each battery, the commander can mix his battalion in any way to best accomplish his mission.

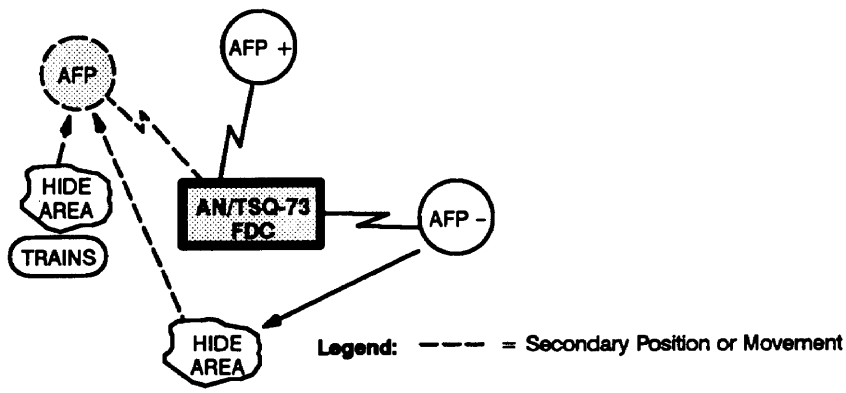
HEAVY/LIGHT, BASE/LEG, BIAD, AND SNIPER BATTERY EXAMPLES



HEAVY/LIGHT, BASE/LEG BATTERY

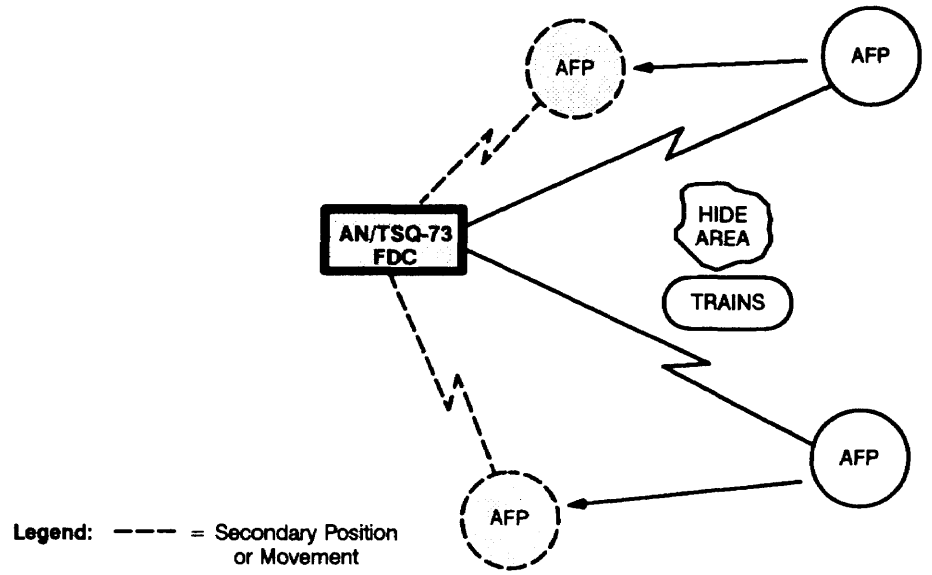


BIAD BATTERY

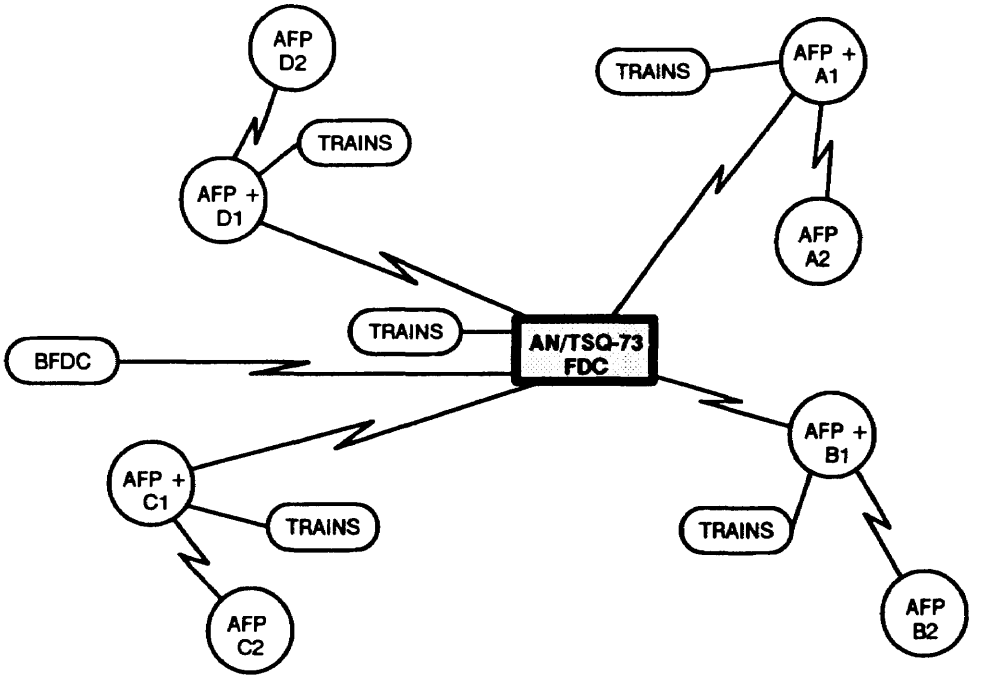


SNIPER BATTERY

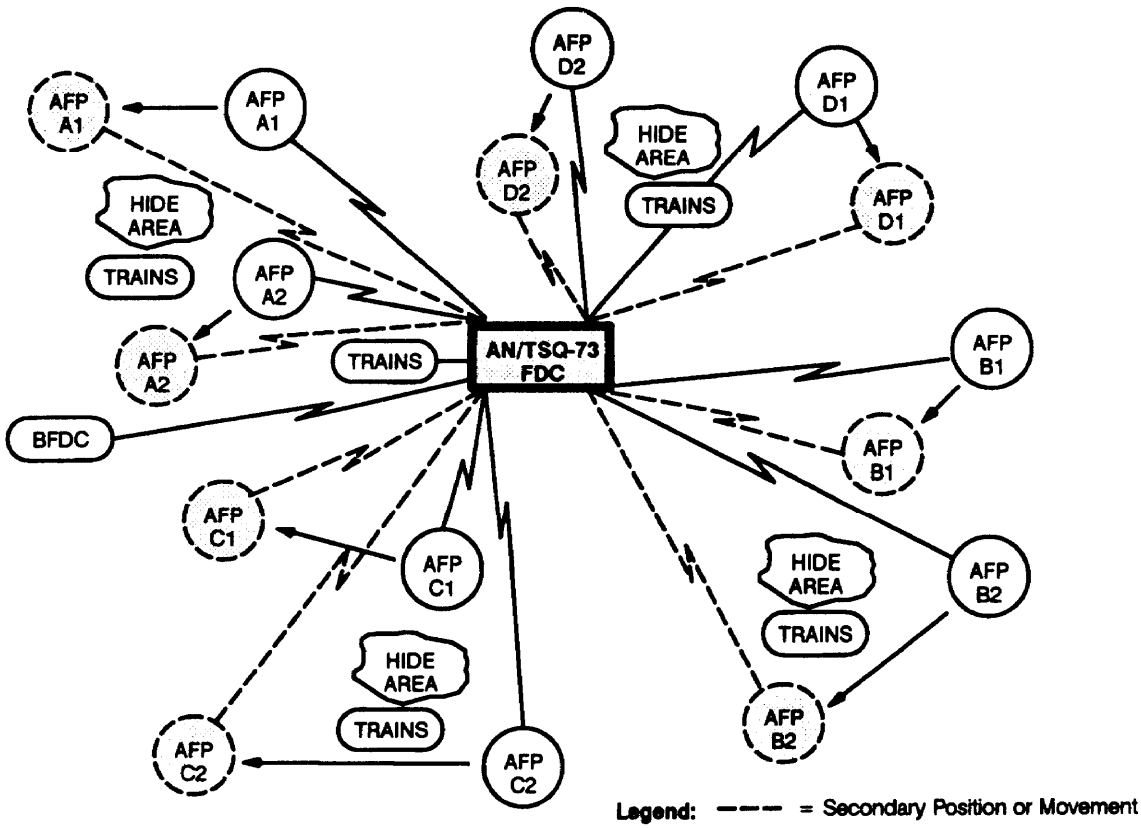
STATIC BATTERY TRAINS AREA/MOBILE AFPs



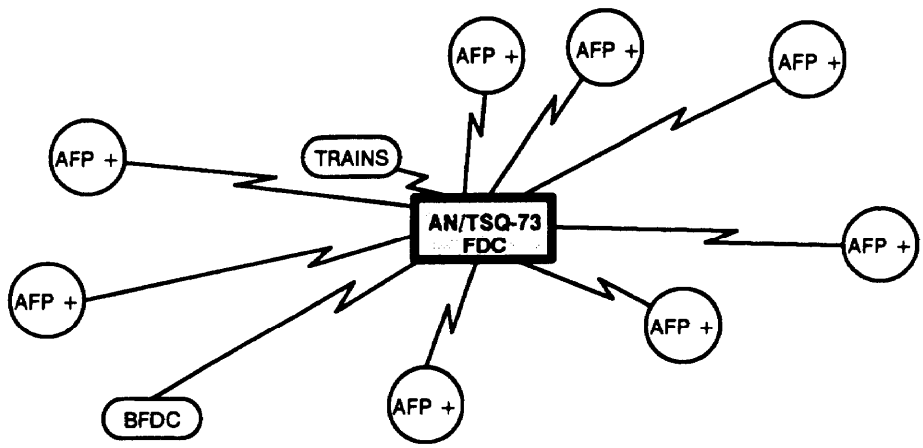
HEAVY/LIGHT, BASE/LEG BATTALION



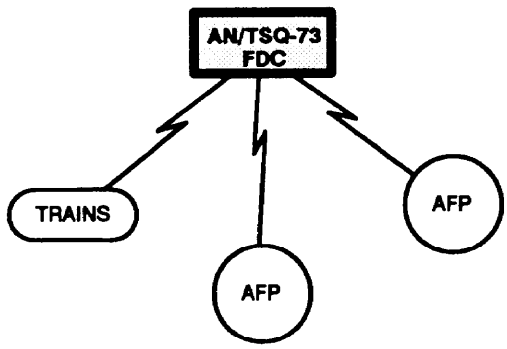
STATIONARY BATTERY TRAINS AREA/MOBILE AFPs



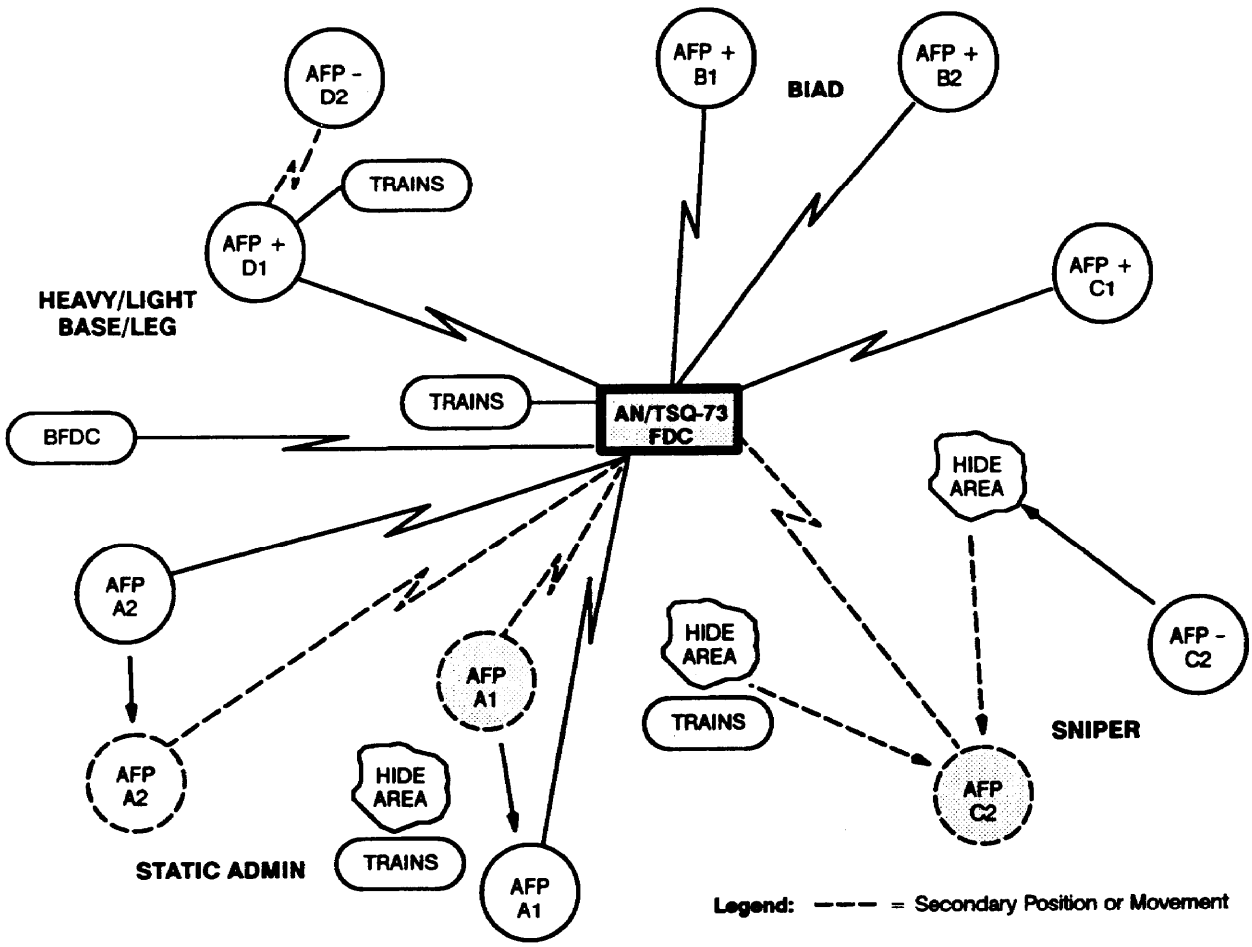
BIAD BATTALION



SNIPER BATTALION



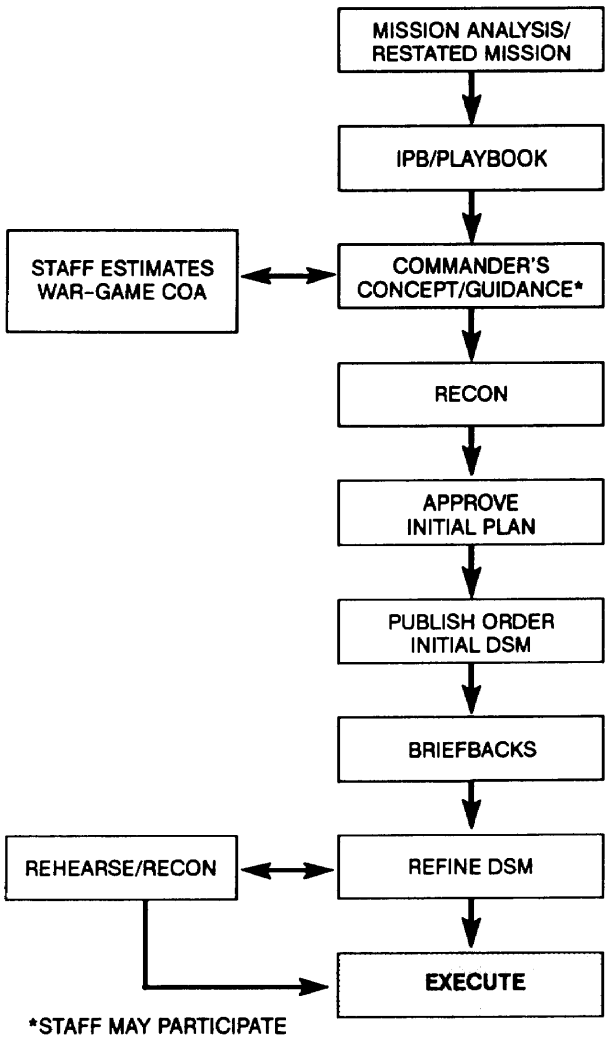
MIXED BATTALION



PLANNING PROCESS

ADA planning is a top-down interactive process between AD elements and the maneuver units they defend, The objective of ADA planning is to achieve a synchronized air defense at the critical time and place on the battlefield. Although the platoon leader is involved in the planning process, the majority of the plan is developed at brigade, battalion, and battery levels. This top-down process leaves more time for the battery commander and platoon leader to rehearse and execute the chosen course of action. The following illustration displays the planning process.

MODIFIED STAFF PLANNING-PROCESS



BRIGADE

Upon receipt of a new mission, first the brigade and then battalion staffs will conduct an AD estimate using Appendix C of FM 44-100. The initial product of the staff planning is the decision support template (DST). See Appendix H for additional information.

The DST is an intelligence estimate (both air and ground) in graphic form. The DST identifies critical events or enemy activities relative to time and location which may require tactical decisions.

Throughout the planning, the staff should consider the use of plays to express defense design and unit employment concepts. These plays communicate the commander's intent in a phrase. For example, the play "warrior" could mean that the two forward Hawk batteries focus on rotary-wing tracks along the PTL. The play is used at all levels to help illustrate the commander's concept of the operation, focus staff planning, and facilitate the production of the DST and decision support matrix (DSM).

After reviewing the new mission and the DST the staff will war-game courses of action and will publish an initial decision support matrix. The DSM integrates the air defense fight against a number of possible enemy contingencies.

The brigade provides battalions with a concept for the integration of the brigade into the corps fight, execution guidelines, intelligence information (ground and air), a logistics support concept, and C2 information. The brigade order sets the conditions and goals for the upcoming battle and gives guidance for its execution by subordinate battalions.

BATTALION

Upon receipt of the brigade DST and DSM, the battalion staff follows the same planning sequence and does their mission analysis. They also produce a DST and a DSM. The final product of the battalion planning is an execution matrix for the batteries which is time phased for their movements, gives PTLs, dictates EMCON, gives appropriate C2 information, and the location of key C2 and logistics facilities.

As each of these plans is briefed to the appropriate commanders and staff, it is briefed back to the commander to ensure his intent and concept are understood. The plan is then modified to incorporate any problems that surface during the briefback.

The briefback is an excellent tool to ensure subordinates understand the intent and concept of the operation. It can be employed by the platoon leader after

convoy briefings, RSOP briefings, or in any situation where accurate communication is essential to mission accomplishment.

BATTERY

The battery commander takes the battalion DST, DSM, execution matrix and briefs the platoon leaders. The platoon leader designs a platoon execution matrix for rehearsal and execution. This execution matrix is based on the commander's mission analysis and is supported by the unit's SOP, TSOP and the commander's intent. The battery execution matrix will provide platoon primary and secondary positions, logistics, EMCON, primary and alternate PTLs, and C2 information. Note: Examples of a DST, DSM, and execution matrix will be based on the contingency scenario at the end of this chapter.

The final stage of the planning process is a rehearsal. All commanders, staff, and key players must be present. They will physically walk through the plan, discussing contingencies. Each subordinate unit commander will give the specifics of their plans. The staff will then incorporate the details of the execution matrixes into the DSM.

The rehearsal is a multiechelon tool that is critical to the success of the mission. Rehearsals clarify the commander's concept and identify any potential problems before they jeopardize the mission. The rehearsal clarifies the subordinate commander's execution plan for the commander and allows him a complete overview of the operation. The plan is then refined to accommodate any issues raised during rehearsal. It is then ready for execution.

Note: The rehearsal can be used successfully at the platoon level whether the platoon is setting up a ground defense, sweeping an area for enemy activity, or emplacing a Hawk AFP.

PLATOON

The Hawk AFP is the lowest echelon at which Hawk fights. Hawk defense design is the application of air defense employment principles, employment guidelines, and weapon system design capabilities to determine the positions of individual AFPs. A well-designed scheme of maneuver will increase the effectiveness of air defenses and system survivability. The focus of any air defense operation must be the protection of the critical assets. (S) FM 44-100A (U) (TBP) provides classified data on system capabilities and planning.

In a contingency or offensive operation, planners foresee the Hawk battery in support of a maneuvering force. Under these conditions, the battalion will need more detailed coordination to maintain control of the platoons and to provide an integrated defense.

PLANNING FOR CONTINGENCY OPERATIONS

Planning is most critical in the preparation for deployment in a contingent operation. Contingency operations involve the deployment and use of US forces at the direction of the national command authority in support of national policy. The size and mission of the specific force involved in any operation may vary widely depending on the situation. Currently, corps Hawk elements are designated to support such operations.

ADA units participating in contingency operations will defend the prioritized assets of the contingency force commander. These operations will typically take place over vast areas, and the force will be vulnerable to air attack from any azimuth. Because of the unique characteristics of contingency operations, the focus of AD priorities must be to assure the survivability of the force. ADA protection for contingency operations requires a combination of HIMAD and FM elements. During the initial phases of the operation, contingency forces are extremely vulnerable to air attack. Given this consideration, Hawk units will enter contingency operations as early follow-on forces to participate in composite HIMAD, FM, and USAF or USN defense of arrival airfields or beachheads. To provide adequate protection, the Hawk element should be no smaller than battalion size. But, the command can deploy a Hawk element as small as a battery (two AFPs). The assets to receive priority protection in the initial phases will typically include—

- Airfields and ports receiving the deploying force.
- Forward airfields used to deploy maneuver forces into their battle positions.
- Command and control facilities.
- Logistical train areas.
- Lines of communications and main supply routes.
- Maneuver forces.
- Other assets designated by the commander as critical to force survivability.

Throughout the fighting phases of contingency operations, the task organization of all ADA supporting forces must be flexible to effectively support the commander's shifting priorities. These priorities will change as the situation develops and as the vulnerability of critical elements of the force changes. In all cases, the mission of the Hawk units is to assure the survivability of the contingency force.

Deploying Hawk elements smaller than a battalion in offensive or contingency operations demands special consideration and planning. Normally, the ADA battalion headquarters provides legal, medical, and overall administrative support for its units. The battalion S1 and S4 administer these functions. A dedicated ordnance company supports the battalion with Hawk-peculiar supplies, repair parts, and maintenance, along with automotive, power generating, air conditioning, and communications (except for COMSEC) support.

The commander or platoon leader coordinates with the battalion S4 and the supported elements' combat service support units to ensure logistics support. Special coordination is necessary for Hawk missile resupply, maintenance, and logistics support from the Hawk-peculiar ordnance company. Each Hawk system will require contact team support. Other common equipment maintenance support is coordinated with the supported unit.

Plans have to be made to accommodate the additional personnel and vehicles of the maintenance support team. Consideration should also be given to POL support for prime movers but most importantly for power generation equipment. For more details see Chapter 6 of this FM and FM 44-1.

HAWK ARMY AIRSPACE COMMAND AND CONTROL

Army airspace command and control (A2C2) consists of those actions that ensure the synchronized use of airspace and enhance the command and control of those forces using airspace (USAF, field artillery, ADA, and Army aviation). When Hawk units are supporting units or are part of a task force, the airspace it uses for engagement must interface with other agencies providing AD to provide maximum use of all AD assets. This coordination of airspace is necessary to prevent multiple unit engagements on the same aircraft, prevent fratricide, and control fires and aircraft flight routes. See FMs 100-103 and 24-1 for detailed information.

HAWK LATERAL COORDINATION GROUND PLANNING

The tactical situation, mission, supported element, and proximity to other elements will dictate interface planning. It will focus on what, when, where, and with whom the commander or platoon leader needs to coordinate to provide the best support. He should consider support of the supported element as well as his platoon. He should consider the following needs to get available support for them—

- Additional ground security.
- Local AD assistance.
- Engineer support for bunkers and revetments.
- Coordination of health and welfare facilities (shower and laundry points).
- Medical facilities.
- Motor maintenance support.
- Early warning from Patriot units and area air defense C3I Systems.
- Communications nets.

The AFP can also provide early warning to supported units and another communications link. AFP sensor data will be provided to FAAD units. This is accomplished by using the FAAD Army air command and control liaison officer to the HIMAD source for relaying early warning information over the air defense coordination net (AM). Interface planning is limited only by the platoon leader's initiative, perseverance, and persuasiveness.

OPERATION ORDERS

"Attention to orders" has been yelled at countless ceremonies. In combat, the platoon leader should pay attention to the platoon's orders to plan for and accomplish the mission. The platoon should already have playbooks or SOPS to cover most operations and tactical situations. At the minimum, the following SOPS should be available:

- Tactical SOP—provides guidance for tactical operations.
- Battery SOP—provides guidance for battery and platoon operations. (The battery SOP may include all the other SOPS listed below as annexes.)
- RSOP SOP—provides guidance for reconnaissance, selection, and occupation of position.
- Maintenance SOP—provides guidance for maintaining platoon equipment.
- Safety SOP—provides guidance for accident prevention.
- NBC SOP—provides guidance for NBC teams and decontamination.
- Supply and or resupply SOP—provides guidance for supply and or resupply operations and personnel.

WARNING ORDERS

A warning order gives subordinates advance notice of operations that are to come. This gives them time to prepare. Detailed information is located in FM 101-5. The platoon leader decides what actions his platoon can take to best use the the until execution of the operation order. Use OPSEC procedures to prevent disclosing the platoon's intentions during preparation. See the illustration below.

OPERATION ORDERS

The operation order is a logical presentation of information and instructions needed by the platoon leader to carry out an operation and typically contains five paragraphs. This includes the situation, mission, execution, service and support, command and signal, and the assignment of tasks. Refer to Appendix B, for execution guidelines on OPORDs and RSOPs. Detailed information is located in FM 101-5.

FRAGMENTARY ORDERS

A FRAGO is issued to subordinates when there is not enough time to give a full OPORD, or when an existing OPORD must be changed. The format for a FRAGO is the same as that for an OPORD, but only those items that have changed since the last OPORD should be discussed.

WARNING ORDER EXAMPLE

1. Situation: (Brief description: for example, the enemy is defending our battalion attacking to the north. Attachments and detachments to the platoon or squad.)
2. Mission: (Use the restated mission from the mission analysis.)
3. General Instructions:
   a. Special teams or task organization within platoon or squad.
   b. Uniform and equipment common to all (changes from SOP; for example, drop rucks and drop or pick up helmets).
   c. Special weapons, ammunition, or equipment (different from SOP).
   d. Tentative time schedule. This is formed on the basis of mission analysis. It includes at least--
      (1) Earliest time of move.
      (2) Time and place of OPORD.
      (3) Probable execution time.
      (4) Inspection times and items to be inspected (SOP).
      (5) Rehearsal times land actions to be rehearsed.
   e. Additional general instruction as needed or by SOP.
4. Special Instructions:
   a. To subordinate leaders:
      (1) Platoon sergeant.
      (2) Squad leader.
      (3) RATELO.
      (4) Medic.
      (5) Forward observer.
      (6) Attachments.
   b. To persons helping in preparation of OPORD (SOP).
   c. As needed or by SOP.

SCENARIO

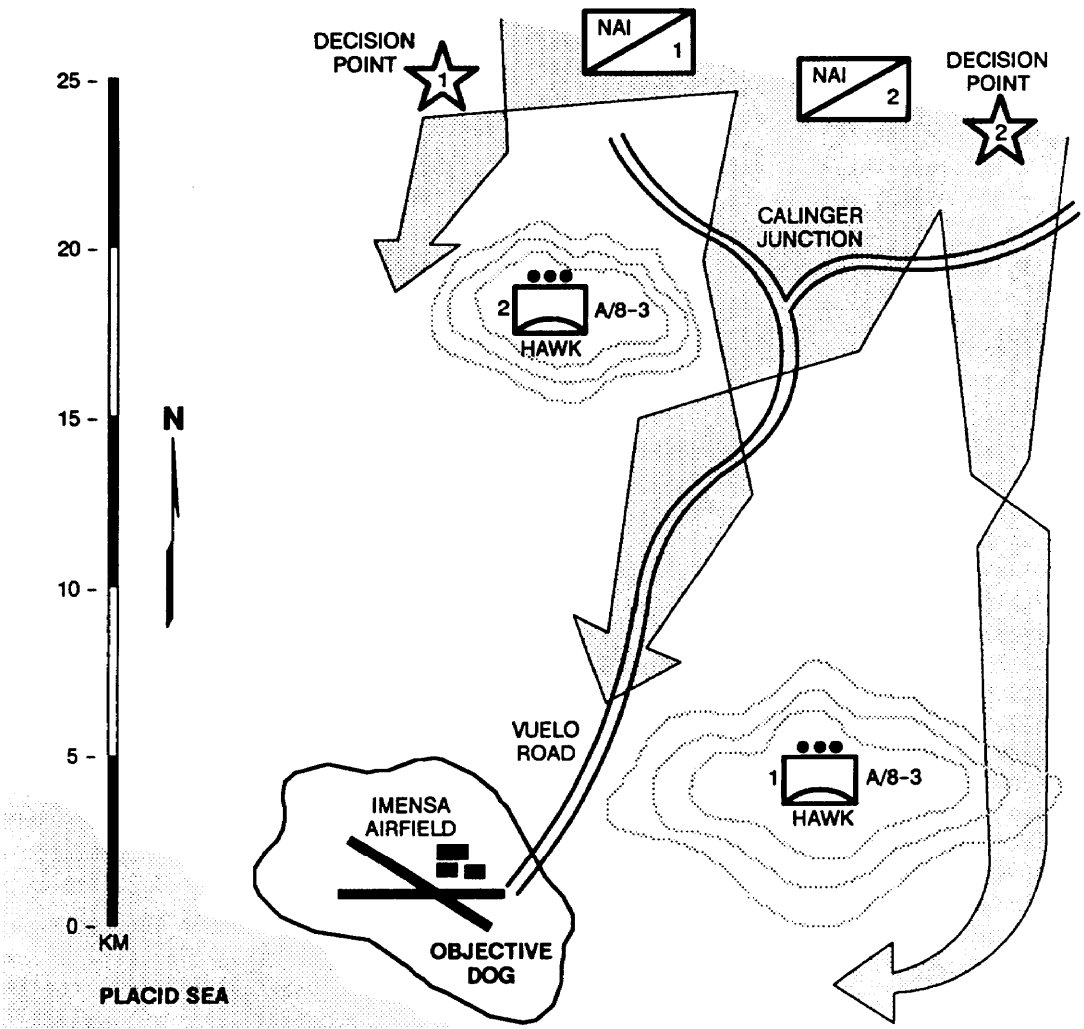
The following scenario illustrates the use of the planning process. It will familiarize the reader with the overall process.

SITUATION

The overthrow of President Marcus in the Republic of Itoman has caused all in-country Americans and their dependents to be jailed for crimes against the state. A US joint task force has been assembled for deployment to Itoman. The 8th Battalion, 3rd ADA (Hawk) has been assigned the mission to provide low- to medium–altitude air defense for the task force.

The 8-3 ADA commander, develops the battalion DST (below) and DSM (on page 3-14), and has decided to deploy Alpha Battery to Itoman for immediate AD coverage of the primary objective—Imensa Airfield—which will be taken by the task force. The rest of the battalion will deploy following the occupation of the objective. He developed the battalion DST and DSM based on the ADA brigade commander's intent and instructions.

DECISION SUPPORT TEMPLATE



DECISION SUPPORT MATRIX

	DECISION POINT 1	DECISION POINT 2
EVENT	• AIR MAIN ATTACK TURNS WEST TO ATTACK LEFT FLANK	• AIR MAIN ATTACK TURNS EAST TO ATTACK RIGHT FLANK
INTEL	• AWACS EARLY WARNING OF LARGE FORMATION OF FIXED-WING AIRCRAFT HEADED TOWARD IMENSA AIRFIELD	• AWACS EARLY WARNING OF LARGE FORMATION OF FIXED-WING AIRCRAFT HEADED TOWARD IMENSA AIRFIELD
HAWK	• 1ST PLT SHIFT PTL TO 5800 MILS • 2D PLT SHIFT PTL TO 6400 MILS • EARLY WARNING TO STINGER PLT	• 1ST PLT SHIFT PTL TO 0400 MILS • 2D PLT SHIFT PTL TO 0800 MILS, ON ORDER MOVE TO ALT POSITION • EARLY WARNING TO STINGER PLT
STINGER	• 1ST SECTION SHIFT PTL TO 6000 MILS • 2D SECTION SHIFT PTL TO 5600 MILS	• 1ST SECTION SHIFT PTL TO 100 MILS • 2D SECTION SHIFT PTL TO 1400 MILS ON ORDER OVERWATCH MOVEMENT OF 2D PLT
C^2	• AWACS PROVIDES AIR PICTURE WITH PRIORITIZED TARGETS	• AWACS PROVIDES AIR PICTURE WITH PRIORITIZED TARGETS
EARLY WARNING	• PASS ON COMMAND NETS	• PASS ON COMMAND NETS

PLANNING

After receiving the DST DSM, briefing, and OPORD from the battalion commander and staff, the A Battery, 8-3 commander, will instruct the platoon leaders to prepare for an AFP deployment.

The commander will use the DST and the DSM to construct the execution matrix (see Execution Matrix illustration). The execution matrix provides event, element, and time matrices to synchronize operations for planning and execution.

The commander briefs the platoon leaders on the execution matrix to ensure clarity. Finally, they walk through the plan to receive the platoon leader's input and resolve any problems. He then has the platoon leaders backbrief the execution matrix to ensure thorough understanding. He emphasizes a 24-hour time limit for preparation of personnel and equipment. The unit will convoy to Lanlee Air Base for air transport to Itoman. The 1st Platoon of A Battery, 8-3 ADA will deploy to Itoman at N+ 20.

The platoon leaders will prepare precombat and OPORD checklists while the battery commander completes his planning process, and briefs battery personnel on OPSEC. The platoon leaders then brief the platoon's key personnel and assign tasks, responsibilities, and deadlines, and schedule inspections as needed.

The 1st Platoon RSOP officer will brief and inspect his team prior to departing for Lanlee Air Base, if time permits. He has reviewed IPB data and the primary position, and selects Imensa Airfield as his alternate position. He also plans to make a radar coverage diagram, using the deliberate method (Appendix G), if time permits.

The platoon leader has already extracted the PTL (800 mils), critical assets (Imensa Airfield), and threat avenues of approach from the DST. The platoon leader also reviews weather and terrain data so he can plan use of the video tracking group (VTG) or tracking adjunct system TAS) for identification. The sector of interest has also been defined as 0 to 1600 mils for the 1st Platoon.

EXECUTION

Upon arrival on Itoman at Imensa Airfield, the 1st Platoon will deploy its RSOP team to the primary position. The 1st Platoon will convoy approximately 3 kilometers to its location. Battery trains and the commander's CP will collocate with the 1st Platoon. Once the 1st Platoon is operational, the 2d Platoon will deploy to its selected primary position.

The organic MANPADS assets will be employed per SOP or as needed to maximize AD coverage. The 2d Platoon leader must ensure ground forces have secured the road junction (Calinger) approximately 15 kilometers from the airfield and the area around it. Upon verification of the AO being secure, the RSOP team will deploy. After the 2d Platoon is operational, the platoons will ensure their communications nets are operational. An ASIT van is located with the 1st Platoon to receive down-linked information from the AWACS. The commander has instructed his platoon leaders to adhere to the TSOP in reacting to communications degradation or loss.

A Battery, 8-3 ADA will provide AD while the rest of the battalion arrives and deploys on Itoman. The battalion AN/TSQ-73 and TOC will be located at Imensa Airfield.

EXECUTION MATRIX

	EVENT				
ELEMENT	**N + 30** 1ST PLT ARRIVES AT ITOMAN	**N + 35** 2D PLT ARRIVES AT ITOMAN	**N + 38** BATTERY TRAINS ARRIVE	**N + 40** AN/TSQ-73 ARRIVES	**N + 43** AN/TSQ-73 OPERATIONAL
INTEL	AWACS MONITORS AO	AWACS MONITORS AO	AWACS AIR PICTURE	AWACS AIR PICTURE	AWACS AIR PICTURE
BATTERY TRAINS	EN ROUTE	EN ROUTE	DEPLOY TO 1ST PLT LOCATION	BATTLE STATIONS COORDINATE MOVEMENT OF AN/TSQ-73 TO LOCATION	BATTLE STATIONS SUPPORT PLT
FIRST PLATOON	DEPLOY RSOP	PTL 800 MILS DEPLOY PLT BECOMES OPERATIONAL	BATTLE STATIONS LINK WITH AWACS THEN 2D PLT	BATTLE STATIONS OPERATE FIRE UNIT TO FIRE UNIT	BATTLE STATIONS LINK WITH AN/TSQ-73
SECOND PLATOON	EN ROUTE	DEPLOY RSOP	PTL 1000 MILS OPERATIONAL	BATTLE STATIONS OPERATE FIRE UNIT TO FIRE UNIT	BATTLE STATIONS LINK WITH AN/TSQ-73
AN/TSQ-73	EN ROUTE	EN ROUTE	EN ROUTE	DEPLOY TO 1ST PLT LOCATION	LINK WITH AWACS
MANPADS	1 TEAM DEPLOYS WITH 1ST PLT RSOP	PTLS 5700 AND 1000 MILS. 2 TEAMS PROVIDE AD FOR 1ST PLT: 1 TEAM DEPLOYS WITH 2D PLT RSOP.	PTLS 5700 AND 1000 MILS. BATTLE STATIONS 1ST PLT PTLS 6400 AND 1600 MILS. BATTLE STATIONS 2D PLT	BATTLE STATIONS	BATTLE STATIONS

HAWK PLAYS

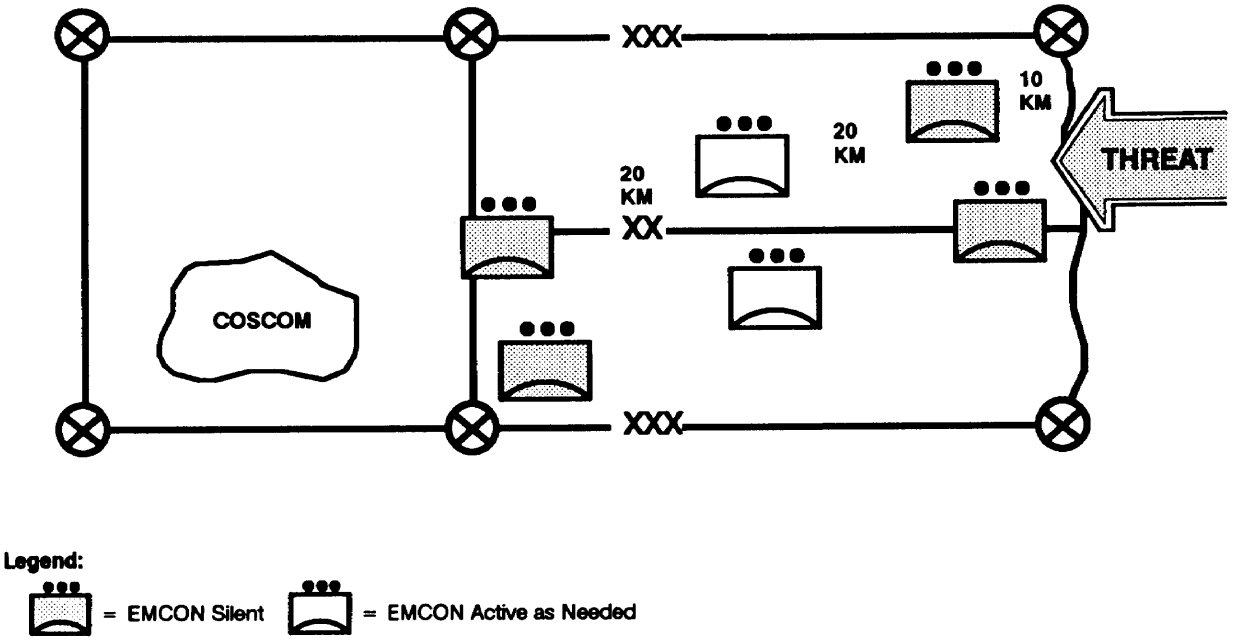
As mentioned earlier, the staff may begin planning, armed with predetermined plays. The play is an execution guide that helps illustrate the commander's concept of the operation and will be executed according to the commander's analysis of the tactical situation. Plays should simplify operational concepts that have been prepared during earlier training or staff planning sessions to allow the brigade commander to express his intent for the coming battle in a single word or phrase. For example, one play could place the emphasis on pure Hawk defense and another direct the formation of a HIMAD task force to counter both the TBM threat and the independent air threat. For contingency operations, plays would plan for lodgement defense or follow-on operations. It is important toremember that a "play" is a concept and must be altered to fit the demands of METT-T.

The following illustrations show several plays for pure Hawk units. These are just examples. Each unit may tailor these plays to its own structure and mission.

RED DOG

The corps ADA brigade commander's intent is to provide the corps main effort with augmented ADA support against the threat aircraft in the threat's main air avenue of approach. The emphasis is to provide Hawk support forward and that key is firepower and mobility (see the Hawk Play "Red Dog" illustration). The two forward AFPs (10 kilometers from the FLOT) are in EMCON silent; they are prepared to engage threat aircraft as far forward as possible using the ADA communications network to receive targets and provide early warning. Target acquisition and tracking is accomplished using VTG or TAS. The two middle AFPs are in EMCON active and are conducting the air battle. The two AFPs in the rear are in EMCON silent and they are prepared to bound forward with the maneuver forces across the FLOT.

HAWK PLAY "RED DOG"



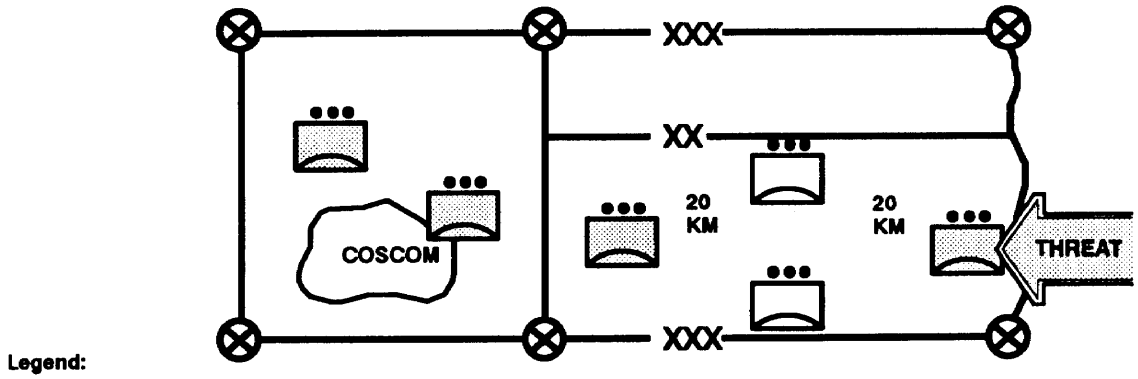
TRAP

The corps ADA brigade commander's intent is to create an ADA kill sack to defeat enemy frontal aviation aircraft. The units would be positioned in a diamond shape with the forward and center AFP in EMCON silent using VTG or TAS. Three other AFPs are in EMCON active. The diamond would be aligned along the primary air avenue of approach to provide maximum ADA coverage in the sector of operations. The two EMCON silent AFPs in the rear are prepared to move to alternate positions after engaging the first wave of aircraft. See the Hawk Play "Trap" illustration.

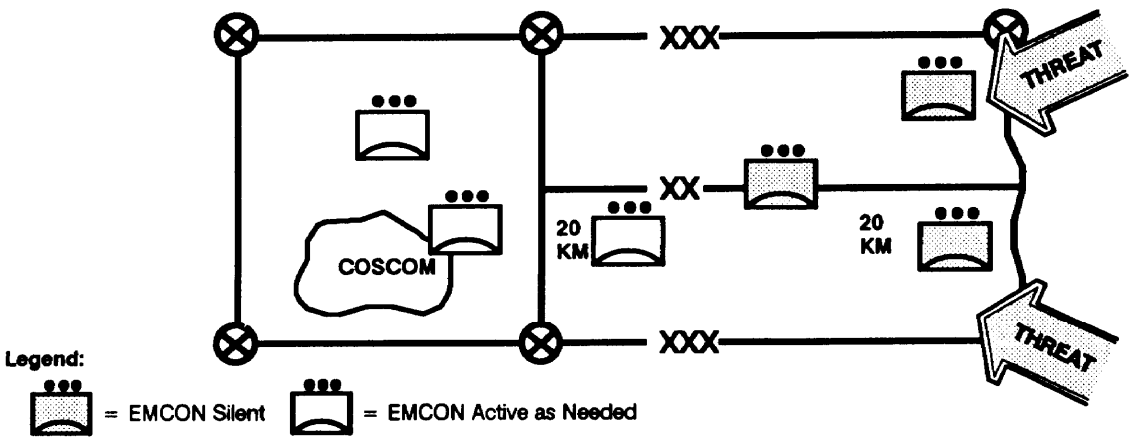
LINEBACKER

The corps ADA brigade commander's intent is to provide maximum ADA coverage to protect division and crops critical rear area assets. The Hawk battalion commander will position his battalion in an elongated H to cover both the primary and secondary threat air avenues of approach. See the Hawk Play "Linebacker" illustration. The EMCON status of the three forward AFPs is EMCON silent and they are centered between the avenues using VTG or TAS for target acquisition. The three rear area AFPs are positioned in a triangle with one AFP forward and are in EMCON active.

HAWK PLAY "TRAP"



HAWK PLAY "LINEBACKER"



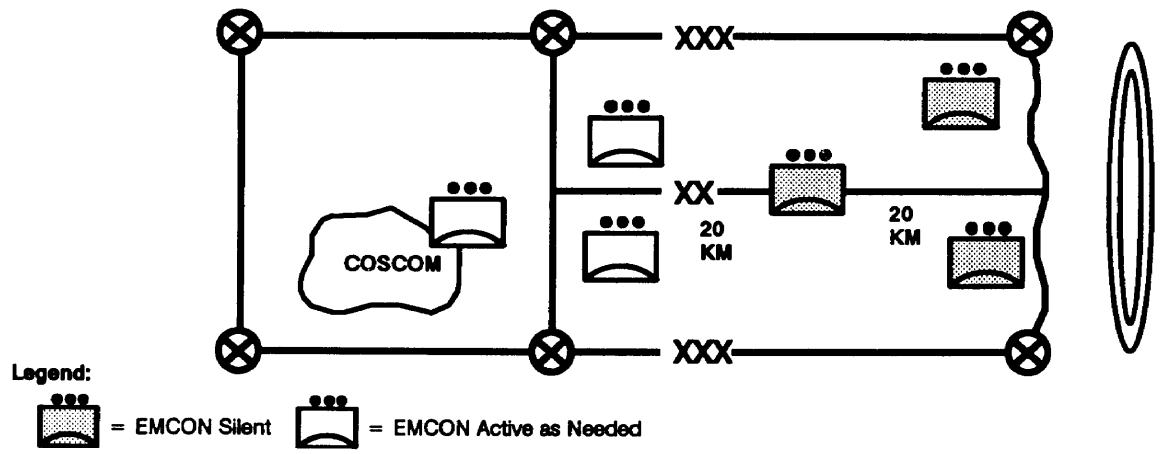
SNIPER

The corps ADA brigade commander's intent is to identify and destroy enemy jammers. Tactical surprise and mobility are the keys to success (see the Hawk Play "Sniper" illustration). Three AFPs are positioned forward as close as possible to the FLOT in EMCON silent using VTG or TAS to identify and engage jammers. One AFP is in the middle in EMCON silent to cover the rearward movement of the forward AFPs. The two rear AFPs will be in EMCON active. After the forward AFPs have identified and destroyed the threat jammers, they will leapfrog backwards under the coverage of the three rear AFPs.

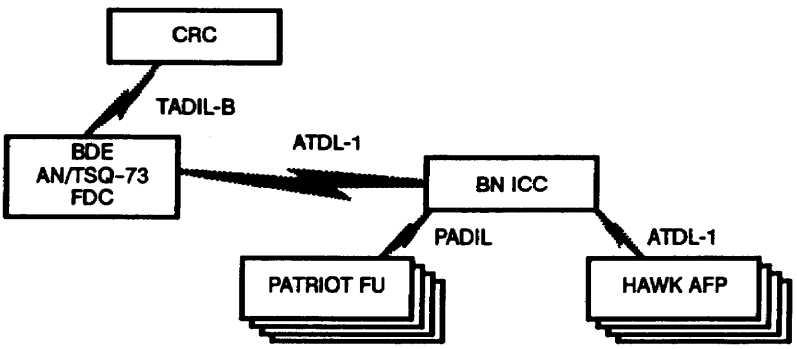
HIMAD TASK FORCE

The HIMAD task force is a mix of Patriot and Hawk units (the exact mix being dependent on IPB and METT-T) under the command and control of a patriot ICC. Hawk AFPs will normally operate under the ICC in the same manner as Patriot fire units. The ICC is capable of controlling Patriot and Hawk fire units in a separate configuration, or of controlling subordinate battalions (Hawk and or Patriot) as well as its own subordinate fire units as shown in the HIMAD Task Force Configuration illustration.

HAWK PLAY "SNIPER"



HIMAD TASK FORCE CONFIGURATION



The size of the task force is determined by METT-Tand system capability. There are five general situations which require consideration for the use of a HIMAD task force:

- The EAC commander, providing HIMAD support in an established theater, may use the HIMAD task force to increase air defense capabilities over the corps in response to specific mission requirements or in response to the threat indicated by the IPB.
- The corps commander desires to extend air defense artillery coverage over his area of interest and into the deep battle in support of a tactical operation (deep air mobile assault). The long range of Patriot coupled with the mobility of Hawk, under the central control of the ICC, would provide the corps with effective air defense.
- Reconstitution of air defense assets after losses could call for the use of a HIMAD task force. When reconstituting, the firepower of remaining Hawk and Patriot fire units may be consolidated under a Patriot ICC.
- In a contingency operation, given the threat of TBMs, the HIMAD task force may represent the best force package to defeat both the TBM threat and the air breathing threat. For example, Patriot batteries would provide protection of the lodgement area primarily against TBMs, while Hawk assault fire platoons would be used to kill attacking aircraft.
- The allocation of Air Force defensive counterair assets (fighter-interceptors) is reduced, thereby reducing the fighter engagement zone and expanding the missile engagement zone.

PATRIOT AND HAWK

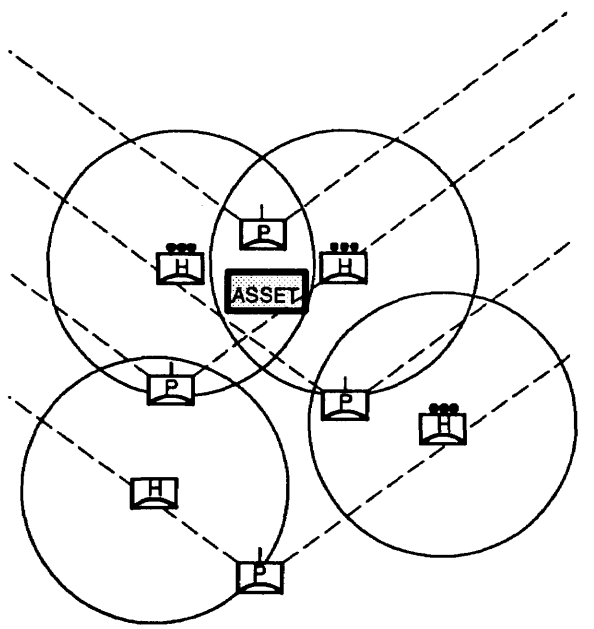
Using the capabilities of the Hawk and Patriot syst ems in a task force configuration increases the effectiveness and survivability of both systems. To fully integrate operations, the Hawk system must be aligned with the Patriot PADS equipment during the RSOP. Exact alignment is vital to Patriot operations. Without accurate alignment, target resolution will be ineffective, and accurate airbattle management will be impossible. Hawk units must be tied into the ICC to receive early warning tracks from the Patriot radars. Because of differences in the track processing computers and data flow rate, special modems must be used to integrate the systems. Tactical directors and tactical control officers must train together to minimize the distraction factor. The system specific languages and system capabilities are just divergent enough to cause confusion during the pressure of battle.

The Phase III Hawk system makes integration with the Patriot ICC much easier because the data displays, mapping, and internal software are modeled after Patriot's. The following illustration shows a HIMAD task force defense with Hawk augmenting Patriot coverage by providing rear and side coverage for the Patriot dead zones. Two AFPs are also providing early engagement and defense in depth to engage air-breathing targets and conserve Patriot missiles for more threatening targets such as TBMs.

To fully implement the concept of the HIMAD task force, the task force S3 must not only understand both the Patriot and the Hawk systems, but must also have a good working knowledge of the software of both systems and its impact on the planning and execution of the mission. Planners may turn to (S) FM 44-100A (U) (TBP) and the technical manuals for technical details and specifics on both systems.

The formation of a HIMAD task force can afford the commander several advantages. These advantages will be discussed in the next paragraphs.

HIMAD TASK FORCE COVERAGE



Mix

By combining the two systems under the ICC, the limitations inherent in each system are to some extent mitigated. For Hawk, track correlation is improved, ID conflicts are able to be quickly resolved, and kill probability is enhanced. For Patriot, existing sector coverage is augmented and dead zones are filled. When Hawk AFPs are placed forward of Patriot batteries, they may provide early warning to the task force and may also be able to drive attacking aircraft up into Patriot fires. In any case, enemy pilots are forced to fly against two systems which use two very different methods of acquisition and guidance and which share a single C2 node.

Economy of Force

Better use of available missiles is more easily accomplished under a task force C2. A coordinated effort allows for a more judicious use of Patriot missiles which are more expensive and less plentiful than Hawk missiles and might better be conserved for use in the TBM role. The placement of Hawk AFPs to support the first use of Hawk and training Patriot TDs to favor the use of Hawk over Patriot is necessary to make the HIMAD task force function.

Agility

The HIMAD task force provides the force commander with a means of tailoring the air defense organization to fit the combat situation and the mission. The task force is a multifaceted organization that can counter the entire spectrum of potential threats facing the corps (fixed- and rotary-wing aircraft, TBMs, and jammers). Use of Hawk with Patriot frees Patriot for the anti-TBM role and for missions against standoff jammers. In addition, Patriot can increase Hawk survivability by providing high-quality early warning via data link as well as by providing incidental TBM protection.

Synchronization of Hawk and Patriot

The coordination of effort that the HIMAD task force allows provides unprecedented synchronization, and therefore, greater effectiveness and lethality on the battlefield. During the planning for contingent operations, the task force may also provide planners with flexible means for providing ground forces with adequate air defense protection. Limited airlift assets require that planners put together force packages that provide a maximum of firepower while costing as little as possible in weight or numbers of aircraft sorties. Pure Patriot or Hawk configurations may meet the requirements of METT-T in some circumstances, but contingency operations need the flexibility that the task force provides in terms of both the TBM threat and ABT.

TRAINING

Training issues for the HIMAD task force include tactics and communications training. Patriot tactical directors and assistants must be thoroughly familiar with the Hawk weapon system. They must understand how their system software functions with regard to Hawk (see (S) FM 44-100A (U) [TBP]). On the Hawk side, tactical officers and radar operators must understand the differences in command, control, and communications under the ICC. In many cases, these are no more than differences in terminology, but unless they are identified and dealt with, they can severely affect the synchronization that is the strength of the HIMAD task force. Hawk TCOs at the battery level will need extensive familiarization with the Patriot system to fully integrate operations and deconflict engagements at the battery level. During task force operations, it is particularly important that the operators in both systems fully understand the capabilities and limitations of the other system to synchronize AD operations.

Training for both Hawk and Patriot communicators is critical. Compatible communications SOPs which stress compatible channelization for UHF systems will go a long way toward reducing the amount of training. They should be familiar with the communications equipment used by their counterparts in the Patriot system. Here again, many of the differences amount to no more than terminology. Training together will reduce these differences. Providing the right slice of system-spedlc support to the HIMAD task force is a difficult problem. Unit SOPS that address this subject should be based upon solid evidence gathered during task force training. Training should be structured to stress the logistical system. SOPS should address how support is to be accomplished, how repair parts are to be issued as well as how maintenance personnel and tools and test equipment are to be allocated. While the emphasis here is on system support, variations in conventional and communications equipment between Hawk and Patriot units must be considered as well.

Patriot software limits the number of fire units that the ICC may control to no more than 12. Any combination of Patriot and Hawk may be assigned to an ICC. Only 6 Patriot fire units can be assigned. In addition, in the master ICC configuration, the ICC may also control up to 5 subordinate battalions, though a

task force that large would likely be beyond the ability of most ICC crews to control, regardless of the level of training.

DEPLOYMENT CONSIDERATIONS

During deployment planning, Patriot should be considered as the base unit to lay the framework for the deployment. Then Hawk AFPs should be factored into the design. Normally, Hawk AFPs should be emplaced within the Patriot sector 10 to 20 kilometers forward of Patriot fire units in valleys or low areas not covered by Patriot. This will ensure that the Patriot air picture provided to Hawk will be of use, and that Hawk can detect low flyers coming up the valleys or dead zones. Hawk detection will force aircraft up into Patriot coverage.

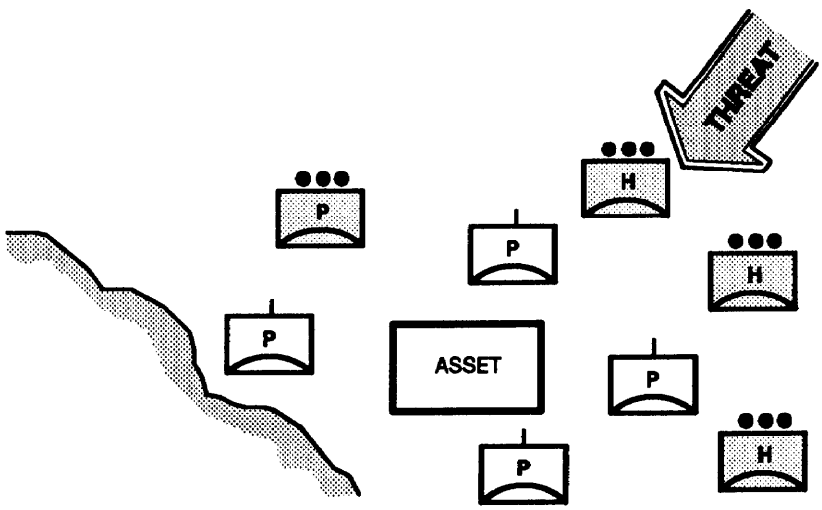
When a task force is organized, it should consist of no less than three Patriot batteries. This will help ensure that the task force will retain ECCM capability through triangulation. Although METT-T will assist in determining the exact size of the task force, a mix of four Patriot batteries and four Hawk AFPs is a good baseline. This facilitates excellent air coverage and is well within the work load capacity of well-trained ICC operators. It also facilitates assignment of remaining Hawk units, eases the system-specific support problem, and maintains the Hawk battery administrative and logistic integrity.

Terrain and mission will be major factors in the decision to forma task force or to fight as pure battalions. If there is no requirement for mutual coverage between Patriot and Hawk, or if their missions are widely divergent, then pure operations maybe favored. However, if there is a requirement to have Hawk operate in Patriot coverage, than task organization under the ICC should be favored because it increases battlefield synchronization, system responsiveness, and survivability of the ADA force.

Even when the terrain does not support this type of deployment, Hawk AFPs should still be placed within these limits for two reasons. First, Hawk receives the benefit of Patriot's TBM protection. Second, Hawk missiles are more available than Patriot missiles, and the Patriot missiles must be retained for missions that Hawk missiles cannot perform. If it becomes clear either during planning or after actual deployment that the Patriot system will be given engagement preference, range bias should be used to restore the desired missile expenditure balance between Hawk and Patriot.

When necessary, Hawk can be deployed on the flanks and rear of the Patriot defense, preferably within Patriot coverage, because of the reasons stated above (see the following illustration). When this is not possible, the S3 should ensure that Hawk AFPs do fall within Patriot sectors after reorientation to Patriot secondary or tertiary target lines.

TYPICAL TASK FORCE DEPLOYMENT



The following illustration is a mission-to-task-force organization matrix. It is a template for planning purposes and is not intended to be prescriptive in nature. Numbers of fire units are given to make the matrix manageable. It is designed so that 1 is the best choice and 4 is the least effective option. To understand the logic behind this matrix, one must understand the advantages and disadvantages associated with each type of task organization.

HIMAD TASK FORCE MATRIX

		UNIT CONFIGURATION			
METT-T	HIMAD FORCE CONFIGURATION	PATRIOT HEAVY TF	HAWK HEAVY TF	PURE PATRIOT	PURE HAWK
MISSION	DEFENSE	1	3	2	4
	OFFENSE	3	1	4	2
	EXPLOITATION	3	3	4	1
	CONTINGENCY	1	3	2	4
ENEMY	INDEPENDENT AIR	1	3	2	4
	TBM	2	3	1	N/A
	FRONTAL FIXED WING	1	2	4	3
	ATTACK HEL REGIMENT	3	2	4	1
	SOJ	2	3	1	4
TERRAIN/ WEATHER	FLAT	1	2	2	2
	HILLY	1	2	4	3
	MOUNTAINOUS	1	2	3	4
	POOR TRAFFICABILITY	3	2	4	1
	POOR ROADS	3	1	4	2
TROOPS/ EQUIPMENT/ RESOURCES	FIREPOWER	1	2	1	3
	TRANSPORTABILITY	3	2	3	1
	SUPPORTABILITY	2	2	1	1
TIME	HIGH MOBILITY	3	2	4	1
	RELATIVELY STATIC	1	3	2	4

Separate Battalions (Pure Hawk or Patriot)

Separate battalions are pure Hawk or Patriot units that are organized with only Hawk or Patriot materials and equipment. These are TOE or MTOE organizations that are stand-alone units.

Advantages. It is much easier to sustain logistically than a HIMAD task force, since it does not require a mix of system specific items. C2 is simpler since no interoperability is required. Patriot and Hawk are dealing only with their normal C2 and logistical channels. Early in the initial deployment, pure units may be the only practical solution to the deployment requirements.

Disadvantages. There is no mix of weapons systems so there is no compensation for the inherent system limitations. Hawk has no real anti-TBM capability and a Patriot battalion lacks complete self-defense capability.

Patriot Heavy Task Force (Three or More Patriot and Two Hawk Batteries)

Advantages. The attached Hawk platoons provide protection for the exposed Patriot rear area and flanks. This allows for the maximum use of Patriot system capabilities to cover the corps area. It enhances Hawk's ability for track correlation, identification, and kill probability. Hawk also receives incidental TBM coverage and increased remote air picture.

Disadvantages. The sustainment of a single Hawk battery poses problems. Cross-leveling and reconstitution with the rest of the battalion would be complicated and slow because they are removed from the normal communications channels. Due to control problems, the Hawk system would not be used to its fullest capability. A second disadvantage would be the lack of any real mission for the Hawk battalion commander and his staff. They would only have two to four AFPs to use.

Hawk Heavy Task Force (Three Hawk and One Patriot Battery

A Hawk heavy TF is an organization composed of more Hawk units than Patriot units. This configurat ion of TF will not be an MTOE or TOE organization but a combination of the two.

Advantages. It is more mobile than the other organizations except for pure Hawk. The Patriot battery can provide overwatch protection. It is extremely effective against frontal aviation and attack helicopter regiments. Hawk unit survivability of forward placed units is greatly increased due to TBM protection received from the Patriot battery.

Disadvantages. No data can be passed between Hawk and Patriot unless the ICC goes with the task force. Sustainment of a single Patriot battery poses the same problems that the Hawk battery has with the Patriot heavy force. The Patriot battery faces decreased survivability due to the lack of a direct tie-in with the other Patriot batteries.

RSOP CONSIDERATIONS

Hawk alignment in the pure configuration normally uses map spotting or resection together with the M2 aiming circle to orient the AFP. This provides sufficient data for the correlation needs of the Hawk AN/TSQ-73. However, when operating with Patriot, these alignment procedures are not accurate enough to ensure track correlation and rapid lock with the Hawk HPI. Accurate and rapid HPI locks depend on the quality of the remote three-dimensional air picture being provided by the Patriot ICC. Consequently, in a task force, survey (PADS) crews assigned to Patriot must be sent to subordinate Hawk AFPs as they move about the battlefield to provide sufficiently accurate location, altitude, and alignment data. This may create a management problem for the force S3 because of the limited numbers of survey crews assigned. Unit moves must be coordinated so that survey crews can be available to RSOP teams before the the main body closes.

HIMAD TASK FORCE PLAYS

HIMAD task force plays are set by the unit's mission rather than location. The task force plays must be aligned to the Patriot system's four missions. The missions are—

- Pure anti-TBM role.
- Anti-TBM heavy with limited ABT defense.
- ABT heavy with limited anti-TBM role.
- Pure ABT defense.

As a part of a HIMAD task force, the Hawk unit should use its plays in conjunction with the four Patriot missions. The exact task force configuration and deployment will depend on the mission of the entire force, the US goals and objectives, and the probable threat capabilities. Each unit will design plays that support their mission.

The following plays are examples of two proposed task force missions: mature and contingent theaters.

In both plays, there is a TBM as well as an ABT. Both plays use the standard task force of four Patriot batteries and four Hawk AFPs.

AXE

The ADA task force commander's intent is to identify and destroy enemy jammers, counter TBMs, and provide the maneuver force with protection from fixed- and rotary-wing attacks (see the Task Force Play "Axe" illustration). Tactical surprise and mobility are the keys to success. The Hawk AFPs are positioned forward of the Patriot units to cover the deadspace. Hawk will be in EMCON silent until required to radiate using TAS or VTG. Patriot will provide an air picture to Hawk. Patriot will be positioned to the rear of the corps sector in direct protection of designated assets. Patriot PTLs for the three rear batteries will be directed towards the TBM threat. The forward battery will provide acquisition for the SOJ threat and cover the main ABT approach.

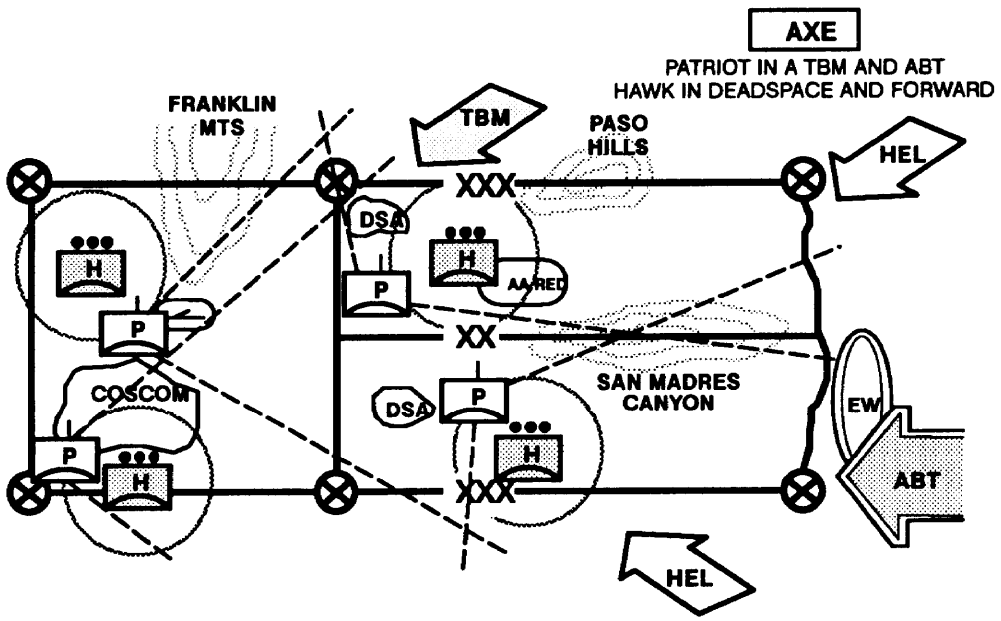
SHIELD

The ADA task force commander's intent is to identify and destroy TBMs and provide the lodgement force with protection from fixed- and rotary-wing attacks (see the Task Force Play "Shield" illustration). Rapid deployment and area coverage are the keys to success. The Hawk AFPs are positioned to the flanks and rear of the Patriot units to cover the out of sector area. Hawk will be in EMCON silent using VTG or TAS until required to radiate. Patriot will provide an air picture to Hawk. Patriot will be positioned around and behind the primary lodgement assets. Patriot PTLs for the two rear batteries will be directed towards the TBM threat. The two forward batteries will provide protection against the main ABT avenues of approach.

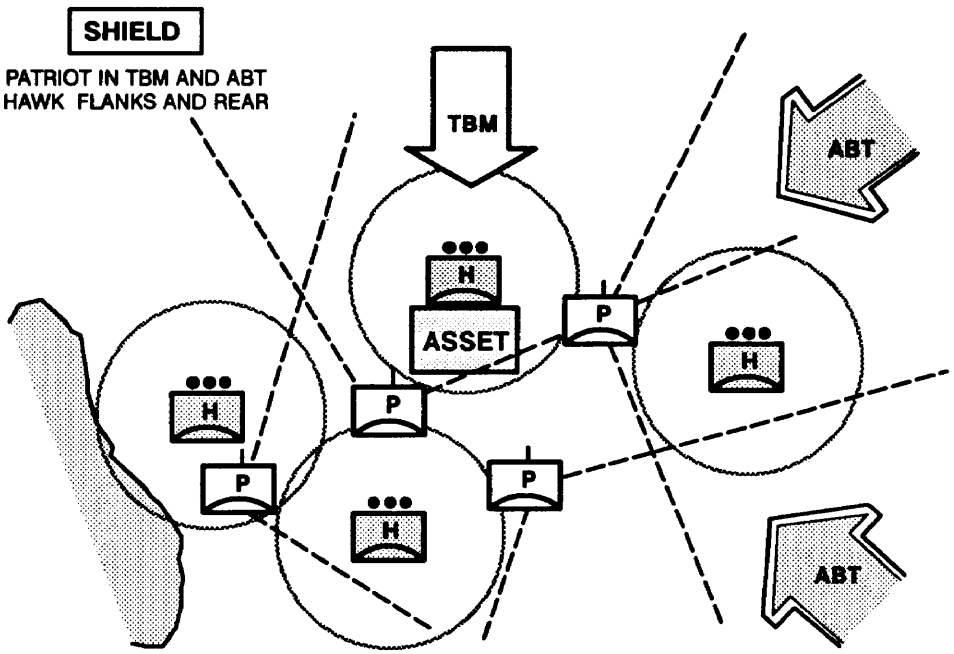
LANCE

The ADA task force commander's intent is to identify and destroy enemy jammers and provide the maneuver force with protection from fixed- and rotary-wing attacks (see Task Force Play "Lance" illustration). Mutual support and overlapping fires are the keys to success. The Hawk AFPs are positioned forward of the Patriot units to counter the helicopter threat and to the flanks and rear to cover the deadspace. Hawk will be in EMCON silent until required to radiate. Patriot will provide an air picture to Hawk. Patriot will be positioned to the rear of the corps sector in direct protection of designated assets. Patriot PTLs will converge for maximum coverage of the defended area.

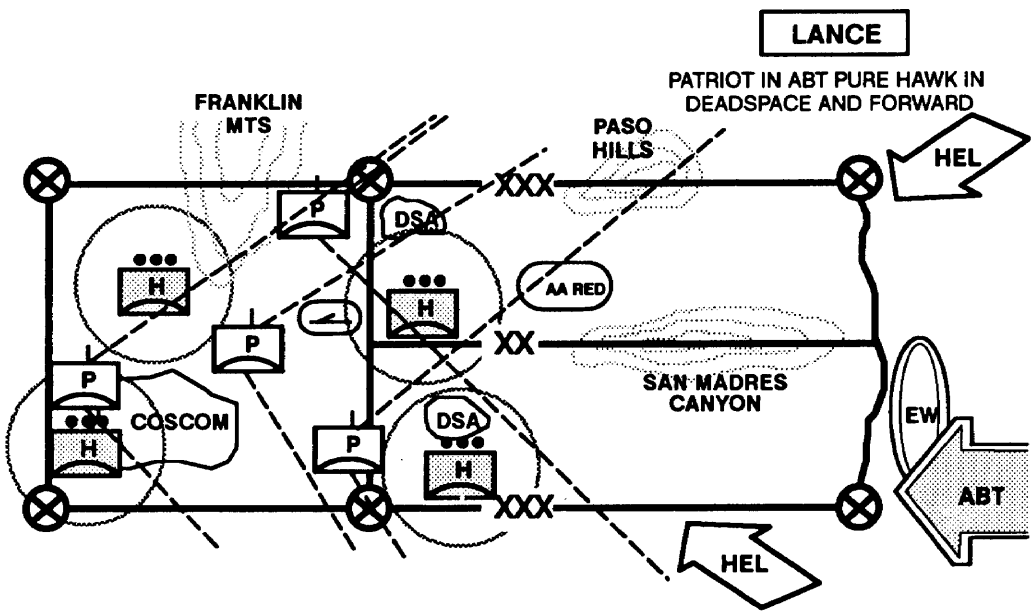
TASK FORCE PLAY "AXE"



TASK FORCE PLAY "SHIELD"



TASK FORCE PLAY "LANCE"



COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

This section discusses the command, control, and communications fundamentals and the structure required for the Hawk platoon to perform its mission in the complex, three-dimensional environment of the AirLand Battlefield. The information is applicable to any theater of operations. It must be recognized, however, that AD organization, control structure, policies, and procedures can vary widely, between and within theaters. These features will depend on the air threat, size and composition of the AD force, mission of the supported force, the transition from peace to war, and the command relationships established between US and allied forces.

The ability of a Hawk platoon to function effectively on the battlefield is based upon C3. Each component of combat power is directed and controlled to maximize its contribution to the overall effectiveness of the force.

INTRODUCTION TO COMMAND AND CONTROL

Command and control are terms used to describe the exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. It is important to note that defining C2 requires two separate statements.

Command is the authority that a commander exercises over subordinates. Command includes the authority and the responsibility to use available resources to accomplish assigned missions and tasks as well as to plan the employment of, organize, direct, coordinate, and control forces. It also includes responsibility for the health, welfare, morale, and discipline of assigned soldiers (JCS Publication 1-02).

Control is the authority, which maybe less than full command, exercised by a commander over part of the activities of subordinate or other organizations (JCS Publication 1-02). The control process is regulatory in nature; its premise is that the activities of units in battle must be supervised and altered when necessary.

COMMAND AND CONTROL FACILITIES

Four standard terms identify Hawk C2 facilities. They are defined in the following paragraphs.

Tactical Operations Center

The TOC is a physical grouping of staff elements concerned with tactical operations, administrative support, and logistical support. Battalion and higher echelon headquarters include a TOC.

Fire Direction Center

The Hawk FDC, at battalion level, is the facility from which the commander exercises near real-time fire direction, fire distribution, and fire control. The FDC receives target intelligence and fire control orders and translates them into appropriate fire directions. Patriot and USAF sensors are sources for the shared air picture. The TOC and AN/TSQ-73 missile minder comprise the Hawk battalion FDC. The AN/TSQ-73 system performs automated fire distribution functions for the Hawk battalion.

Platoon Command Post

The PCP is the control element of the AFP for real-time fire control. The MANPADS control cell operates in the PCP to provide tracks to the MANPADS teams over the FM net. See Appendix A for a description of the PCP?

Command Post

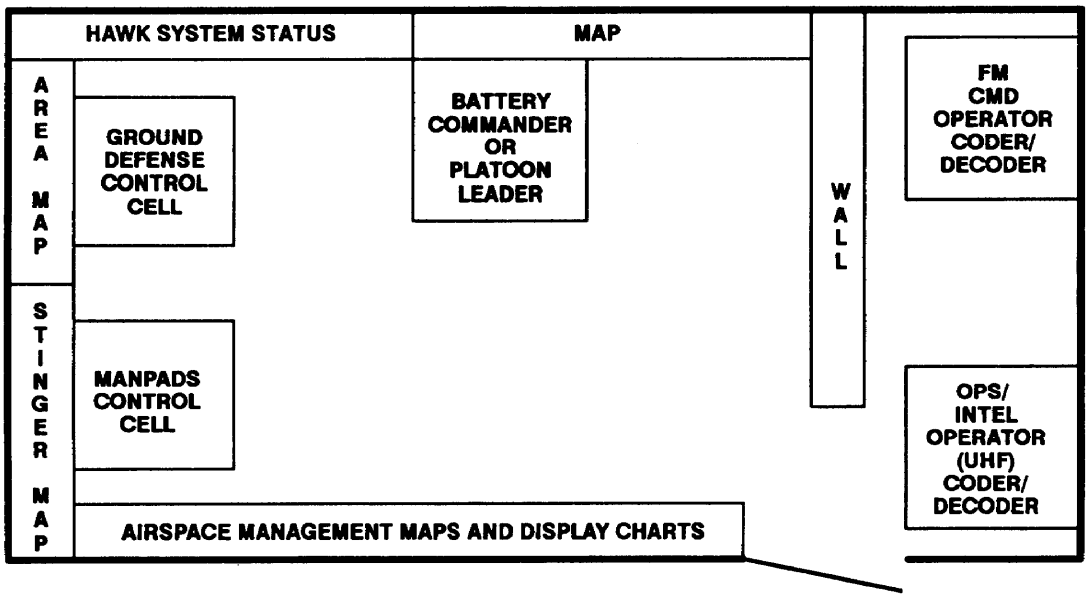
Each Hawk AFP may maintain a CP. The battery commander may establish his CP at either platoon CP. The purpose of the CP is to provide the commander or platoon leader a facility from which to plan and direct operations. The CP will also be the center for control of ground defense, MANPADS operations, and information concerning procedural control of the air battle. The physical layout of the CP will depend on the mission and the actual shelter available (for example: 5-ton expansible van, 2 1/2-ton truck shelter, or trailer). The Hawk battery or platoon command post (see the following illustration) depicts a sample layout for a battery or platoon CP.

To be effective, information displays must highlight changes. Several methods to accomplish this include keeping current situation maps, status boards, and charts. An outdated situation map can cause confusion and bad decisions.

The preferred map scales for the platoon are: situation l:50,000 or l:l00,000 and NBC plotting 1:250,000. In all cases, plotters should use standard military map symbols (see FM 101-5-1) to post information on the map.

Boards and charts present information such as alert status, air defense warning or air raid warning, weapons alert designator or defensive readiness posture, system status, missile count, and kill count. Only essential information should be kept. Posting data consumes manpower, and charts consume space.

HAWK BATTERY OR COMMAND POST



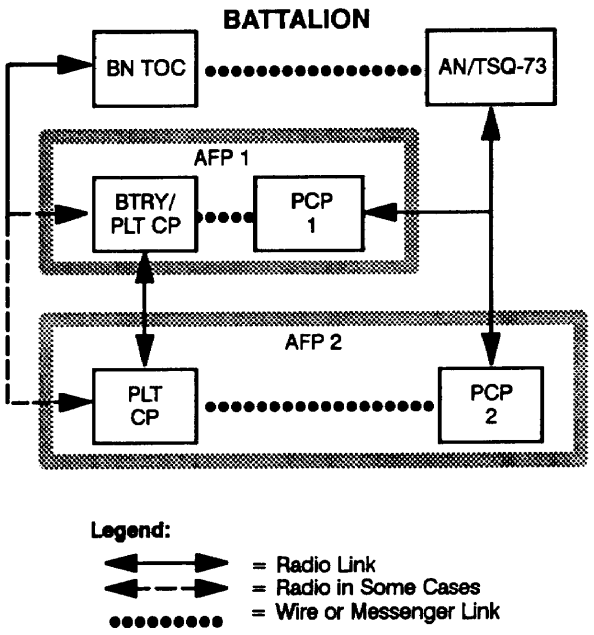
COMMAND AND CONTROL INTEGRATION

One of the objectives of the C3 system is to facilitate the flow of information concerning the air battle among the commanders, staff elements, TDs, and TCOs. Because of the sometimes overwhelming amount of information and because so much of this information is time sensitive, structures and procedures must be fully defined and implemented to ensure effective flow, processing, and control of information.

Communications Flow

The information flow between AFPs and the battalion follows two separate channels. Information relating directly to the air battle often requires immediate transmission. Therefore, it must be passed directly between the TD in the AN/TSQ-73 and the TO in the PCP using both voice and digital links. All information, except that relating to specific engagements in the air battle, will flow between the TOC and the battery CP and from thereto the other platoon CP. In some communications configurations, the TOC will communicate directly with all platoon CPs. In any case, it is vital that a constant exchange of information occurs between the CPs and the PCPs. The Tactical Information Flow illustration portrays the information flow between the battalion and AFPs.

TACTICAL INFORMATION FLOW



Near Real-Time Communications

Electronic means of communications may provide near real-time communications in conjunction with the messenger system. For example, time-sensitive information concerning conduct of the air battle may pass between the TOC and the AN/TSQ-73 over an intercom system, with messages backed up by hard copy as soon as possible. The same system will work for messages passing between the CP and the PCP?

Information Processing

Battalion and battery SOPs should dictate the procedures units will follow to process information. Processing involves all the actions necessary to support decisions with timely available information.

Information Management

Managing a large amount of information within the CP is no simple matter. For each cell in the CP, a single designated individual should manage information. This individual must be well trained to extract relevant information and route it to the proper location. One individual may manage information for more than one cell.

C2 PRINCIPLES

There are three principles that form the basis for AD C2 and relate the management of AD systems to the conduct of the overall air battle.

Centralized Control With Decentralized Execution

Organizations established for AD operations are an integral part of the overall force structure. Centralized control must, therefore, be exercised to ensure the coordination, integration, maximum operational effectiveness, and economy of the entire AD organization. However, to ensure rapid and flexible response to the threat, decentralized execution of AD tasks is essential. Decentralization is accomplishedby delegating authority for mission execution.

Coordinated Air Battle Management

Air battle management is the control and coordination of both tactical air-to-air and ground-based AD resources. Air battle management includes A2C2 and AD command and control (A2C2) (see FMs 100-103 and 24-1). Close coordination among the diverse elements of an integrated air defense system (IADS) is important because of the short reaction times available to engage enemy aircraft and because of the need to integrate AD operations with all other air and ground operations. This coordination becomes especially critical in the integration of AD operations with offensive air operations. Precise centralized coordination is necessary to prevent mutual interference between ADA weapons and air forces. Two basic methods exist to exercise air battle management: positive control and procedural control.

Positive Control. Positive control relies upon near real-time sensor data and communications to provide the information necessary for AD C2 and A2C2 Positive control facilities are vulnerable to attack sabotage, and electronic interference. Line-of-sight requirements and limited communications can also restrict the availability and usefulness of positive control facilities.

Procedural control. Procedural control relies upon techniques such as segmenting airspace by volume and time. It also relies on the use of weapons control statuses to control the air battle. Procedural control is usually more restrictive than positive control. However, procedural techniques are less vulnerable to degradation from electronic or physical attack. They significantly enhance the continuity of operations under the adverse conditions expected on the battlefield. When a unit employs positive control in the air battle, procedural control must be available to provide an immediate backup system should degradation occur. Procedural control provides the only control means for AD systems without near real-time data transmission capabilities.

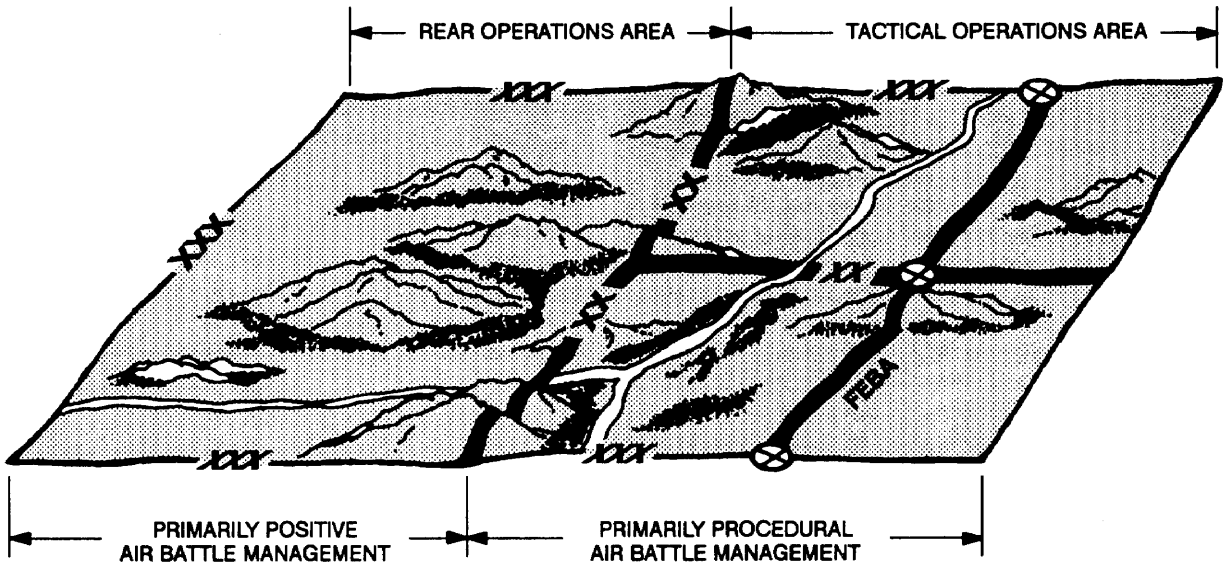
In most cases, the use of a combination of positive and procedural control techniques will facilitate management of the overall air battle.

The methods used for control of the air battle will probably differ for each of the two sectors of the combat area-the rear operations area and the tactical operations area-as shown in the Rear and Tactical Operations Areas illustration. The distinction between these areas depends upon the general patterns of air traffic flow and the types of combat activities which take place in each. Normally, the boundary between the tactical operations area and the rear operations area will be the division rear boundary.

Management by Exception

Positive and procedural techniques must be thoroughly practiced during peacetime. However, the unpredictable nature of combat inevitably presents tactical situations which have not been addressed in procedural or positive rules and directives. In such instances exceptions will be made on a case-by-case basis to countermand or modify previous guidance (either positive or procedural). This case-by-case management is called management by exception.

REAR AND TACTICAL OPERATIONS AREAS



COMMUNICATIONS

The Hawk communications system provides highly reliable and secure communications. It will provide the near real-time data needed to fight the air battle. The system includes communications facilities for control of the air battle and transmission of an air picture; command, administrative, and logistical links with higher and subordinate headquarters; and contact with supported and displacing units. The elements of the communications system provide for backup should one part of the system fail. See Appendix E for information on the communications equipment.

SYNCHRONIZATION OF C2

The effective use of IPB data, planning, and use of communications nets for C2 of the Hawk AFP will create the synergism between the AFP and the IADS. Synchronization within the platoon is the end product of effective and timely planning based on sound and timely decisions. The platoon's execution of its mission is the result of individual and collective training and performance.

COMMAND AND SUPPORT RELATIONSHIPS

To deal with the separation of C2 functions, ADA commanders use two separate and mutually exclusive procedures. These two procedures are command and support relationships.

Command Relationships

There are four command relationships which affect Hawk units. Units may be organic, assigned, attached, or under operational control. Organic and assigned will not be discussed here because the tactical commander cannot change these relationships to affect C3.

Attachment Attachment is the temporary placement of a unit within another organization. The commander of the organization receiving an attached Hawk element exercises the same degree of command and control over the attached unit as he does over units organic to his command. This includes responsibility for administrative and logistical support. The receiving commander's authority will, of course, be subject to the limitations imposed by the attachment order and by the rules and procedures established by the AADC. The parent Hawk unit must ensure that a fair share of support accompanies the attached element or that a realistic support plan exists.

Operational control. OPCON applies when a Hawk unit is provided to another commander to accomplish specific missions or tasks that usually are limited by function, time, or location. The commander may deploy the unit concerned and retain or assign tactical control of the unit. OPCON does not include administrative and logistic responsibility, discipline, internal organization, or unit training.

Support Relationships

The assignment of tactical mission responsibilities defines specific responsibilities between Hawk units and the units they support. Commanders who have organic, assigned, attached, or OPCON ADA units may assign support responsibilities to those units.

The support relationship establishes responsibilities and defines specific relationships between supported and supporting units. Assignment of a support relationship does not relieve the Hawk unit of responsibility for its own administrative and logistical support. In some cases, the supported unit may provide certain logistical support to assist the Hawk unit in performing its mission and meeting its responsibilities. Such support depends upon the tactical situation and requires prearrangement between the staffs involved. The four tactical support relationships are discussed below.

General support. A Hawk unit in a GS relationship provides support for the force as a whole. It is not committed to any specific element of the supported force.

General support reinforcing. A Hawk unit in a GSR relationship provides coverage for the force as a whole and augments the coverage of another ADA unit. GSR units are not committed to any specific element of the force.

Reinforcing A Hawk unit with an R support relationship augments the coverage of another ADA unit that is committed to a specific element of the force. Given this relationship, both the reinforcing Hawk unit and the reinforced ADA unit are committed to a specific element of the force.

Direct support. A Hawk unit in DS provides dedicated AD for a specific element of the force that does not have assigned or attached ADA. The ADA DS unit is committed to that specific element of the force (see the ADA Standard Tactical Mission Responsibilities illustration).

ADA STANDARD TACTICAL MISSION RESPONSIBILITIES

ACTION	GENERAL SUPPORT (GS)	GENERAL SUPPORT REINFORCING (GSR)	REINFORCING (R)	DIRECT SUPPORT (DS)
Who recommends ADA priorities?	Commander assigning the support relationship (approved by the supported force commander).	Same as GS and R.	NA (The reinforced ADA commander assigns ADA priorities to reinforcing ADA commander.)	The ADA commander (approved by the supported force commander).
Who coordinates for terrain for ADA units; fire units?	Commander assigning the support relationship (approved by the supported force commander).	Same as GS and R.	The reinforced ADA commander (approved by the supported force commander).	The ADA commander (approved by the supported force commander).
Who establishes liaison?	Commander assigning the support relationship.	Same as GS and R.	The reinforcing ADA commander.	The ADA commander.
With whom to establish liaison?	As required by commander assigning support relationship.	Same as GS and R.	The reinforced ADA commander.	Supported unit.
Who establishes communications?	The ADA commander.	Same as GS and R.	The reinforcing ADA commander.	The ADA commander.
With whom to establish communications?	As required by commander assigning support relationship.	Same as GS and R.	The reinforced ADA unit.	Supported unit.

Notes:

1. ADA leader at fire unit level positions fire unit on specific terrain. This leader for FAAD weapons is the squad leader or crew chief, for Hawk is the platoon leader, and for Patriot is the battery commander.

2. This positoning is accomplished within the assigned area of operations as assigned by the next higher leader in the chain of command. This next higher leader is also responsible for coordinating for terrrain with the supported force commander.

CHAPTER 4

Contingency Operations

This chapter discusses the role of the Hawk platoon as part of the ADA family of weapon systems during contingency operations. It covers the techniques and special planning considerations to conduct an "expanding torrent" in a nonmature theater of operations. The term "expanding torrent" is given to the expanding AD coverage protecting a lodgement area. Arriving AD units become operational upon reaching the lodgement and integrate their fires for lodgement coverage. The protected airspace increases as AD systems with longer range capabilities arrive.

The focus of this chapter is how to kill enemy aircraft while supporting maneuver forces during lodgement oper ations. It includes echelons above platoon level so leaders can understand their role in lodgement operations.

CONTINGENCY OPERATIONS PHASES

Contingency operations involve the deployment of US forces at the direction of the National Command Authority in support of national policy. The size and mission of the force involved in any operation may vary widely depending on the situation.

In all likelihood, the USAF and or USN weapon systems will arrive on the scene before US Army ADA assets. In past situations, the US government has ordered USN and USAF systems into the region just in case the situation escalates. Once the US Army is directed to participate in a contingent mission, certain actions are taken to support the operation. ADA units supporting the operation require forethought and planning. Planning is critical during contingency operations and must include the following:

- Detailed coordination for recall.
- Upload.
- Transportation of equipment and personnel.
- Initial and expansion of lodgement actions.
- Logistical supply procedures for equipment and personnel
- Reinforcements and reconstitution actions.

Contingent operations include the deployment of forces to a nonmature theater or area. This area may be under friendly, neutral, or hostile control. The objective of enemy forces is to prevent the establishment of a US lodgement area. Consequently, they will use all the weapons available to counter US forces. The air threat may consist of TBMs, or fixed- and rotary-wing aircraft obtained from a wide variety of sources. Enemy TBMs will target the lodgement area, strategic assets, ports, sustainment facilities, ADA sites, and airfields. FW aircraft will support enemy ground forces in their assaults on the lodgement areas and attack targets of opportunity. RW aircraft will provide close air support (CAS) or battlefield air interdiction (BAI), troop transport, air assault, and containment of friendly force expansion and counterattack,

Hawk units participating in contingency operations will defend the prioritized assets of the contingency force commander. In general, contingency operations consist of five phases.

PHASE I—PREDEPLOYMENT

This phase consists of the planning and coordination for mission accomplishment. These actions are taken before a unit can deploy. They can involve anything from an emergency deployment readiness exercise (EDRE) to an actual contingent deployment.

CONTENTS

PHASE II—DEPLOYMENT

The installation EDRE SOP is used to support ADA forces during contingent operations. Despite this support, platoon planners must assess the threat, force protection requirements, and phased deployment of AFP assets. To do this, the battery commander and platoon leaders use reverse planning. The initial force package is designed to support the "expanding torrent" concept. The mission requirements of the operation dictate the sequence, arrival time, and disposition of forces at the lodgement. If forced entry is required into the area of operation, the division will organize two echelons—an assault force and a follow-on force. ADA planning must support both forces.

The initial assault force moves into the area and secures an airfield or beachhead. Operations in a nonmature theater will normally begin with insertion of light or special divisional forces supported by other joint forces. These forces deploy with their organic ADA assets (MANPADS).

Sequential deployment mandates a high level of discipline at the platoon level to ensure successful AD coverage with limited guidance. Deployment of heavy divisions is not as rapid as assault force deployment. The heavy division role during deployment is that of a follow-on force. During sealift deployment, equipment dispersion on board ships must be considered to prevent an entire unit being lost or delayed if a ship is damaged, sunk, or breaks down.

PHASE III-LODGEMENT

Lodgement operations is the third of the five phases of contingency operations. It is separated into four major stages. The general lodgement operations concept will apply to any theater in which a US force must be inserted and operate without mature US base support. The lodgement of forces typically occurs at an airfield or seaport and the force may be vulnerable from attack in any direction. Hawk AFPs must orient their priorities toward ensuring the survivability of the lodgement force and facilities.

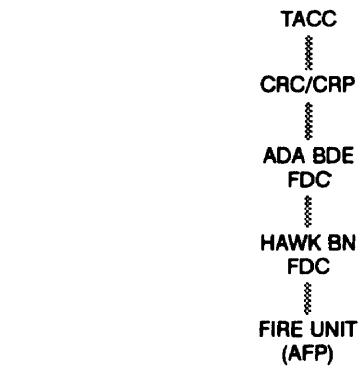
Follow-on combat forces move into the area to reinforce the assault force and establish the lodgement area. Normally this area will contain the facilities needed for continued expansion of the operation. It is essential that secure embarkation perform an IPB and METT-T analysis and defend the most vital assets within the lodgement against enemy air attack. Depending upon METT-T Hawk AFPs could be deployed in a pure Hawk configuration or as a HIMAD task force with Patriot providing TBM protection and Hawk providing ABT protection.

ADA protection for lodgement operations requires a full mix of weapons systems. Normally, MANPADS will deploy with the initial assault force to protect the ground and air forces until the entry site is secured. Patriot will be one of the first HIMAD systems to be deployed to counteract the TBM threat. Hawk assets will expand the ABT protection over the heavy divisions and lodgement facilities. The corps Hawk battalion or task force must be prepared to move out from the lodgement area to cover the maneuver forces as the "expanding torrent" operation continues. Patriot will concentrate on engaging the TBMs, allowing Hawk to engage the ABT. A HIMAD task force would maximize the HIMAD capabilities and lower the chance of simultaneous engagements by use of positive fire control. The selection of priority assets will normally include the following:

- Airports of debarkation (APOD) and seaports of debarkation (SPOD) receiving the deploying force.
- Forward bases for maneuver forces.
- C3 facilities.
- Logistical support areas and trains.
- Major communications and supply routes.
- Maneuver forces.
- Other critical assets.

In the initial stages of a conflict, the joint task force commander (JTF) will direct the joint force air component commander (JFACC) to perform counterair operations. The JFACC directs the tactical air control center (TACC) and the control reporting center (CRC) and integrates with deploying ADA units for operational control of ADA fire distribution centers (FDCs) (see the Levels of Control illustration).

LEVELS OF CONTROL



The JTF commander's priorities may change as the operation continues and the vulnerability of critical assets changes. Airspace management is dictated by the Army air defense commander. Positive airspace management is preferable but may not always be possible. ADA units need to anticipate possible airspace management problems that will exist in a lodgement operation and train rigorously to eliminate as many as possible prior to deployment (see Air Defense C2 Network illustration). Detailed information is located in FM 100-103.

In joint contingency operations, Hawk AFPs have the ability to link directly to AWACS through JTADS. JTADS can be located at brigade, battalion, or with the AFPs.

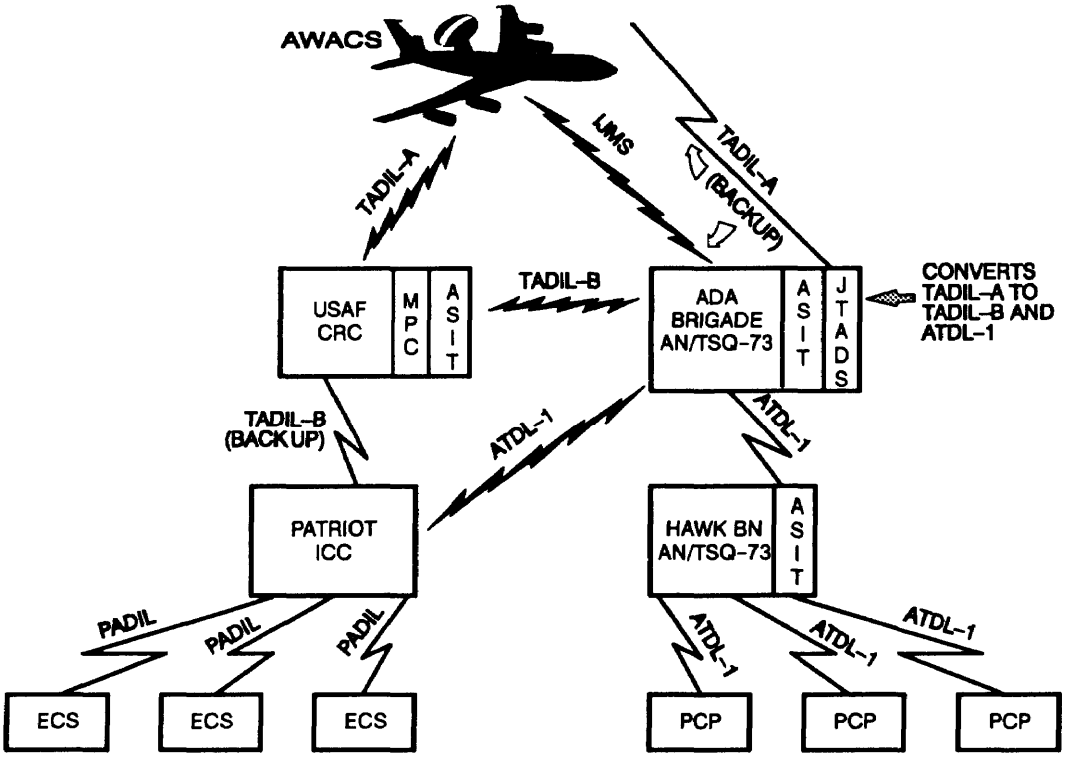
Typically AWACS information is downlinked to the Hawk battalion FDC via the adaptable surface interface terminal (ASIT) system. The FDC will then downlink data to the deployed AFPs. The operational control will change according to the control levels present during the contingency operation. As the theater matures, the standard levels of control will be emplaced as required. The establishment of command and control procedures is vital in a joint air defense operation and must be synchronized with the Air Force, Navy, and Marine operations of US and host forces. Coordination must be made with civilian aircraft control facilities as well as CAS and BAI sortie controls.

During the expansion of the lodgement area, METT-T continues to drive the tailoring and task organization of the force. AD missions and priorities will change during this period. Hawk will protect theater EAC or corps assets either in the lodgement area or in the expansion area.

PHASE IV-EXPANSION AND BUILDUP

Once the lodgement area has been secured and stabilized, the buildup of tactical forces and the expansion of the logistical base occurs. The contingency force may initiate offensive operations or may remain on the defensive according to the purpose of the operation.

AIR DEFENSE C² NETWORK



PHASE V—TRANSITION OR TERMINATION

The nonmature or contingency theater may often consist of short duration combat operations (for example, Operation Just Cause). The nonmature theater may transition into a mature theater if the national objectives are not accomplished. The lodgement will consequently transition to support sustainment, mature theater tactical operations. ADA forces must be prepared to protect the expanding lodgement during the transition phase. As the mature theater develops, deploying forces and C3 elements will need ADA protection.

Termination of the lodgement requires a phased withdrawal of AD assets. Phasing the withdrawal ensures that adequate protection is provided for all elements of the JTF. ADA units may be among the last to withdraw based on METT-T.

AIR DEFENSE OF THE LODGEMENT

A lodgement is established by introducing combat forces into the area of operations. Four distinct stages are discussed in the following paragraphs.

LODGEMENT STAGES

The stages of lodgement operations are outlined as they typically take place.

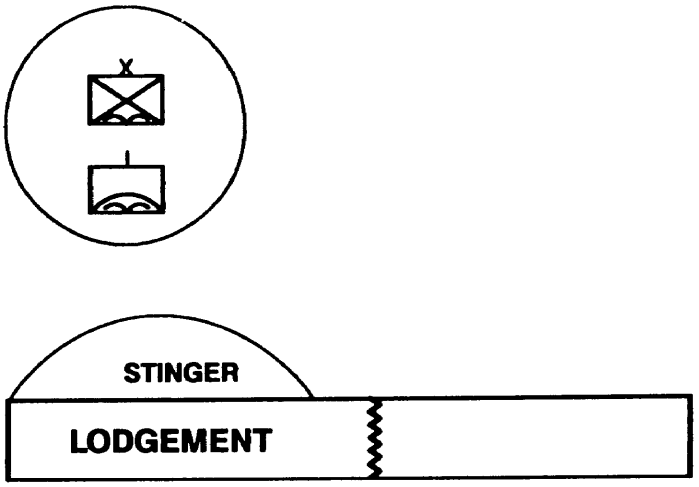
Stage One—Establishment of the Lodgement by an Airborne or Ready Brigade

Stage one consists of light or special operations forces which will enter the theater with their organic ADA unit. Organic MANPADS will be tasked with early deployment to supplement USAF and USN AD. Initial assault objectives obtained by friendly forces at SPOD or APOD help the landing of follow-on forces during lodgement operations. These initial objective areas may be consolidated to form a lodgement area, or dispersed to immediately commence combat operations (see the Stage One illustration). These light FAAD forces will perform an IPB and METT-T analysis and defend the most vital assets within the lodgement against enemy air attack.

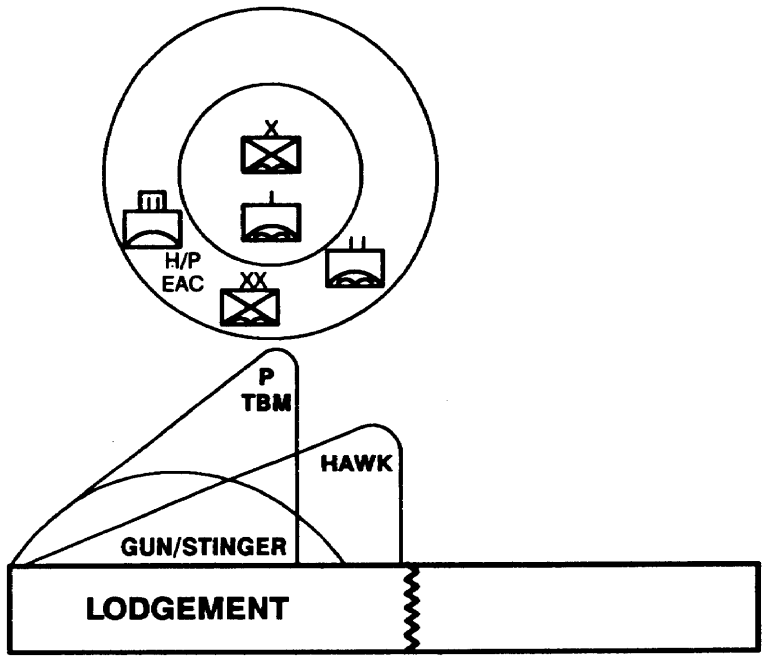
Stage Two-Airborne or Ready Division With Battalion and EAC HIMAD

If the enemy possesses a TBM capability to attack the lodgement, the force commander should tailor an EAC Patriot package and introduce it into the lodgement at the earliest possible opportunity. A Hawk package may also be considered if METT-T and IPB indicate an ABT. HIMAD assets are deployed with the minimum engagement capability needed to counter the threat (see the Stage Two illustration on page 4-5).

STAGE ONE



STAGE TWO



Stage Three—Heavy Forces Arrive With Corps and EAC ADA Assets

In this stage of operation, it is imperative that a JTF area air defense commander be appointed to coordinate all theater AD assets. He must coordinate with the host nation, USN, USAF, and C2 facilities in the theater. If a Hawk package has not been deployed, its introduction is given serious consideration to defeat the ABT to the expanding lodgement. As heavy forces arrive at the lodgement, they deploy with their organic battalions and corps ADA brigade elements (see the Stage Three illustration on page 4-6).

Hawk units play a crucial role in lodgement protection. They will replace the light and special AD forces protecting the lodgement or will move immeditely with their supported force to begin AD operations. In either case, ADA units must coordinate their coverage with the other AD forces to ensure that no gaps occur in the defense.

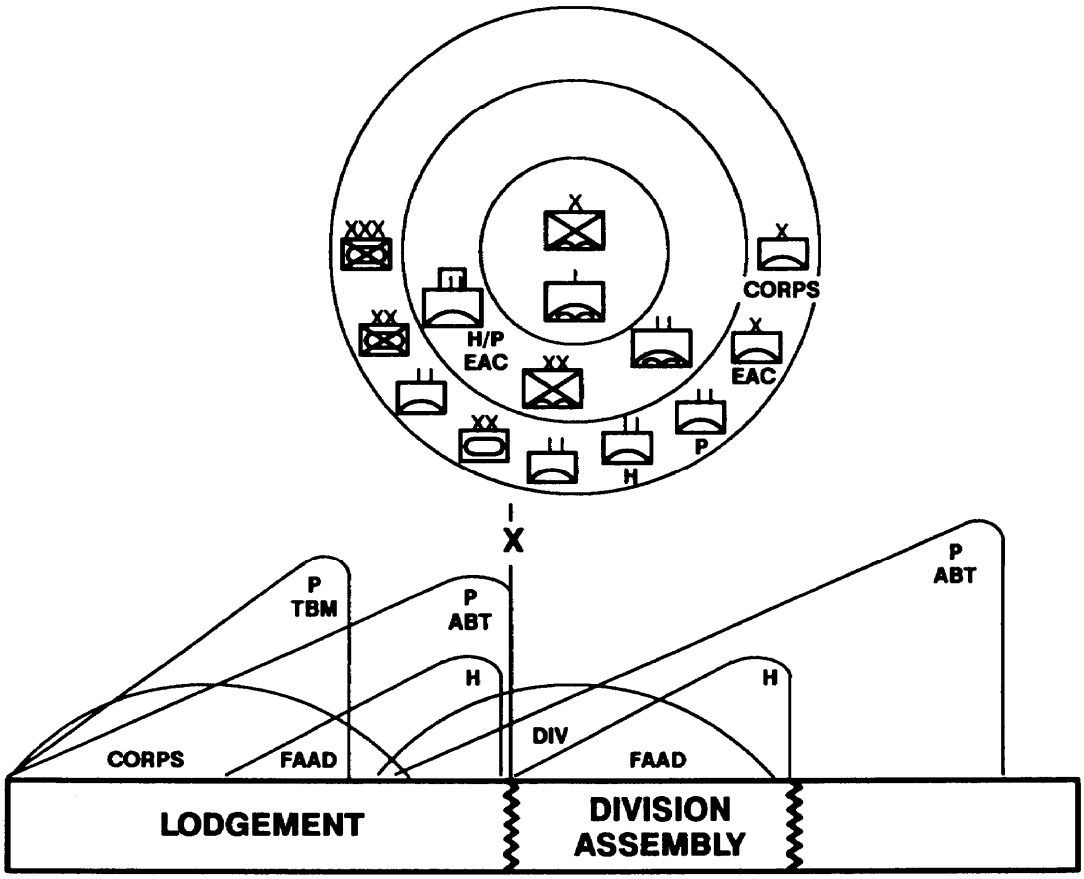
The corps ADA brigade commander must plan for the defense of the heavy forces with HIMAD assets and FAAD protection for corps facilities as the lodgement grows. Corps FAAD forces relieve divisional ADA at critical points within the lodgement. Divisional FAAD units have the responsibility for providing a balanced, mutually supported defense of divisional assembly areas and are overwatched by the corps ADA brigade HIMAD forces.

Stage Four—Expanding Torrent of ADA

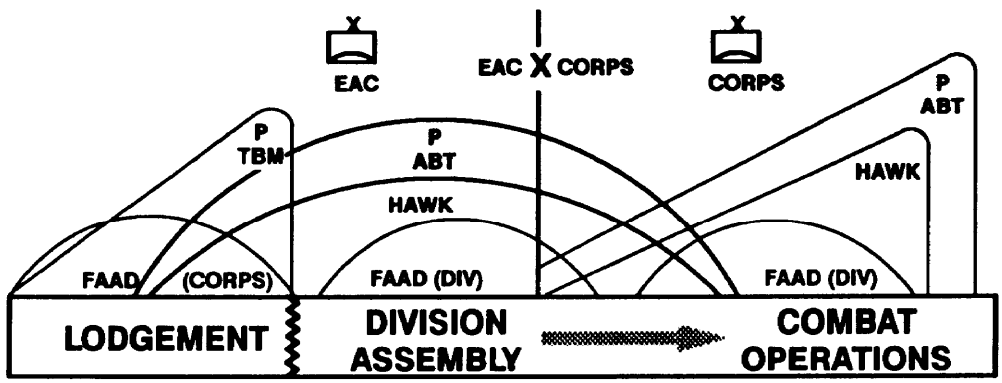
The corps continues expanding the lodgement and begins combat operations against the enemy. The corps ADA brigade must continue the aircraft and TBM defense of the lodgement while pushing HIMAD units forward to overwatch maneuver forces in the combat zone. This may require the deployment of additional HIMAD forces into the theater to meet all AD requirements (see the Stage Four illustration on page 4-6).

The AD of a lodgement is an "expanding torrent" of ADA coverage employing all the members of the ADA family of weapons. The ADA planner must be sensitive to airlift restrictions, CSS imperatives, and host nation support and agreements (forklifts, warehouses, contracting, etcetera). The four stages just described will provide the agility necessary to meet all potential enemy courses of action.

STAGE THREE



STAGE FOUR



LOW- AND MID-INTENSITY CONFLICT OPERATIONS

During LIC and MIC operations, the primary air threat is to the lodgement facilities. The threat includes terrorist and political objectives, maneuver forces, logistical and reinforcement bases, and C2 facilities. It is imperative that the lodgement area airspace be controlled by friendly forces. This can be accomplished through strict C2 of the air defense assets by the contingency theater commander. The primary mission for Hawk is to kill enemy aircraft.

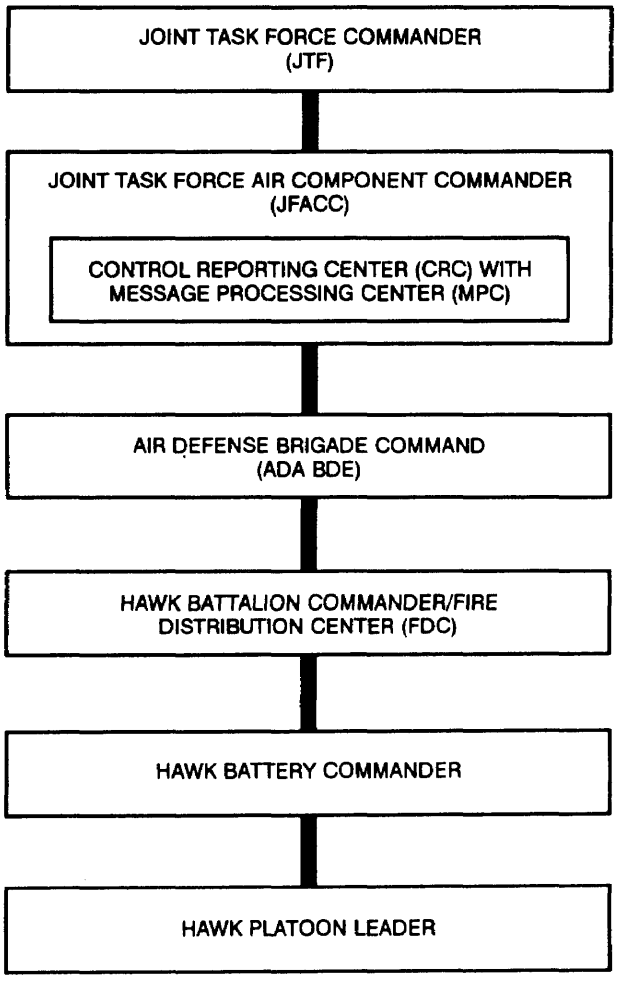
ARMY AIRSPACE COMMAND AND CONTROL OPERATIONS

A2C2 is the linchpin of a successful air defense operation. This linchpin couples two key elements by the system; the Air Force TACC and the ground component's (Army and or Marine Corps) air defense fire direction center (FDC) for Patriot and or Hawk. Integrated counterair operations require the exchange of tactical information between sensors, C2 elements, and weapon systems.

The Hawk platoon leader must understand the typical C2 elements in his chain of command and coordination responsibilities. The following Command and Control Structure illustration provides the Hawk platoon leader a quick look at a typical C2 linkage.

Command and control is extremely critical in the early stages of lodgement operations. The Hawk battalion advance party should establish liaison with the Patriot unit and any joint AD C2 operations. The Hawk commander may need to use some imaginative planning and execution to integrate into AD C2. It is important that the Hawk units tie into the AF CRC or USMC TAOC either through the EAC ADA facilities or directly. The rules of engagement (ROE) and airspace control procedures (ACP) need to be established and disseminated quickly.

COMMAND AND CONTROL STRUCTURE



STINGER OPERATIONS

The Hawk AFP has integral Stinger teams for self-protection. These teams should be deployed in a balanced configuration two kilometers outside the Hawk site to provide dead zone AD protection. The Stinger control cell at each site is responsible for ensuring the accurate use of the teams. The control cell must have constant communications to the tactical control officers who are manning the Hawk system to receive timely and usable early warning data. This must be rehearsed continuously to work effectively.

CHAPTER 5

Combat Operations

Effective employment of Hawk in AirLand Operations requires sound, detailed planning, and timely execution. Hawk commanders must possess a thorough understanding of their mission, the supported commander's intent, the system, and the tactics, techniques, and procedures for its employment. Using the factors of METT-T, commanders must be able to quickly and competently interpret the aerial and ground IPB, and accurately evaluate system capabilities. Detailed CSS planning is imperative because of the technical nature of the Hawk system. Hawk's contribution to the AirLand Battle allows the force commander greater mobility and freedom of action.

OFFENSIVE OPERATIONS

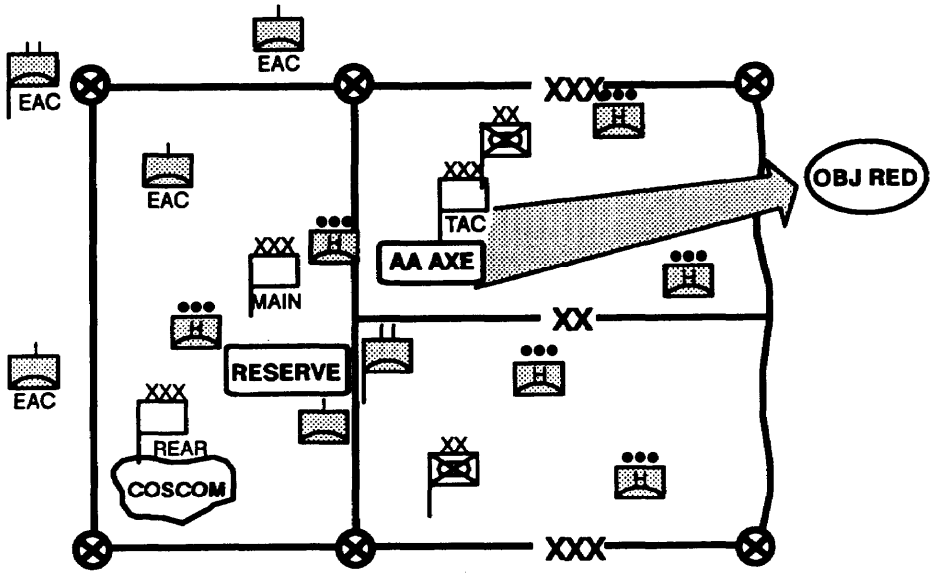
In any offensive operation, the Hawk battalion will deploy against a variety of enemy air operations to protect the corps maneuver forces and other critical assets. The Hawk battalion can be deployed as a pure battalion or as a HIMAD task force as described in Chapter **3.** The EAC Hawk battalion will defend against independent air operations in the theater area, or when necessary, augment corps Hawk battalions. This will enable corps Hawk assets to move forward to provide AD protection of maneuver divisions or against enemy jammers. The corps Hawk battalion will be deployed against frontal aviation units in the corps rear area. Corps Hawk assets will augment divisional ADA battalions against an AH regiment mass offense or any other attack as directed.

The corps division conducting the main offensive should be provided AD protection by a Hawk battalion. Offensive operations are extremely fluid and characterized by rapid movement. Therefore, extensive contingency planning (see Chapter 3) will be required by Hawk AFPs to determine primary and alternate locations, convoy routes, and coverage areas to maintain two-thirds coverage over fast-moving maneuver forces. Hawk commanders supporting offensive operations should be prepared to leapfrog one or two AFPs at any time. The Hawk Offense illustration on page 5-2 depicts a diagram of offensive operations. To provide continuous HIMAD protection in the offense, the Hawk commander will push one or two AFPs as far forward as possible (10 kilometers from the FLOT). The purpose of positioning the AFPs forward is to kill enemy aircraft along the most likely air avenue of approach. The AD mission should be to protect the main offensive effort and primary assets and to move with the maneuver forces.

All AFPs should generally remain in EMCON silent, relying on the down-tell of track data from alternate sensors for VTG and or TAS acquisition and engagement. ADA assets can best support the ground commander's scheme of maneuver by killing enemy aircraft that would defeat his main attack. To ensure they understand and best support the ground commander's scheme of maneuver, Hawk commanders at all levels must attend divisional briefs and rehearsals. Close coordination is required to provide maximum AD for the division while maintaining Hawk's survivability. Speed and clarity are essential if Hawk is to keep one step ahead of maneuver forces. Liaison teams must be established with the divisional ADA battalion to provide early warning and receive information on the divisional tactical situation. Early warning is a key mission for Hawk. Hawk has the capability to provide early warning in the silent mode (VTG or TAS). Early warning from Hawk allows the divisional ADA the opportunity to maximize the killing power of their shorter range systems and kill the enemy at the maximum range.

CONTENTS

HAWK OFFENSE



Mobility and deception are key elements for success. Night operations are normal and units move under the cover of darkness whenever possible. EMCON is extremely important to deception. With proper deception, continuous active surveillance of the operations area may not be necessary. Enemy pilots can be caught unaware of Hawk units and engaged, forcing threat air to to fly defensively or attempt to go around Hawk coverage. This may also force enemy aircraft to fly higher and into Patriot fires or perhaps lower into FAAD fires. Hawk AFPs should remain in EMCON silent as long as Possible with the forward AFPs being used in a silent mode to provide forward coverage.

The key to offensive operations is depth, as a result of synchronization and agility. Synchronization for Hawk is the ability to provide AD protection for the maneuver units at the critical time and place on the battlefield against frontal aviation, independent air operations, rotary-wing aircraft, and jammers. The mobility of the Hawk AFP, its ability to see deep into the enemy area of operations, the use of a remote air picture and EMCON procedures, and the ability to react quickly to continually changing situations on the fluid battlefield provide the necessary agility.

DEFENSIVE OPERATIONS

The immediate goal of defensive operations is to cause the failure of an enemy air attack by killing aircraft and protecting critical assets and maneuver forces. The ultimate goal is to create the opportunity to resume the offense. Balance and mutual support are key to the defense. EAC and corps Hawk units in the defense will provide AD protection for vital assets such as maneuver and reserve forces, C3I facilities support areas, and rear area operations bases from the independent air operations and frontal aviation. In the defense, Hawk units could be tasked with a variety of missions: deep defense, security, and flank or critical asset defense.

The commander may require an ADA deep operation AFPs would be positioned close to the FLOT to defeat enemy jammers. Forward “Sniper” AFPs will be extremely light, carrying only minimum engagement equipment. They would remain silent. Once the unit has fired on a target, the AFP will move immediately. This mission will require detailed planning and close coordination with forward maneuver and other ADA forces to augment unit survivability.

In the security force area, the Hawk units will provide early warning to other ADA units and the maneuver forces. Hawk AFPs in the silent mode would be positioned as far forward as possible to provide early engagement and early warning to the sister and adjacent Hawk units.

In the main battle area, Hawk will counter the frontal aviation assets and the AH regiments. The key here is balance and mutual support.

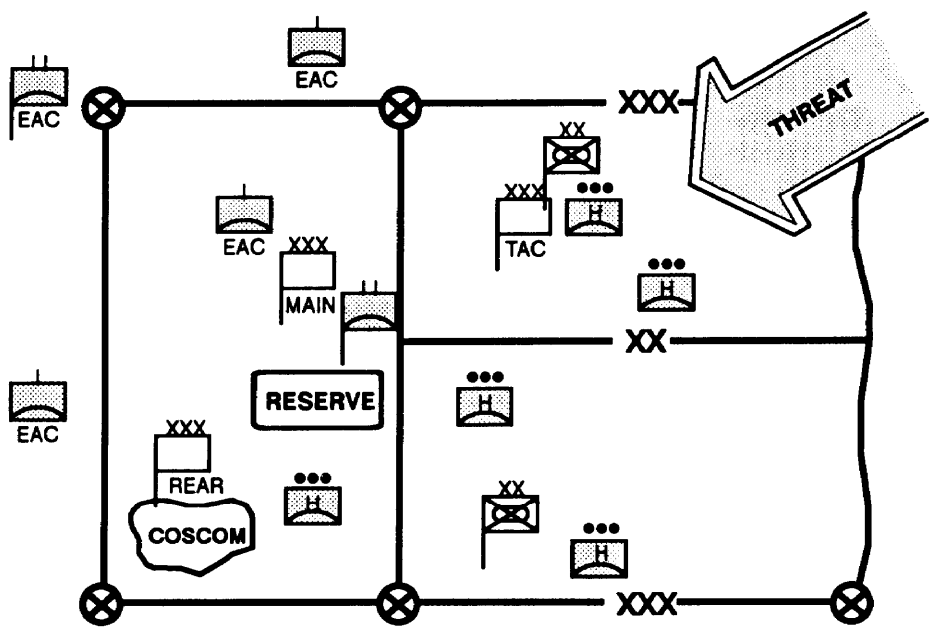
To achieve surprise, the Hawk unit in the defense must use strict EMCON procedures. Whenever possible, no radars will radiate. Instead, the early warning and air picture should come through the data link from Patriot, AWACS, or other remote sources. If local acquisition data is required, only the minimum radars needed for acquisition should radiate; all others should be in EMCON silent. The following illustration is one example of a Hawk defensive operation emplacement.

BATTALION OPERATIONS

A corps Hawk battalion consists of six AFPs, a fire direction center, and a support company. The Hawk system is most effectively used as a pure battalion or as part of a task force. The Hawk battery organization is the same for corps and theater assets. The Hawk system is provided real-time air battle data through the use of internal radars and data links with other acquisition sources such as CRCs and AWACS. Using theremote data from other units, the AFP is able to fight from a silent mode (not radiating from their location until just prior to engagement). This ability gives the Hawk unit increased survivability. The silent data is then passed to FM units for early warning over radios without Hawk ever revealing its position. The radiation of the AFP's radars is controlled at the battalion level through EMCON procedures (see SOE in Appendix J). The battalion determines which unit will radiate, what emitter, and for what length of time based on METT-T. For survival, Hawk units must minimize all emissions from their sites because the signature source is easily located.

The Hawk battalion commander and S3 will plan the deployment and EMCON status of the AFPs. The operations and intelligence section is also responsible for providing an air defense fire coordination officer (ADFCO) to establish liaison at the headquarters of the supported unit, at the unit responsible for the area of operations the Hawk unit is located, or at the ADA

HAWK DEFENSE



brigade. The following illustration shows the duties and liaison locations for the ADFCO. The air battle is commanded from within the TOC and is controlled from the AN/SQ-73 missile minder system. These elements are almost always collocated due to the intensity of the air battle and the necessity for instantaneous message passing. Administration, personnel, intelligence, operations, NBC, and logistics are controlled at the battalion level by the staff. A continuous flow of information both to higher and lower units is maintained through several communications systems, the most important being the UHF (ultrahigh frequency) secure system.

The missile resupply section operates under the supervision and control of the battalion S4. They have both the personnel and equipment necessary to receive and assemble missiles and to transport them to a distribution point for the fire units.

The maintenance company, intermediate support (DSU) from the corps or theater support command, provides direct support maintenance and parts supply to the Hawk battalion for Hawk and conventional equipment.

HAWK CREW DRILLS

Hawk crew drills have been standardized for use by US Hawk units worldwide. Crew drills for Phase II are provided in AKTEP 44-497-10-Drill and for Phase III in ARTEP 44-497-13-Drill.

The procedures can be performed in any order to facilitate operational requirements if—

- No required checks are invalidated.
- No safety features are violated.
- No sequence of related or dependent operations or checks are violated or changed.
- No equipment is subjected to adverse conditions.

Operators and technicians can assist each other when performing their assigned tasks. However, this does not reduce personnel requirements in terms of number or proficient. All personnel must be made aware of their responsibility to command, "Stop fire," when an unsafe condition is observed, and of the actions to take upon receipt thereof.

DUTIES AND LOCATIONS OF ADFCO

LIAISON IS ESTABLISHED WITH--

A^2C^2 – CORPS AREA
FAAD TOC – DIVISIONAL AREA
WOC – AIR BASE DEFENSE
C^2 – ADJACENT AD OR OTHER MAJOR FORCES, ADJACENT CORPS, ARMIES, USAF, USMC, USN, AND HOST NATION ELEMENTS

INFORMATION EXCHANGED OR COORDINATED:

ENEMY AIR ACTIVITY AND THREAT DATA
PLANS, ACTIVITIES, AND STATUS OF HAWK
AD ROE AND PROCEDURES USED BY HAWK
EARLY WARNING
ROUTE CLEARANCES AND POSITIONS
STATUS OF MANUEVER FORCES
LOCATION OF FEBA, FLOT, AND FSCL
OPORDS, PLANS, AND ANNEXES
PLANS AND ACTIVITIES OF OTHER UNIT
AIRSPACE ACTIVITY AND USAGE
COMMANDER'S PRIORITIES
LOGISTICS SUPPORT
FIRE SUPPORT
ENGINEER SUPPORT
NBC WARNING AND AREAS

SURVIVABILITY

To survive on the battlefield, Hawk units must have a thorough ground defense plan. To defend the large Hawk perimeters, all available means of defense must be used. This includes mines, wire barriers, obstacles, small arms, and crew-sewed weapons. Communications from the command post to the soldiers on the ground must be efficient and fast. NBC and enemy intelligence information must be passed down to the lowest level to allow each unit to protect itself. Stinger teams must be deployed along low visibility or masked air avenues of approach to protect from overflights. The system must be camouflaged and revetted to hide the distinctive Hawk signature. Light discipline is extremely important due to the prevalence of night operations. Emissions discipline is vital due to the accuracy of enemy direction finding equipment, particularly when Hawk is within 10 kilometers of the FLOT Detection at this range can result in enemy artillery attack within two minutes. Movements should be after dark to hide the new location. Equipment should be located in a tree line or some other disguising terrain feature and not out on the top of a bare hilltop. Nonessential equipment and personnel should be dispersed.

CHAPTER 6

Combat Service Support

Combat service support (CSS) deals with the services and supplies necessary to maintain and sustain operating weapon systems on the battlefield. Note that CSS is not only concerned with operational weapon systems; it is also concerned with the soldiers who operate those weapon systems.

Each commander is responsible for CSS of his organic and attached units. CSS is directed toward the fighting unit--that is, as close to the fighting unit as the tactical situation permits. The CSS system is designed so that supplies are delivered and services are performed as close as possible to the actual fighting unit. This reduces the support burden of the tactical commander and frees him to conduct tactical operations.

ORGANIZATION

Generally, CSS requirements for Hawk batteries are met by either the parent Hawk battalion or corps support command (COSCOM) units. In a multicorps theater, rear area theater army support command units may provide support for Hawk units deployed outside the corps area of operations. Additionally, in those situations where the Hawk unit is operating within a division area of operations, support maybe provided from the division support command (DISCOM).

COSCOM

COSCOM units provide corpswide supply, maintenance, and field services on an area basis to units located in the corps rear area. This includes support in the areas of health services, personnel and administration, transportation, ammunition, and civil affairs. Support groups located in forward portions of the corps rear area also provide general support and back up direct support to divisional units.

A COSCOM materiel management center (MMC) is designed to be used in support of each corps. The missile division of the MMC manages system-peculiar maintenance and supply for Hawk battalions.

A COSCOM general support ADA facility is also located in each corps area. This facility provides general support (GS) maintenance and supply to all ADA units for ADA system-peculiar equipment. The COSCOM GS ADA unit is highly responsive to the Hawk battalion direct support (DS) battery. It stocks a reserve of high demand and critical mission-essential items to provide support during interruptions in other delivery systems. This support is coordinated by the battalion S4 and is provided to the batteryand platoons in the form of a CSS overlay to the OPORD. The platoon may be directed to make contact with one of these locations to use their support.

HAWK BATTALION

The parent Hawk battalion provides overall administrative, financial, legal, chaplain, and health service support for its batteries and AFPs. Additionally, the Hawk battalion support battery provides--

- Direct support maintenance (less automotive) for items peculiar to the Hawk missile system. Included are power generation and air conditioning equipment.
- Direct and general support maintenance for the battalion fire distribution system.
- Receipt, storage, and issue of repair parts peculiar to the Hawk system, fire distribution system, and selected engineer and signal items.

CONTENTS

RESPONSIBILITIES

The following paragraph describes responsibilities necessary to support the AFP. The responsibilities may vary based on task organization.

Executive Officer and First Sergeant

The Hawk battery executive officer (XO) supervises CSS operations with supply and maintenance support normally coordinated by the first sergeant. CSS for assault fire platoons consists mainly of maintenance, supply, personnel, and medical services required to sustain their fighting capability. Most of this support comes from the battery and battalion.

Hawk Platoon Leader

The platoon leader is responsible for all actions of the platoon and the personnel assigned. In the area of CSS, he is responsible for—

- Supervising the platoon's CSS effort.
- Ensuring the platoon sergeant and the XO and or first sergeant coordinate the CSS effort.
- Ensuring the AFP warrant officer coordinates all maintenance support with or through the battery warrant officer and XO.
- Keeping informed on AFP's CSS posture by the warrant officer. Since the platoon leader's primary function is to conduct the air battle, he manages CSS by exception. The platoon sergeants and warrant officers keep the platoon leader informed on the CSS status.

Warrant Officer

The warrant officer is an extremely important member of the Hawk platoon. He is the Hawk system resident expert on equipment, system operations, and logistics. He is responsible for the following:

- Maintaining all equipment assigned to the AFP per the maintenance SOP.
- Controlling the prescribed load list (PLL) stockage and usage of Hawk peculiar and conventional repair parts.
- Advising the platoon leader on system capabilities, limitations, and equipment status.
- Coordinating between battery warrant officers to ensure Hawk peculiar parts and supplies are available for maintaining a mission-capable posture.
- Directing the actions of Hawk system maintenance personnel.
- Ensuring equipment outages, work orders, and requisitions for repair are initiated and recorded.
- Ensuring equipment status is forwarded to the battery per SOP.

Platoon Sergeant

The platoon sergeant supervises the performance of most of the CSS tasks in the platoon. At platoon level, he is responsible for the following—

- Ensuring that all equipment is assigned according to the modified table of organization and equipment (MTOE), is on hand, accounted for, and safeguarded.
- Maintaining prescribed levels of ammunition, POL and rations.
- Requesting resupply of spent, lost, damaged, or destroyed conventional items.
- Maintaining all conventional equipment, weapons, and vehicles, and evacuating items needing repair.
- Taking care of the personal needs of soldiers in the platoon.
- Coordinating platoon requirements with the battery CSS personnel through the lSG.

Normally, procedures for CSS are specified by unit SOP. The SOP should spell out the agency that the platoon personnel contact to get a service, an item, or technical help. In the battery, this will usually be the battery executive officer, first sergeant, supply sergeant, motor sergeant, or warrant officer. If these personnel cannot handle the request, they normally coordinate with the battalion S4 for the support.

TRAINS

Battery trains is a grouping of personnel, vehicles, and equipment to provide logistic support to the Hawk AFPs. Trains at battery level consist of the Hawk and conventional maintenance sections with mechanics, PLL and equipment; the supply section with supply sergeant, supply clerk, and armorer the medical aid attachment of two medics and an ambulance from the battalion medical section; a mess section with cooks and a mobile field kitchen; and posslibly a small stock of supplies (mostly petroleum, oils, lubricants (POL), and ammunition). Battery trains are under the control of the executive officer or the first sergeant. Battery trains can be employed in one of two ways: as one entity in which case they are termed unit trains and are collocated with the battery

headquarters which may be collocated with the heavy platoon; or in echelon, with the more urgently needed elements well forward to support the firing platoon and the not-so-urgently-needed elements farther to the rear. Forward elements of battery trains (medical, recovery, maintenance, and Class IX supply elements) constitute battery combat trains, while elements held farther to the rear (supply and mess teams) constitute battery field trains. Field trains are collocated with headquarters and AFP (heavy platoon) or are positioned independently. The actual position selected for occupation by support elements at battery level is dependent on three factors: amount of available cover and concealment, intensity of enemy activity in the area, and whether the type of operation underway is offensive or defensive. See the Trains Organization illustration below.

PLANNING CONSIDERATIONS

It is harder to ensure CSS for deployed platoons than for a consolidated battery. This is because—

• AFPs are at different locations. The distance between platoons is normally kept within 10 kilometers. However, because of the terrain and mission, this distance can, in some cases, be as great as 40 kilometers.

• AFPs move often. Platoons can move at different times or simultaneously.

• Equipment repair assets are not sufficient for division among all platoons equally. These include spare parts, tools and test equipment, recovery vehicles, and technical personnel.

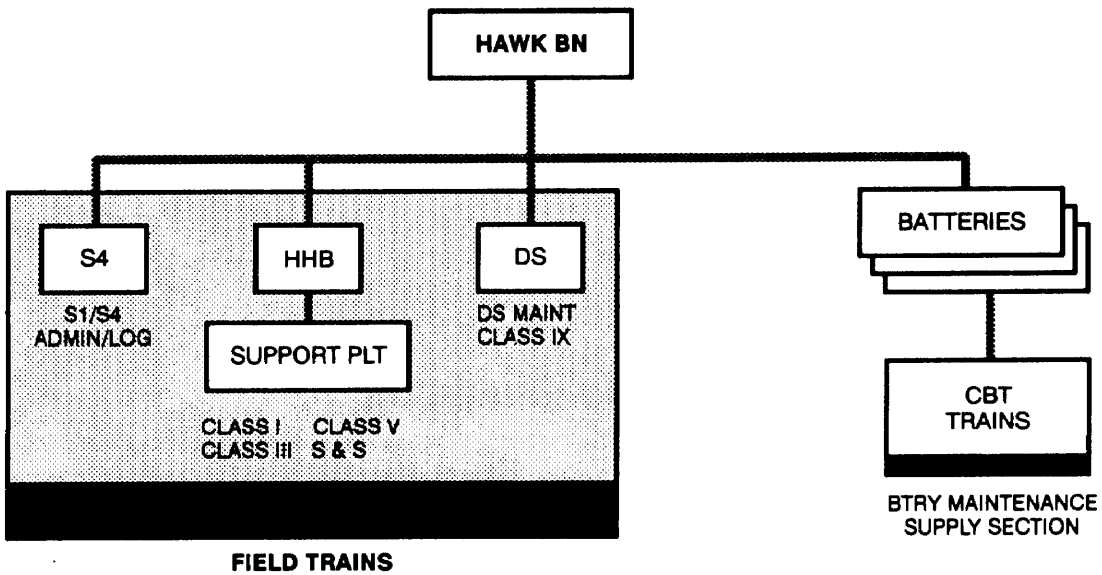
• Refueling assets are not sufficient to refuel deployed platoons without extensive planning and coordination.

• Ration support assets are not sufficient to protide continuous, hot, fresh meals and potable water to each deployed platoon.

AFP PLANNING

Proper planning can alleviate problems and simplify coordination. Specific measures that the platoon leader and battery commander can take are shown as follows.

TRAINS ORGANIZATION



Rations Support and Water

Coordinate a schedule between the mess section and the platoons. Insulated food containers can be used to transport hot meals to deployed AFPs. Stagger dining hours to allow hot meals for all platoons and to allow time for rations pickup from rations breakdown points. In situations where it is impossible to schedule hot meals for each platoon, they should be rotated so that each unit gets at least one hot meal per day. For other meals, immersion heaters can be used to provide hot water for heating individual rations and personal hygiene. Care must be taken to ensure platoon personnel drink water that has been tested and found suitable for humans.

Drinking water is drawn from the closest water supply point to ensure the platoon maintains an adequate supply. Water is required for the following:

- Cooking.
- Drinking.
- Sanitation.
- Vehicles.
- Cleaning.
- Hygiene.

Refueling

Develop a comprehensive plan for refueling of platoon equipment. This plan must include pickup of fuel at the battery or COSCOM issue points, delivery to the platoons, and scheduled refueling trips to supply power generating equipment. Consider dividing tank and pump units between platoons and make each platoon responsible for its own fuel pickups from the issue points.

Repair Assets

Anticipate which platoon will need specific repair parts first. Send those repair parts with that platoon when it deploys. For instance, assume that a platoon's CWAR is nonoperational and awaiting repair parts. In this case, where certain parts are not expected to be on hand soon, send most of the CWAR repair parts that are on hand with the AFP deploying. Likewise, if you know that an AFP item of equipment is going bad, it would be logical to send repair parts for that item along with the AFP.

Keep repair parts that you do not expect to need soon and critical parts that all platoons have an equal need for with the "heavy" platoon. This is because the "heavy" platoon will normally move less frequently than the AFR The "heavy" platoon also has more vehicles to support delivery of parts to the deploying AFP, should this be needed. The key to maximum repair parts flexibility is to have accurate parts status—know what parts you have, and where they are heated.

Coordinate the maintenance effort. Divide technical personnel by MOS evenly throughout the platoons, but retain the highest ranking individual in each MOS at the "heavy" platoon. Dedicate a communications channel for maintenance so warrant officers and key maintenance and PLL personnel can monitor maintenance activities. If maintenance problems cannot be resolved over the communications link, contact teams can be dispatched from the heavy platoon. Dedicate transportation for contact teams, test equipment, manuals, and parts as required.

Finally, determine those areas that are critical to the mission and will be most affected by separation and distance. Plan to take these considerations into account. Rehearse and train platoon deployment to check plans and ensure that key personnel are familiar with unit operations. Ensure everyone understands the conduct of maintenance is a command responsibility and every soldier is responsible for the maintenance of the equipment.

Platoon Communications

Once the AFP is ordered to deploy to a position no longer collocated with the battery, communicantions becomes an area of interest. Platoon leaders must ensure that the platoon's radios are operable and that communications are established and maintained with the heavy platoon and supported units. Communications nets are vital to maintain the receipt of voice and data transmissions.

SUPPLY OPERATIONS

Supply is the process of providing all items necessary to equip, maintain, and operate a military unit. It involves the procurement, storage, distribution, maintenance, and salvage of items. The Army divides supplies into 10 classes for administrative and management purposes. See the Classes of Supply illustration on page 6-5.

A basic load is the amount of supplies required by the SOP for AFP to sustain itself until resupply can be effected. It is expressed in days of supply or in rounds per weapon. Platoons maintain basic loads in Classes I, III, V, and IX. Basic loads of Classes I, III, and V are replenished during combat operations by the battery.

CLASSES OF SUPPLY

SUPPLY CLASS	DEFINITION/EXAMPLES
I	SUBSISTENCE ITEMS AND GRATUITOUS ISSUE HEALTH AND WELFARE ITEMS: MEALS, READY-TO-EAT (MREs), AND FRESH VEGETABLES.
II	ITEMS OF EQUIPMENT, OTHER THAN PRINCIPAL ITEMS, WHICH ARE PRESCRIBED IN AUTHORIZATION/ ALLOWANCE TABLES: INDIVIDUAL EQUIPMENT, CLOTHING ITEMS, TENTAGE, TOOL SETS, AND ADMINISTRATIVE AND HOUSEKEEPING SUPPLIES.
III	PETROLEUM, OILS, AND LUBRICANTS (POL): PETROLEUM FUELS, HYDRAULIC AND INSULATING OILS, CHEMICAL PRODUCTS, ANTIFREEZE COMPOUNDS, COMPRESSED GASES, AND COAL.
IV	CONSTRUCTION AND BARRIER MATERIALS: LUMBER, SANDBAGS, AND BARBED WIRE.
V	AMMUNITION: SMALL ARMS AMMUNITION, ARTILLERY ROUNDS, HAND GRENADES, EXPLOSIVES, MINES, FUZES, DETONATORS, MISSILES, AND BOMBS–INCLUDES SPECIAL AMMUNITION (CHEMICAL AND NUCLEAR ROUNDS).
VI	PERSONAL DEMAND ITEMS: ITEMS THAT WOULD NORMALLY BE SOLD THROUGH THE EXCHANGE SYSTEM: CIGARETTES, CANDY, AND SOAP.
VII	MAJOR END ITEMS: FINAL COMBINATION OF ITEMS THAT ARE READY (ASSEMBLED) FOR THEIR INTENDED USE: VEHICLES, SELF-PROPELLED ARTILLERY PIECES, MISSILE LAUNCHERS, AND MAJOR WEAPONS SYSTEMS (THE WEAPON ITSELF–NOT INCLUDING THE CREW).
VIII	MEDICAL MATERIAL: MEDICINES, STRETCHERS, SURGICAL INSTRUMENTS, MEDICAL EQUIPMENT, AND REPAIR PARTS.
IX	REPAIR PARTS AND COMPONENTS, INCLUDING KITS AND ASSEMBLIES, AND ITEMS REQUIRED FOR MAINTENANCE SUPPORT OF ALL EQUIPMENT: BATTERIES, SPARK PLUGS, AXLES, AND TANK ENGINES.
X	MATERIAL REQUIRED TO SUPPORT NONMILITARY PROGRAMS: ITEMS WOULD BE USED TO SUPPORT CIVIL AFFAIRS OPERATIONS: COMMERCIAL DESIGN TRACTORS FOR USE BY LOCAL CIVILIANS, AND FARM TOOLS.
MISC	MISCELLANEOUS ITEMS THAT DO NOT FIT INTO ONE OF THE 10 CLASSES ABOVE: WATER, MAPS, CAPTURED ENEMY EQUIPMENT AND MATERIEL, AND SALVAGE MATERIAL.

The basic load of repair parts is called the prescribed load list. A PLL is the authorized quantity of maintenance repair parts required to support a Hawk unit. The PLL is a demand supported group of parts stocked at the battery level. Parts are added to or deleted from the PLL based on usage during a specific time period. A combat PLL is typically identified as the critical parts that have the highest failure rate in the system. The AFP takes the critical repair parts with it when it deploys.

The supplies most needed by the platoon are rations, POL, ammunition, repair parts, and operational items. Procedures normally followed by Hawk platoons to obtain these and others are discussed in the next paragraphs.

CLASS I—SUBSISTENCE

Rations are issued to your battery at the nearest COSCOM Class I distribution point, based on reports from the battalion S1. Under certain conditions, corps may direct the Hawk battalion to obtain Class I supplies from the unit which the battalion units are supporting. This is normally the case when lines of supply are extremely long. Individual combat rations for from three to five days are normally stocked by batteries. Battery feeding, using hot, fresh meals, is used to the maximum extent Possible.

Each platoon carries combat rations for the number of days specified in the battery OPORD based on personnel strength. Rations and drinking water will be supplied to the platoon by the battery mess section.

When the situation permits, the mess team will deliver hot meals. When hot meals arrive, the platoon sergeant ensures everyone is fed by rotating personnel in a timely manner while still maintaining mission manning requirements. Drinking water maybe drawn from the closest water supply point by the platoon if they control a water trailer. The platoon leader or platoon sergeant may submit special ration requests per unit sop.

CLASS II—CLOTHING AND TENTAGE

The Class II items required to support the platoon are obtained through the Hawk battery supply sergeant. Platoon sergeants ensure proper serviceable clothing is being worn by soldiers in the platoon. Tent repair kits and required items to erect and maintain tents are obtained through the battery supply room.

CLASS III—POL

The battalion S4 requisitions POL by submitting a bulk POL forecast through the Class III DS supply unit (DSSU) to the MMC. Formal Class III requests are not usually required by batteries. Normally, empty fuel tankers or containers presented at any COSCOM distribution point are refilled.

The tactical situation, Class III supply availability, distribution point locations, battery and AFP location and mission, and tanker availability all influence POL distribution. The resupply objective is to provide responsive support by eliminating duplication of effort and bypassing intermediate supply points whenever possible. Normally the platoon sergeant requests POL through the battery executive officer or first sergeant. Vehicle fuel tanks should be topped off anytime the tactical situation allows. Whenever Possible, refueling operations should be conducted during darkness or periods of limited Visibility to reduce the possibilility of compromising battery and AFP locations. Usually batteries send their tank and pump units (TPUs) to the closest COSCOM Class 111 distribution point for bulk supplies.

Supply point and battery distribution are the primary methods used to provide Hawk AFP vehicles with fuel. Refueling is normally done in one of two ways

D Battery distribution. The battery delivers fuel to the platoon. In this method, battery personnel make all fuel pickups from COSCOM distribution points, and deliver fuel to deployed platoons according to a prearranged schedule, based on need.

D Supply point distribution. The platoon picks up fuel from the distribution point. This method is generally more flexible and responsive to the needs of the platoon.

CLASS IV-CONSTRUCTION AND BARRIER MATERIALS

These supplies are typically lumber, sandbags, and barbed wire. These items are obtained from the battery supply sergeant.

CLASS V—AMMUNITION

The COSCOM MMC exercises control of conventional ammunition assets as directed by the crops commander. Resupply is accomplished by a supply point distribution system in which batteries pick up from ammunition supply points established and operated by COSCOM on an area basis.

Missile resupply to the Hawk AFP is probably the most difficult CSS mission in the battalion. Factors affecting missile resupply include the type and tempo of combat operations, the numbers of missiles available in the theater, and the availability of transport.

Hawk missile resupply is provided from special ammunition supply points (SASPs) assigned to COSCOM. A special ammunition control facility within the MMC accomplishes the control of Hawk missile distribution according to priorities established by the ADA brigade commander. Missile resupply is basically a supply point distribution system where users pick up from the SASP or forward supply points.

Resupply of platoon ammunition and missiles is based on a report of expenditures submitted to the executive officer or first sergeant. Ammunition resupply (both missile and conventional) to the platoon is normally accomplished in one of three ways:

• If possible, ammunition is delivered to platoon positions by battery, battalion, or higher-level support personnel. Missiles may be preassembled before delivery.

• Battery, battalion, or higher-level units pick up ammunition from COSCOM distribution points and deliver it to a central point for all fire units. Missiles are assembled by the battalion missile team under the direction of the S4. Platoon personnel then pickup ammunition from the central point and deliver it to the platoon location.

• The platoon is responsible for ammunition and missile resupply, from picking it up at the distribution point to delivery at the site.

CLASS VI-PERSONAL DEMAND ITEMS

These items are items normally obtained through the exchange system such as cigarettes, candy, and soap.

CLASS VII-MAJOR END ITEMS

Class VII is issued based on the unit daily battle loss report or by formal requisition. Major weapon system end items may be replaced by operational readiness floats (ORFS). These are maintained at the DSU for each battalion; however, the DSUs may cross-level with other DSUs for floats. At the battalion level, reconstitution consists of obtaining crew personnel and equipment end items from other units.

CLASS VIII-MEDICAL

Emergency treatment and evacuation to the nearest medical clearing station is provided by the battalion surgeon and his medical personnel. This section provides an aidman to each of the batteries. If a crew member is wounded, he receives lifesaving first aid from the platoon aidman and is evacuated for further evaluation by the battalion medical section. If required, he is evacuated by ambulance to the nearest brigade clearing station or COSCOM medical facility. In severe cases, helicopter evacuation maybe provided by the corps-level medical brigade.

Medical supplies for the platoon are provided by the battalion medical section, through the medic at the battery. The medic supporting the platoon assists the platoon sergeant and squad leaders in preparing a consolidated list of required medical supplies. These include not only the medical supplies needed by the medic, but also those used by each soldier, such as first aid dressings, water purification tablets, and foot powder. The platoon sergeant or the medic passes the list to the battery evacuation team. This team forwards the list to the battalion medical platoon where the medical supplies are provided.

CLASS IX—REPAIR PARTS

Repair parts are stocked by the individual batteries and AFPs. Normally, the Hawk system warrant officer ensures the platoon maintains sufficient stockage of required repair parts. Repair parts for the platoon are requested through the battery. Parts may be delivered, or the platoon maybe responsible for picking them up. Replacement of system-peculiar items is accomplished through the Hawk battalion support battery, which maintains its stockage from the COSCOM GS ADA facility. Repair parts ‘or other equipment are requested through the battery and are obtained from the appropriate COSCOM DSU.

CLASS X—NONSTANDARD ITEMS

All of the above classes of supply, with the exception of COMSEC materiel, are provided by appropriate COSCOM supply elements. (COMSEC materiel is provided and maintained by the supporting ADA signal battalion.) The battery submits requisitions through battalion to the appropriate COSCOM DS supply unit. Requests are then filled from the DS unit’s stocks or forwarded to the MMC. The MMC will cause supplies to be issued from other COSCOM stocks. Supporting corps supply installations will usually deliver requested supplies to the DS unit or, when appropriate, directly to the battery.

The support units must “push” supplies down to the lowest level to expedite resupply of user units. Battery personnel must ensure the deployed AFPs are resupplied in a timely, direct manner. AFPs must keep the battery trains personnel informed of AFP support needs. The “pull” method occurs when platoon personnel go to designated supply issue points to obtain supplies for the platoon. This method is based on demands for supplies and causes supplies to be drawn forward or “pulled” to support the AFP.

Maintaining an adequate level of supplies within the platoon is mainly a matter of timely requests for resupply. Do not wait for ammunition levels and other basic loads to become very low before requesting resupply; the platoon will not have enough to continue operations. Resupply and refueling must be accomplished at every opportunity.

MAINTENANCE OPERATIONS

The platoon leader is responsible for the maintenance of his system and vehicles. He has warrant officers and NCOs to ensure maintenance is performed. He must be able to perform preventive maintenance himself know what to do when a maintenance problem arises, know how to inspect, and know how to train the operators. Cross–training is critical; the loss of one individual must not adversely affect the combat readiness of the platoon.

Proper maintenance is the key to keeping equipment and material in serviceable condition. It includes inspecting, testing, servicing, repairing, requisitioning, recovering, and evacuating. Repair and recovery are done as far forward as possible, either by unit personnel or contact team. When equipment cannot be repaired on site, it is moved to the rear, but only as far as necessary for repair.

The platoon leader has certain maintenance functions that combine to give him three major tasks: executing daily maintenance, executing scheduled maintenance, and executing maintenance training. He is assisted by the warrant officer and NCOs. These functions include—

- Training of operators and crews.
- Inspecting.
- Providing adequate time to perform required maintenance.
- Supervising all maintenance periods.
- Keeping the chain of command informed of major problem areas.

To prevent problems, the platoon leader and section chiefs must continuously conduct equipment inspection and inventory. Formal inspections and spot-checks are a good way to do this. Special emphasis must be placed on checking equipment which has not been used in a while. The most frequently lost or improperly maintained items are unit equipment such as tools, radiacmeters, radios, and crew-served weapons. Every piece of platoon equipment should be assigned to soldiers for accountability and maintenance. If losses occur, determine the reasons and take actions to avoid future losses. If improper procedures are at fault, they must be corrected. Tools, TA-50 equipment, batteries, and other expendable are obtained through the company supply sergeant.

UNIT MAINTENANCE

Unit maintenance is the responsibility of the unit that is assigned the equipment. It is performed by operator and or crews and battery mechanics.

Operator maintenance includes proper care, use, and operation by the platoon members who perform daily services on the Hawk system and on all other assigned equipment such as weapons, night vision devices, and nuclear, biological, and chemical gear. These services include inspecting, servicing, tightening, minor lubricating, cleaning, preserving, and adjusting tools and equipment as prescribed by relevant technical manuals. Drivers are required to record on DA Form 2404 all equipment faults they cannot correct. The DAForm 2404 reports is the main way to convey information about equipment faults to the platoon leader and to unit maintenance personnel.

Daily services prescribed for the automotive and weapon systems are divided into three services or checks:

- Before operation.
- During operation.
- After operation, to include detailed daily service.

These services should be conducted as prescribed in the operator's manual. The operators are not the only persons that have maintenance responsibilities. Every member of the platoon should be assigned tasks to aid in maintenance.

When Hawk repairs are beyond the capabilities of the battery maintenance, the battalion maintenance company is notified. Battalion maintenance personnel have test equipment that allows them to rapidly diagnose faults in the system. If battalion maintenance is not authorized to make the repair, it will arrange to have it checked by intermediate forward maintenance.

INTERMEDIATE MAINTENANCE

Intermediate maintenance has two orientations: general support and direct support maintenance. The function of intermediate direct support is to repair end items and return them to the user unit. They must be mobile and focus support as far forward as possible.

General Support

General support level maintenance is performed infixed facilities and is production oriented. The mission is primarily rebuild and or refurbishment of end items and some components. Repair time guidelines are not established.

Direct Support

Direct support (conventional) maintenance units perform maintenance regardless of geographic location in the theater of operations.

MAINTENANCE DEFINITION

The following paragraphs describe maintenance definitions used in maintenance operations. The levels at which these actions are authorized may vary depending on mission.

Controlled Exchange

Controlled exchange is the systematic removal of serviceable parts from unserviceable equipment for immediate use to restore a like item to readiness. It is permitted when the required serviceable part, component, and assembly cannot be obtained on a timely basis RX or normal supply channels. When controlled exchange is practiced, the serviceable part removed is replaced by the unsericeable. Controlled exchange is performed by the platoon only when directed by the battery commander.

Cannibalization

This is the authorized removal of serviceable repair parts, components, and assemblies from unserviceable, uneconomically repairable, or excess end items of equipment authorized for disposal. It is a supply source for authorized low mortality or difficult to obtain repair parts. It is also a source for high-priority items when delivery cannot be made by the required delivery date. It is a source for items not stocked in the supply system. This function is normally performed at a Cannlibalization point (see AR 710-2). Cannibalization of organic equipment in a peacetime environment is not authorized.

Battle Damage Assessment and Repair

This is the process of assessing the status of damaged equipment. This function will be performed by trained battle damaged maintenance personnel, who will make the critical decision to repair on site, recover, or evacuate. If the decision is to recover or evacuate, equipment is moved directly to maintenance units with the repair capability.

Operational Readiness Float

An operational readiness float (ORF) account is a quantity of end items and major assemblies that may be stocked to provide replacement for unserviceable items of equipment when their repair and return to the user cannot be accomplished within command set time limits.

Recovery Operations

Recovery is necessary to repair vehicles, or other items essential to mission accomplishment, that cannot be repaired on site, or to prevent capture or destruction by the enemy. Recovery is the action taken by the owning unit to remove or secure equipment to repair or evacuate it. Organic recovery vehicles in the Hawk units are trucks with winches, and wreckers. When equipment has to be recovered, the platoon leader reports its location and the type and extent of damage or, if known, the repair needed. Normally, a recovery vehicle from the company maintenance team will recover the damaged vehicle.

Reconstitution

Reconstitution is the process of restoring combat capability to an incapacitated AFP. Reconstitution is not accomplished at platoon level but at battalion level. When this action is required the battalion S3 will direct the effort based on the battalion commander's intent.

PERSONNEL SERVICES AND ADMINISTRATION

The AFP platoon leader must also promptly report casualties and other losses. Personnel services—leaves and passes, command information, postal service, religious activities, exchanges, financial services, legal and welfare services, bath and laundry services, and rest and relaxation opportunities are designed to help commanders maintain morale. The platoon leader is responsible for having these services fairly and impartially provided to his soldiers. Recommendations for promotions, awards, and disciplinary actions are made to the battery commander by the platoon leader through the first sergeant.

APPENDIX A

Battery and AFP Organization

This appendix describes the battery and AFP organizations. The Hawk battery provides AD to maneuver forces and critical assets in EAC and corps, and augments ADA fires of divisional ADA units.

HAWK BATTERY CONFIGURATION

The Hawk battery has a battery headquarters section, two AFPs (including organic MANPADS teams) with each AFP having an AFP headquarters, firing control section, and a firing section. It also has a maintenance platoon with a maintenance headquarters, a motor maintenance section, a system maintenance section and two system maintenance teams (see the ADA Battery, Hawk illustration on page A-2).

BATTERY HEADQUARTERS SECTION

The headquarters section has a command element, a supply element, and a food service element. This section may collocate with one of the AFPs. Moreover, it provides the administrative and logistic support for the AFPs. This section also contains the communications section.

MAINTENANCE PLATOON

The maintenance platoon is responsible for the organizational maintenance of the Hawk sytem. The Hawk missile system technician, in addition to being the battery technical expert, is the battery commmander's advisor on system maintenance activities and status. The platoon is divided into a headquarters, a motor maintenance section, and a system maintenance section with two system maintenance teams. One system maintenance team deploys with each AFP. This platoon is also responsible for the operation and maintenance of the Hawk-peculiar power generation equipment.

HAWK ASSAULT FIRE PLATOON

The AFP has a platoon headquarters, a fire control section, and a firing section (see the AFP Organization illustration on page A-2). It also includes a system maintenance team, communications team, and motor maintenance team.

PLATOON HEADQUARTERS

The platoon headquarters section is responsible for the supervision, management, and training of the platoon. It is also charged with subsistence and supply support necessary for platoon operations. The platoon leader is responsible to the battery commander for the training, maintenance, discipline, and welfare of the platoon. This means the platoon leader is accountable for everything the platoon does or fails to do. The tactical control officer (TCO) provides positive control of Hawk engagements from the PCP. Target identification, external communications, and automatic data processing are available for this control. Two organic man-portable air defense system teams will provide AD for platoon operations. MANPADS AD support is most critical during preparation for travel, road march, emplacement, and during system outages. The deployment and mission of the MANPADS teams will be according to FMs 44-18, and 44-18-1 and the unit SOP.

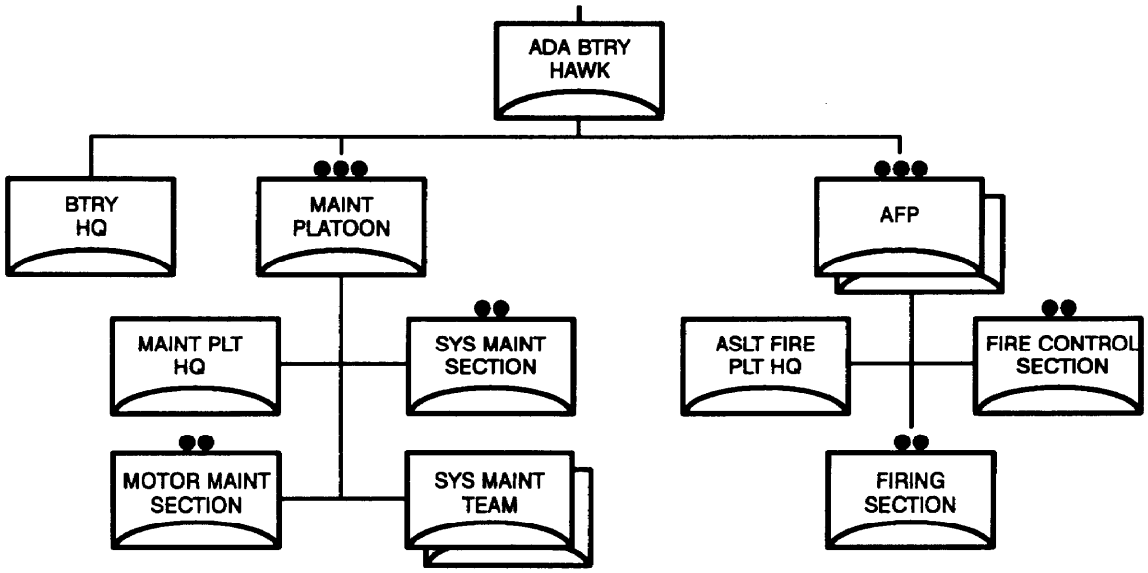
FIRE CONTROL SECTION

The fire control section is responsible for the operation and operator maintenance of the PCP, CWAR, and HIPIR. A four–man fire control crew controls one Hawk AFP from consoles located in the PCP during engagements. This crew consists of the following personnel:

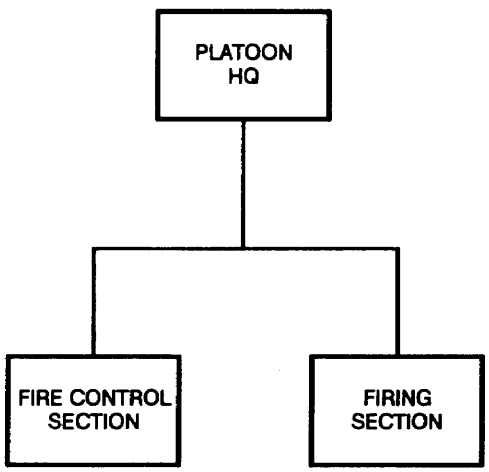
- Tactical control officer.
- Radar operator.
- Platoon command post operator.
- Radio communications operator.

CONTENTS

ADA BATTERY, HAWK



AFP ORGANIZATION



FIRING SECTION

The firing section is responsible for the operation and operator maintenance of the launchers (three per section in corps Hawk batteries and three per section in theater Army Hawk batteries). The firing section also has two loader-transporters, one LSCB (two may be used with Phase III), the AFP's basic load of missiles and the associated missile handling equipment. After the missiles are loaded onto the launchers, one individual controls the launcher section from the LSCB.

SYSTEM MAINTENANCE TEAM

The system maintenance team is a slice of the battery's system maintenance section. The team normally includes a 140D (OIC); 24R or 23R (NCOIC); 76C (PLLclerk); and 24C, 24G, and 52D (maintenance personnel). The 24C and 24G MOSS are replaced in Hawk Phase III by MOS 23R.

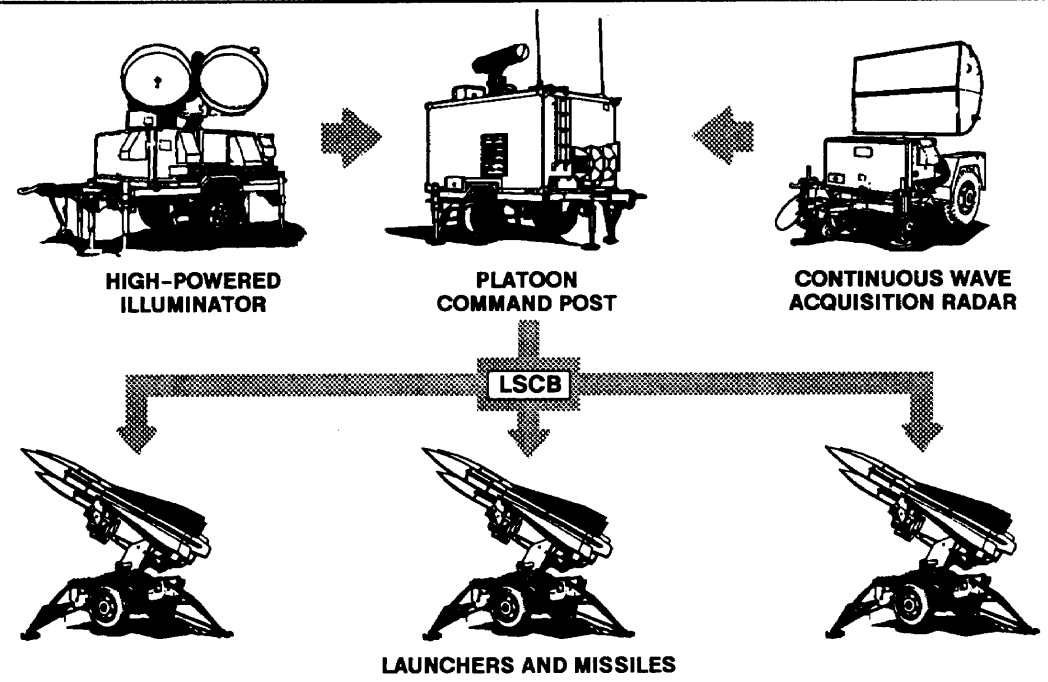
MOTOR MAINTENANCE SECTION

The motor maintenance team performs the organizational maintenance of all automotive equipment including the automotive and track components of the loader-transporters all wheeled vehicles, and small generators. This team is also responsible for refueling operations and providing POL to the AFP.

HAWK PLATOON EQUIPMENT

This paragraph provides an introduction to the Hawk AFP equipment. This section includes a brief explanation of the AFP functions. The following illustrations show how the equipment in a Hawk AFP is connected to perform its ADA mission.

ASSAULT FIRE PLATOON CONFIGURATION



CABLE REQUIREMENTS

ITEM	SYSTEM					
	PHASE II		PHASE III			
	DATA	PWR	DATA	PWR	WD-1	WF-16
PCP		1		1		
HIPIR	2	1		1	X	X
VTG	1		1			
CWAR	1	1		1	X	X
LSCB	1		1 OR 2			
LCHR	3	3	3	3		
TOTAL	8	6	5 OR 6	6	X	X

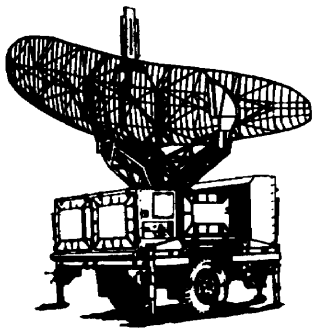
Note: PCP to LSCB data cables can be extended with cable adapter PN 13233771 to double their length. X designates the cable is used with no definite length. Data and power cables are 114 meters (375 feet) long. Data cables weigh about 250 pounds with reel. Power cables weigh about 225 pounds with reel.

MAJOR ITEMS OF EQUIPMENT

This manual describes the major items of Hawk equipment to the extent necessary to understand the tactical function of the system. The references section in the back of this manual lists technical manuals which contain detailed information on Hawk end items.

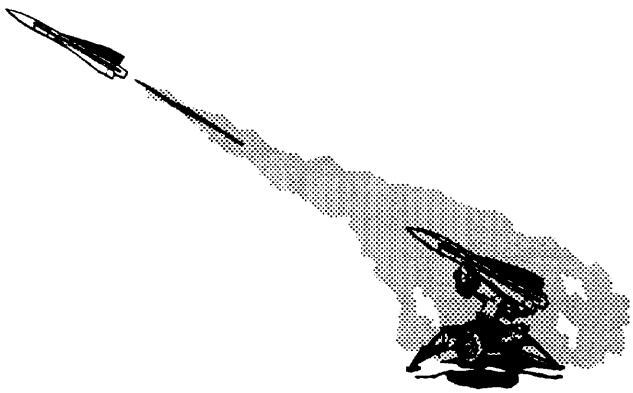
The following illustrations present a brief description of each major item of equipment and the standard manning practices. Unit SOPs and the battlefield situation may affect manning. Trailer-mounted generators (60-kilowatt, 416-volts alternating current, 400-hertz) provide electrical power for the Hawk missile system.

MAJOR ITEMS OF AFP EQUIPMENT



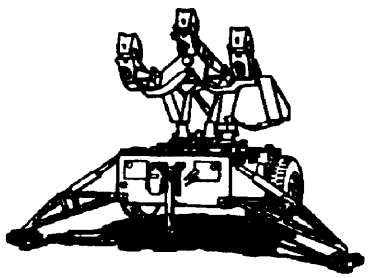
PULSE ACQUISITION RADAR

The PAR complements the CWAR coverage in FORSCOM units and is used to provide low-to medium-altitude detection coverage. Target information provided by the PAR consists of azimuth and range which is sent to the TDECC for display. The PAR will be present in designated units. A second microprocessor is provided in the PCP to permit usage of the PAR. TM 9-1430-2535-10 provides additional information on the PAR when used by the AFP.



HAWK MISSILE

The missile is propelled by a dual-phase, single-chamber, solid propellant rocket motor. It uses semiactive homing guidance for proportional navigation to the target. It has three basic functional systems: propulsion, guidance, and fuzing. The propulsion system develops the initial thrust to boost the missile to its operational speed and provides the sustaining thrust to maintain that speed throughout the missile's flight. The guidance system uses energy reflected from the target and a reference signal from the HIPIR to develop guidance commands to guide the missile to an intercept point. The fuzing system detonates the missile warhead at the optimum point to ensure destruction of the target.

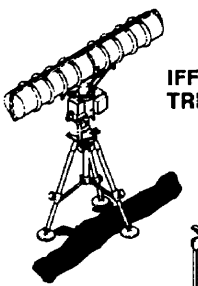


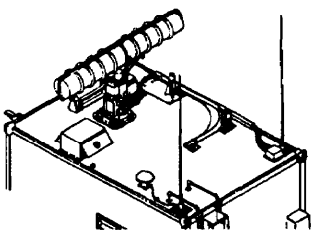
HAWK MISSILE LAUNCHER

The launcher serves as a firing platform for one to three missiles. It has three basic purposes: aim the missiles, send prelaunch commands to the missiles, and send data to the PCP. During an engagement and after the fire command, the launcher accepts lead angle and super elevation from the HIPIR or ADP to aim the missile at a predicted intercept point and then launches the missile. The launcher can be positioned through 6400 mils in azimuth and can be raised or lowered in elevation. It may be programmed to avoid obstructions.

MAJOR ITEMS OF AFP EQUIPMENT (CONTINUED)

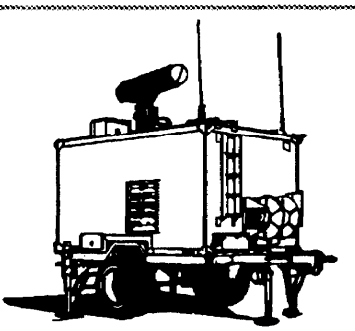
IDENTIFICATION, FRIEND OR FOE (IFF)
Tracks are identified using prescribed criteria for declaring targets hostile. Hawk identification, friend, or foe (IFF) equipment is used to aid in identification. IFF data can be obtained manually in the PCP, or automatically by ADP in the PCP and BCP.
The Hawk IFF system offers cryptographically secure Mode 4, along with Modes 1, 2, and 3. The IFF antenna can be installed on the PCP shelters, or can be remoted to a distance of up to 114 meters from the interrogator set.
Correlation is also performed both manually and automatically. Radar data is correlated with early warning and automatic tactical data link (ATDL) information from control agencies and other ADA units. Correlation includes position, speed, altitude, heading, and identification.



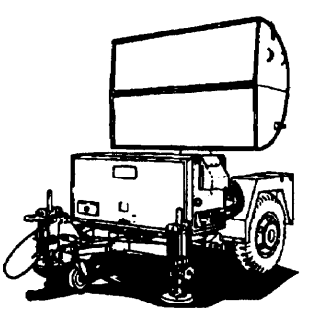


IFF ANTENNA MOUNTED ON TRIPOD AND ON SHELTER

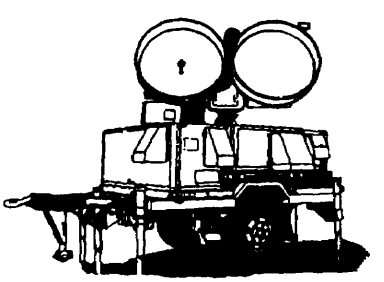
PLATOON COMMAND POST
Personnel in the PCP control and direct AFP operations. The PCP houses a TDECC, an IFF interrogator set, communications equipment, and ADP. Normally three crew members and a tactical officer man the PCP.



CONTINUOUS WAVE ACQUISITION RADAR
The CWAR provides low- to medium-altitude target detection. It provides target azimuth, radial velocity, approach/recedes status, and range rate and doppler audio. This information is processed by the ADP and displayed in the PCP.



HIGH-POWERED ILLUMINATOR RADAR
The HIPIR is the AFP's tracking radar. Hostile aircraft are assigned to the HIPIR for engagement. It is a continuous wave radar. It uses the doppler principle to lock on and track assigned targets. The HIPIR provides a reference signal for the missile's proportional navigation system. It also has an electro-optical device (VTG) for visual tracking.



HAWK ASSAULT FIRE PLATOON ENGAGEMENT

The Assault Fire Platoon Engagement illustration below shows the functions of a Hawk AFP in an engagement. The AFP detects acquires identifies, engages, and destroys the target. The system detects targets using the CWAR. Target data may also be provided from outside the AFP through a data link from the battalion fire direction center. Target data is fed to the PCP. The PCP provides a means of target display, IFF challenge and IFF response display, threat ordering of targets, and target assignment. The TCO in the PCP evaluates and selects the target for possible engagement and assigns the target to the RO for tracking. The HIPIR tracks the target and provides a reference signal to the missile. After launch, the missile homes in on the target by continuously comparing the transmitted signal from the HIPIR with the reflected signal from the target. The missile flies a proportional navigation course to the intercept point.

HAWK CAPABILITIES AND LIMITATIONS

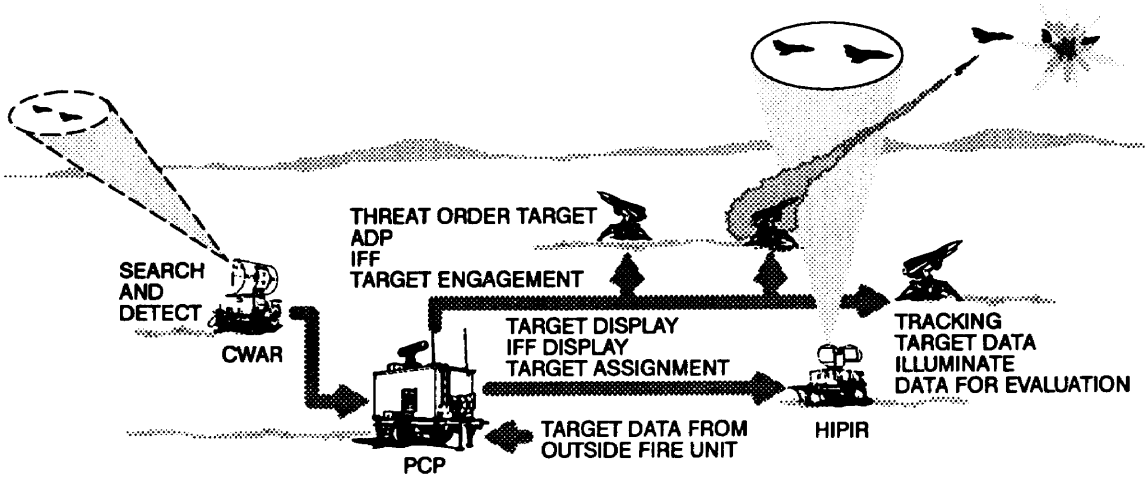
This section discusses the Hawk AFP capabilities and limitations. It also provides a detailed overview of Hawk Phase III capabilities.

HAWK SYSTEM CAPABILITIES

To effectively use any weapon system in a battlefield environment, commanders, operations and logistics planners, and operators must have an understanding of how the system works and what it can do. The Hawk system must perform the US Army ADA mission within the system's capabilities. To ensure the combined arms team retains the freedom to maneuver, protect C3I nodes, sustain the battle, and kill enemy aircraft the first time, the Hawk system—

- Engages targets from near ground level tomedium altitudes and ranges of more than 40 kilometers.
- Operates during all types of weather and in reduced visibility.
- Functions effectively in a heavy ECM environment.
- Complicates the enemy's ability to locate friendly Hawk units through the use of EMCON.
- Interfaces with adjacent ADA units and C3I facilities.
- Responds to targets detected by sensors outside the Hawk battalion through the use of the Army tactical data link or joint tactical information distribution system (JTIDS).
- Moves quickly about the battlefield using organic prime movers, tactical (helicopter) airlift, or rail transport.
- Deploys by strategic airlift or by ship.

ASSAULT FIRE PLATOON ENGAGEMENT



HAWK PHASE III/BLOCK IV MODIFICATIONS

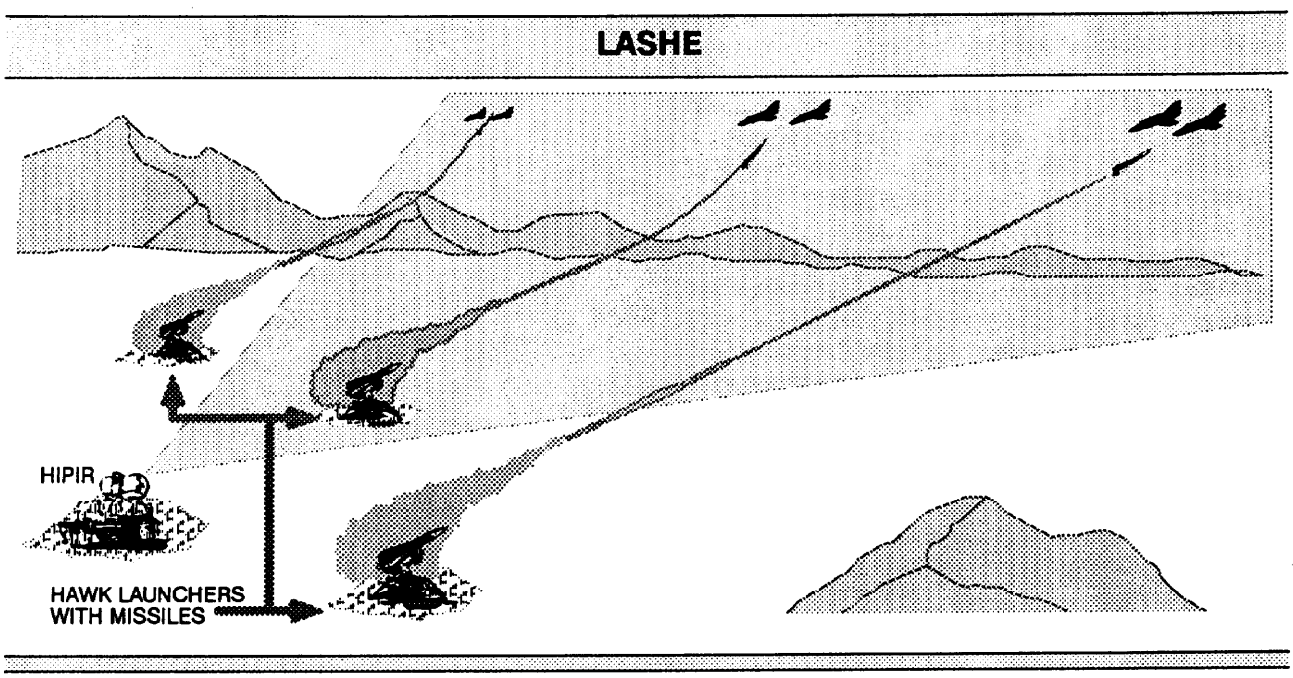
Phase III is a continuation of the modifications begun with Phase II. Phase III is the most ambitious Hawk program fielded. It improves the firepower, survivability, and reliability of the Hawk system. The Phase III implementation also will reduce the present MOSS (16D, 16E, 24C, 24G, and 24R) to 14D Hawk operator and 23R Hawk maintainer. The objectives of Phase III are focused on operational, logistic, mobility, and training issues to-

- Increase firepower.
- Improve ECCM capabilities.
- Reduce logistic support.
- Improve capacity for realistic training.
- Upgrade data exchange.
- Increase mobility of the system.
- Improve software.

Low-Altitude Simultaneous Hawk Engagement

LASHE provides Hawk with an improved self-defense capability. It is a method of engaging a group of incoming targets within certain range limits. It uses a wide beam to illuminate a wide area and therefore more than one target is illuminated. While the target is illuminated, the missile is able to home in on it and receive the needed rear reference signal. In this mode, the HIPIR does not track individual targets and therefore, no audio feedback from the HIPIR receiver is sent to the RO. Toneburst and target breakup will not be received. The system will automatically reengage CWAR tracks that are updated by radar returns after the predicted intercept time. Because the HIPIR does not lock, and missiles are available from all launchers, the firing sequence alternates between launchers. This provides the rapid fire capability which makes LASHE effective against a large mid. The operator may also engage targets seen by sensors other than the CWAR. Once a target has been engaged by the system, the engagement will be supported until fly-out of the missile. CWAR data is used to compute missile lead angles and fly-out time. The following is a partial list of changes:

- Hardware changes were required on the TDECC, HIPIR, and launchers. A wide beam illuminating antenna was added to the HIPIR (see the LASHE illustration below).
- Prioritization of incoming targets is based on parameters established by the TCO during system initialization.
- LASHE is primarily a self-defense tool and should be used for self-defense against multiple targets.
- Once the TCO accepts the ADP recommendation to go to LASHE, he should remain in LASHE until all the targets are destroyed or no longer a threat.



Continuous Wave Acquisition Radar

The Phase III CWAR is modified by replacing the signal processor with a solid-state, single-scan processor. Target range, speed, and azimuth are determined on a single scan. This improves target detection and correlation at the AFP and enhances the air picture uplinked to the battalion FDC.

Additional improvements include a new signal processor containing a microcomputer that provides more target information as well as new jam–mapping techniques and other ECCM capabilities. The CWAR now provides azimuth, range, and range rate data on a single three-second scan. This provides a higher quality, more complete air picture of low-altitude targets, including receding targets, to the operators and the FDC. The CWAR microcomputer-processed data consists of information on jamming and nonjamming targets.

CWAR all range processing. The CWAR ARP is the primary source of low-altitude target data for the fire unit. The CWAR is a track-while–scan radar that provides an update for each target every three seconds. It measures the parameters of range, range rate, and azimuth for benign fixed-wing and coherent jammers, azimuth and ECM power level for noncoherent (noise) jammers, and azimuth for helicopters.

With the power map, the ARP indicates to the TCO the approximate detection degradation of the CWAR in the existing ECM environment. If the range map in an ECM environment moves in halfway at any azimuth, a 50 percent reduction in detection is assumed (if the PPI display is set at 80 kilometers). In a non-ECM environment, the range map will not be a full circle since clutter effects also degrade the sensitivity of the system. The range map is a valuable tool in assuring that the CWAR is emplaced in such a way that minimum degradation is indicated in the primary sector (see the Range Map illustration).

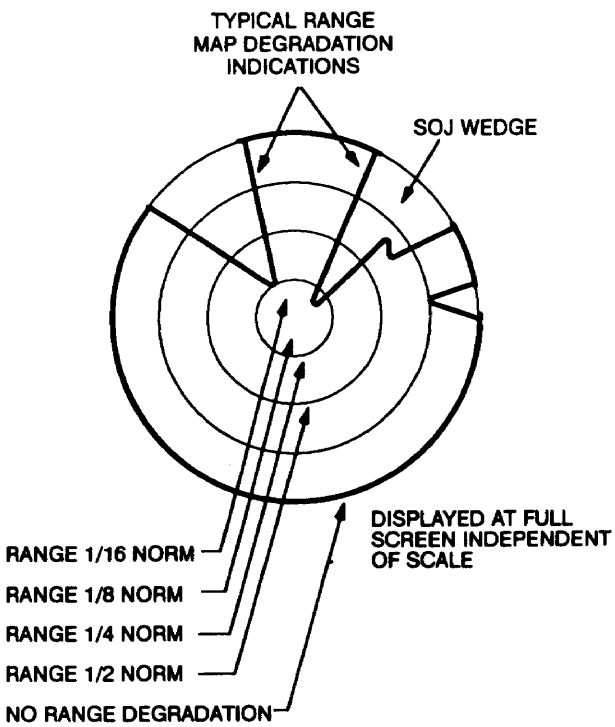
The power map displays the ECM power over approximately 40 degrees. This display provides a more precise threat picture within the SOJ wedge. The ARP sends two types of jammers to the PCP for display: the guard-band and in-band. A guard-band jam strobe symbol appears near the outer edge of the display at 90 percent of the screen radius. A guard-band jammer indicates a likely SOJ. An in-band jam strobe symbol is displayed at 48 percent of the screen radius. The in-band strobe is separately displayed since an attacking self-screening jammer (SSJ) is most likely to employ an in-band device.

An approaching jammer is also indicated by constantly increasing jammer energy as indicated by the range and power maps. Remote ECM fixes and HIPIR jammers are displayed at the range specified in the track file. The range of a HIPIR jammer is either a default range or the manual range value selected by the RO. CWAR jammers provide no ranging information. If the jammer appears inside the screen, then jumps out to the outer edge of the display, the TCO should call up the power and range maps to check signal strength. This may indicate an approaching self-screening jammer.

To control CWAR radiation, the TCO can place the radar in a special EMCON state. Forced silent is an intermediate mode between standby and radiate. RF radiation is off; however, when commanded, the CWAR returns to radiate more rapidly than from the standby state.

Individual CWAR detection reports on nonjamming targets are displayed as first hits unless they can be used to update a track which has met local detection criteria prior to or on this scan. Helicopter first hits are displayed with a unique symbol at the azimuth of the return but at a default range of 15 kilometers.

RANGE MAP



Helicopter detection. CWAR helicopter tracks are not allowed to correlate to any local or remote tracks and are not reported on ATDL The following illustration lists the TDECC display symbols and their definitions, including first hits (initial radar detection symbols) and confined tracks.

HIPIR Illuminator Tracking Radar

In the Phase III HIPIR, the target intercept computer is replaced by a microcomputer. The HIPIR microcomputer system consists of two major sections: low-level electronics and the microcomputer. The LLE is the interface between the radar and the microcomputer. It provides voltage level isolation between the radar and the microcomputer. The HIPIR microcomputer consists of a signal board computer, memory system, and data channel. It provides real time digital control and monitoring of HIPIR functions, serial data exchange with the PCP and self-test diagnostics for fault detection. Phase III includes the following HIPIR improvements:

- The system detects the presence of multiple targets in the tracking beam.
- In the LASHE mode, multiple targets are engaged and destroyed.
- Field wire WF-16 replaces two data cables, which enable the HIPIR to be deployed up to 1 kilometer from the PCP If deployed with the VTG, deployment is limited to 114.3 meters.

As a result of incorporating LASHE and sector scan into the system, there are five HIPIR operating states (see the illustration on page A-10).

EMCON The quiet state of a HIPIR is always either the EMCON or Forced Silent mode of operation. EMCON does not allow the HIPIR to radiate unless the TCO or the ADP initiate an assignment.

HIPIR silent launch. This is possible when the HIPIR achieves optical track with the TAS (VTG). Whenever the HIPIR is in slaved or forced silent, the IN-RANGE and FIRE switches are activated for optional use in a silent launch. For this firing, the HIPIR does not need to radiate until after launch. The HIPIR is commanded to radiate automatically soon after missile lift-off. It is the responsibility of the TCO and RO to determine that the target is really in range and approaching. If the slaved or forced silent sequence occurred during a HIPIR assignment, information from the HIPIR track can be used. If the sequence occurred after an RO manual target acquisition with TAS, then the RO or TCO would have to use visual cues from the TAS to determine that the target was in range and approaching. In addition, the TCO would have to take a MANUAL ASSIGN action to inform the ADP of the assignment. In both cases, the ADP will use a default of the short-range helicopter range and range rate for computing missile firing parameters.

AIR PICTURE SYMBOLOGY

SYMBOL NAME/DESCRIPTION	SYMBOL
GROUND IMPACT POINT	
SPEED/HEADING	
LOW SPEED	
MEDIUM SPEED	
HIGH SPEED	
REMOTE, SINGLE (Example for hostile. Size the same for all remotes–unknowns, friends, and multiples)	
TARGET ENGAGED BY REMOTE SITE	
ECM FIX (Example for hostile)	
TO BE ENGAGED MODIFIER	
ENGAGED MODIFIER	
PROBABLE KILL	
CWAR FIRST HIT	
HOSTILE, SINGLE	
HOSTILE, MULTIPLE	
HOSTILE, SINGLE (Not eligible for engagement)	
HOSTILE, MULTIPLE (Not eligible for engagement)	
UNKNOWN, SINGLE	
UNKNOWN, MULTIPLE	
UNKNOWN, SINGLE (Not eligible for engagement)	
UNKNOWN, MULTIPLE (Not eligible for engagement)	
FRIENDLY, SINGLE	
FRIENDLY, MULTIPLE	
CWAR LOW-VELOCITY HELICOPTER FIRST HIT	
HOSTILE CWAR LOW-VELOCITY HELICOPTER	
UNKNOWN CWAR LOW-VELOCITY HELICOPTER	
FRIENDLY CWAR LOW-VELOCITY HELICOPTER	
JAMMER (Range unknown)	
JAMMER WITH ESTIMATED RANGE (Displayed at that range)	
TACTICAL BALLISTIC MISSILE	

OPERATING STATE SWITCHING OF THE HIPIR

	INITIAL STATE	DESIRED STATE	MODE	METHOD
1.	EMCON (Not Radiating) Pencil Beam or LASHE	Sector Scan	AUTO ENG or NORMAL	• TO activation of HIPIR Sector Scan Controls
2.	Sector Scan	Sector Scan	AUTO ENG or NORMAL	• Reactivation of HIPIR Sector Scan Controls
3.	Sector Scan, Pencil Beam or LASHE	Pencil Beam	NORMAL or AUTO ENG	• TO activation of ACCEPT (Narrow Beam) ENGAGE OTHER (Narrow Beam) MANUAL ASSIGN
4.	EMCON (Not Radiating)	Pencil Beam	NORMAL	• Same as 3
			AUTO ENG	• TO activation of ENGAGE OTHER or MANUAL ASSIGN • Computer automatically assigns HIPIR if target in range
5.	Sector Scan	LASHE	AUTO ENG or NORMAL	• TO activation of ACCEPT (Wide Beam) or ENGAGE OTHER (Wide Beam)

Safety. A peacetime condition of HIPIR Safety EMCON is imposed on the HIPIR to inhibit radiation in sectors that would cause a personnel hazard. When the three-position ARM/OPERATE/TEST switch is in the TEST or SAFE position, safety EMCON is in effect. The HIPIR will not radiate when pointed to an excluded azimuth, which was input at the HIPIR during initialization. After switching the HIPIR from local to remote, with the system in SAFE or TEST, the excluded area is displayed on the PCP situation display by means of an arc of dollar signs ($) just inside the 40-kilometer range ring. When using the IOT launcher model, the HIPIR is in safe and will not be allowed to be assigned within the safety sector. When the switch is in the ARM position, safety EMCON is overridden and firing circuits are enabled. The arc is not displayed at this time.

HIPIR sector scan. Sector scan gives the Hawk TCO the capability to move the HIPIR to an azimuth and put it into one of three sector scan search widths. It is used primarily to supplement CWAR detection coverage in a region where CWAR detection is degraded, such as in the SOJ wedge. Additionally, a concentration of jammer indications within a specific area or a high ECM level on the CWAR power map display would indicate that support to CWAR detection is required.

To minimize radiation time during sector scan operations, the TCO may enable cyclic EMCON via the TDECC RCU menu. When cyclic EMCON is enabled, the HIPIR will complete one sector scan pattern then not radiate for a random period of time at the end of which the pattern is restarted. To further minimize radiation, a narrow sector width should be used.

The RO also has the option to select the spectrum analyzer (SA) instead of the power map. When selected, the HIPIR searches the upper and lower legs of the pattern and the VTG or SA display appears on the RO VTG or SA display in place of the power map display. The RO can use this to monitor pause locks encountered during the search. He may also switch to SA once delay lock is achieved on a short-range target.

During sector scan, the HIPIR reports all clean target detections to the ADP for correlation and display. It also compares the range of each nonjamming return against a self-defense range. If the target is within this range, the HIPIR remains on the target and obtains delay lock. The ADP compares this report against other threats held. If it is a newly detected target and is the

highest threat, the ADP recommends an engagement using the NARROW BEAM ACCEPT. If the recommendation is refused, sector scan will resume. All HIPIR nonjamming detections which do not correlate to existing CWAR or remote tracks are displayed with standard symbology. HIPIR detections during sector scan are not reported over ATDL.

To engage a sector scan target, the TCO must force a transition from sector scan to an auto or manual pencil beam assignment. Sector scan targets are not allowed to be LASHE engaged. If the HIPIR is locked on a sector scan target, the TCO should accept the computer recommendation. When the TCO accepts a sector scan target, the automatic TOJ override is maintained and the TOJ OVERRIDE on the RO panel is illuminated. This is activated because sector scan is normally used in an ECM wedge, and a nearby jammer could cause the HIPIR to pull off the target without the TOJ OVERRIDE enabled. The RO may remove TOJ OVERRIDE once the auto assignment has begun, if the target being tracked initiates noise jamming ECM. The TCO can also engage sector scan targets which are not recommended by hooking them and pressing ENGAGE OTHER or MANUAL ASSIGN. Once the TCO takes an action to assign the HIPIR, the system is no longer in sector scan, and the HIPIR's target is reported on ATDL. Pencil beam illumination is the normal single target tracking condition for the HIPIR. Wide angle illumination is used during LASHE operations for multiple target tracking.

Initialization. During initialization, the TCO can authorize use of the HIPIR three-dimensional designation capability. When three-dimensional target data is received from the battalion FDC and includes a "high accuracy" indicator (currently this tag is only set on Patriot radar tracks), an assigned HIPIR will automatically point to the azimuth and elevation of the track and search only a small offset about the remote track's position. This feature reduces reaction time for HIPIR lock, especially on medium-to high-altitude tracks because the HIPIR does not perform the wide box search down to the horizon. It also reduces the spread of the radiation, thus reducing the Hawk signature. This feature is not used if local radar track data exists.

PCP

The Phase III PCP includes digital displays, electronic mapping, an integral operator trainer, and a new computer. Software changes within the PCP give the TCO the capability to electronically map boundaries, safe passage corridors, airspace control orders, weapons control volume data, FEBAs, FSCLs, and protected asset data on the digital and video displays of the TDECC. Additionally, in the Patriot post deployment build-three and Phase III, Hawk will provide an improved direct data interface between the Hawk PCP, the Patriot ICC, and the AN/TSQ-73. Currently activated system improvements include--

- Automated firing doctrine.
- Standardized video displays.
- ADP upgrade.
- Improved track management.
- Speed-in data transfer, data processing, and data update times.
- Improved ID/IFF coordination and or conflict resolution.
- Improved Patriot-Hawk interoperability.

The ADP is comprised of two single board computers, memory system, data channels for each ADP microcomputer interface, and HIPIR doppler generator used by the IOT. There are five ADP microcomputer data channels: the CWAR, HIPIR, IFF, TDECC, and the AADCP data channels.

Modes of operation. The PCP has four modes of operation. FIDOC is embedded firing doctrine which provides fire recommendations based on intercept in a high-lethality zone while providing an indication when intercept is predicted in a lower lethality zone. FIDOC determines the number of missiles to be fired. The modes are selectable by the TCO using two controls, NORMAL/AUTO ENGAGE and FIRE ONE/AUTO FIDOC.

NORMAL ENGAGE involves operator action to accept all engagements. It is used for pencil beam engagements when strict EMCON procedures are in effect. The computer will not assign a HIPIR without operator action.

AUTO ENGAGE permits the system to automatically accept a recommended narrow beam engagement, but operator action is required to fire missiles for all engagements except LASHE. AUTO ENGAGE should be used when the tempo of the air battle becomes so intense that the TCO is willing to allow the computer to automatically assign the HIPIR to the highest priority targets. If the HIPIR is available, the computer automatically assigns it to the highest threat or LASHE targets that meet engagement criteria. If a IASHE situation occurs, the system also fires missiles without operator intervention.

For FIRE ONE, the computer recommends firing one or two missiles per FIDOC rules. RO activation of the FIRE SI or computer acceptance of the firing recommendation (LASHE AUTO ENGAGE only) causes the firing of one missile. Firing of additional missiles during this engagement requires RO action.

FIDOC uses the set firing doctrine embedded in the computer for recommendations. In NORMAL/AUTO FIDOC, if the computer recommends that two missiles be fired, operator action is required to fire the first missile only; the second is fired automatically. If in AUTO/AUTO FIDOC, the TCO activation of the FIRE SI or computer acceptance of the firing recommendation (LASHE only) causes the firing of the number of missiles recommended within appropriate time intervals.

These two controls allow the system to be set in the following modes:

- NORMAL/FIRE ONE.
- NORMAL/AUTO FIDOC.
- AUTO/FIRE ONE.
- AUTO/AUTO FIDOC.

Saturation alleviation. When the target load nears the capacity of the acquisition sensor processors or the PCP processors, the computers automatically begin to drop the tracks of longer range targets outside the predefine sectors so that the most threatening targets may be displayed and processed. The operator is alerted whenever saturation alleviation is occurring. The range is reduced in increments of 10 kilometers outside the primary sector, then, if necessary, inside the sector. Benign targets beyond the refined system maximum processing range are purged from the track file. Jammers, helicopters, remote TBMs, or targets with alert statuses are not purged during saturation alleviation. The 10 most threatening targets, tracks causing friendly protect, CWAR single scan hits, and FDC queued commands are always displayed. hacks within the 360-degree, self-defense zone are not dropped. When the target load is no longer overloading the computer, the range is moved outward again in reverse order of the alleviation. Eventually, full processing is restored. The following actions result in target ineligibility for automatic recommendation for 30 seconds:

- The TCO refuses a computer recommendation on that target.
- The TCO presses the TERMINATE ENGAGE button (this only cancels the targets assigned to the HIPIR and does not apply when the HIPIR is in sector scan).
- When a LASHE target engagement is terminated (only the engaged targets are tagged as ineligible).
- Any ATDL HOLD FIRE or CEASE ENGAGE that is complied with (WILCO).

Friendly protect. This function is provided to prevent the accidental engagement of any friendly (ID or IFF) aircraft which might be within the vicinity of an intended target. When this situation exists, the intended target is not recommended for assignment, no matter how severe a threat. The intended target will be recommended when it flies out of the near vicinity of the friendly aircraft. ENGAGE OTHER can be used to manually override friend protection. When an ATDL command is complied with (WILCO), the engagement is processed and the HIPIR assigned, as if it were an ENGAGE OTHER action. The WIDE BEAM ENGAGE OTHER has four purposes:

- To add jamming targets to the LASHE set or create a jammer LASHE set.
- To add a remote target or a local target not being recommended to an ongoing LASHE set.
- To override friendly protect.
- To initiate a LASHE set.

Interrogation. In a situation where the target is challenged with more than one mode, only the last valid response is associated with the track. For example, if the track is challenged in Mode 3A first and receives a valid reply, it will be designated an assumed friend. If it is then challenged in Mode 4 and returns a valid reply, it will become a true friend. However, if it is first challenged in Mode 4 and then in Mode 3A, the true friend response will change to an assumed friend. The system does not remember previous valid IFF responses for tracks after the challenge mode is changed. IFF assumed friend indications are not sent on ATDL (see the Air Picture Symbology, IFF Data illustration).

In manual interrogation, the TCO may manually challenge any location within the area of the situation display. A target symbol does not need to be present on the TDECC display to be challenged. The TO positions the HOOK symbol over the selected position on the display and presses the CHALLENGE switch on the TO panel. The ADP will schedule up to two IFF manual challenges to occur when the IFF antenna passes the hooked azimuth location.

AIR PICTURE SYMBOLOGY, IFF DATA

SYMBOL NAME/DESCRIPTION	SYMBOL
TRUE FRIEND (MODE 4)	T
ASSUMED FRIEND (MODES 1, 2, AND 3A)	A
IFF EMERGENCY	A A A A
IFF INDICATOR/POSITION	A A
MANUALLY CHALLENGED (AFTER TO COMMANDS MANUAL CHALLENGE)	C
HIPIR SAFETY EMCON SECTOR	SSSS

In auto interrogation, IFF interrogations maybe initiated automatically by the ADP when the ADP AUTO CHALLENGE and the SIF REPLIES CODED switches are on. All local tracks are candidates for an automatic challenge during each IFF scan except jammers and TABs. A priority system determines the local targets to be automatically challenged.

Special processing is performed for CWAR helicopter tracks because these tracks have no measured range. CWAR helicopter tracks are candidates for automatic challenges and track-to–IFF response correlation is performed. Due to the lack of measured range, any valid IFF mode response within a certain area is considered a response from that helicopter target. Because the HIPIR can only be assigned to a helicopter track via manual assign, a HIPIR assignment to a helicopter track will not be automatically broken down by the system due to an IFF response correlation.

Initialization Parameters. Initialization data is a set of variable system operational parameters used by the system during tactical and training operations. Input of data into system storage is accomplished through one or more of the following input-output devices: input-output storage (IOS) device, RCU, computer front panel, laptop download, and TDECC operator controls. Note that the RCU will show a fault “IOS module not available” if the IOS board is not present or if it is not preprogrammed for TDECC computer recognition. All stored programs and initialization data, once entered into system storage, is protected from destruction after the occurrence of a power loss. All stored data will be available to the system computers within 10 seconds of startup. After 18 hours of power loss, the initialization parameters will return to default values.

The laptop computer download is extremely important to rapid and accurate operations. Using any IBM compatible laptop, a floppy disk may be made with the initialization parameters stored on it. Also a "clear" program is beneficial. This is a program that blanks out all previous information from previous parameters to load new parameters cleanly. Without this program all data must be changed manually. The use of the laptop and “clear” program cuts about 45 minutes from initialization entry time. The laptop must be purchased by the unit as it is not part of the system. The software can be obtained from the US Army Air Defense Artillery School (ATSA-DTD-TS), Fort Bliss, Texas.

Menus. The majority of data inserted at initialization is entered through the RCU. It allows selection of 10 different items for modification of system parameters at system initialization or during on-line operations. The RCU menu is shown below in the following table. This table and the Initialization Data table on page A-14 outline the input, display, processing, and modification data to be entered for initialization parameters. The following examples are Block 4.

The UNITS OF MEASURE menu allows the TCO to select the units in which data is displayed on the TDECC and RO displays. Selectable units include LAT/LONG, GEOREF or UTM, roils or degrees, knots or meters per second, and kilofeet or kilometers (see the Units of Measure illustration on page A-14).

RCU MENU

MENU XX	0 EXIT
	1 UNITS OF MEASURE
	2 EMPLACEMENT DATA
	3 GEOGRAPHIC FUNCTIONS
	4 VOLUME FUNCTIONS
	5 IOS FUNCTIONS
	6 HPI/LAUNCHER DATA
	7 CWAR SECTORS
	8 ID WEIGHT FUNCTIONS
	9 SELF-DEFENSE CRITERIA
	10 DISPLAY OPTIONS

INITIALIZATION DATA

PARAMETER	INPUT	TDECC DISPLAY	ID/FIDOC PROCESS	ON-LINE MODIFICATION
RADAR ALIGNMENT CORRECTIONS	RADAR	NO	NO	NO
IFF ALIGNMENT CORRECTION	PCP FRONT PANEL	NO	NO	NO
CWAR SHIM	RADAR	NO (ARO)	NO	NO
UNITS OF MEASURE				
GEOGRAPHIC	TDECC RCU	YES	NO	YES
AZIMUTH	TDECC RCU	YES	NO	YES
RANGE	TDECC RCU	YES	NO	YES
VELOCITY	TDECC RCU	YES	NO	YES
ALTITUDE	TDECC RCU	YES	NO	YES
EMPLACEMENT DATA				
SIDE POSITION	TDECC RCU	NO	NO	YES
DLRP	TDECC RCU	NO	NO	YES
SITE ATITUDE	TDECC RCU	NO	NO	YES
SITE ADDRESS	TDECC RCU	NO	NO	YES
PRIME TARGET LINE	TDECC RCU	YES	NO	YES
MAX SAFE VELOCITY	TDECC RCU	NO	YES	YES
3-D DESIGNATE	TDECC RCU	NO	NO	YES
TBM MODE	TDECC RCU	NO	NO	YES
GEOGRAPHIC FUNCTION				
POINTS	TDECC RCU	YES	NO	YES
ORIGIN	TDECC RCU	YES	NO	YES
LINES	TDECC RCU	YES	NO	YES
VOLUME FUNCTIONS				
WEAPONS CONTROL VOLUMES	TDECC RCU	YES	YES	YES
PROHIBITED VOLUME	TDECC RCU	YES	YES	YES
RESTRICTED VOLUME	TDECC RCU	YES	YES	YES
SAFE PASSAGE CORRIDOR	TDECC RCU	YES	YES	YES
HPI/LAUNCHER DATA				
MIN. LAUNCHER EL	TDECC RCU	NO	YES	YES
HPI CYCLIC EMCON	TDECC RCU	NO	NO	YES
CWAR SECTORS				
PRIMARY SECTOR	TDECC RCU	YES	YES	YES
TARGET/JAM BLANKING	TDECC RCU	NO	NO	YES
HELICOPTER BLANKING	TDECC RCU	NO	NO	YES
ID WEIGHT FUNCTIONS	TDECC RCU	NO	YES	YES
SELF-DEFENSE CRITERIA	TDECC RCU	NO	YES	YES

UNITS OF MEASURE

TYPE OF DATA		OPTIONS		
GEOGRAPHIC	x	1 LAT/LONG	2 GEOREF	3 UTM
UTM SPHEROID	x	1 INTRNL	2 CL 1880	3 CL 1866
		4 CL 1858	5 EVEREST	6 BESSEL
AZIMUTH	x	1 MILS	2 DEGREES	
RANGE	x	1 KM	2 NMI	
VELOCITY	x	1 KNOTS	2 MPS	
ALTITUDE	x	1 KILOFEET	2 KM	

The EMPLACEMENT DATA menu consists of that data needed for operations with the ATDL, HIMAD task force, and miscellaneous data such as site position and DLRP (see the Emplacement Data illustration).

Maximum safe velocity (MSV) is used as a hostile ID weight. If target velocity exceeds the MSV, the target's identity is weighted towards hostile. MSV must be chosen with care as measured target velocity is spread over a reasonably large set of values with respect to actual velocity. Therefore, to assure a target actually exceeds MSV, a margin for allowable error must be selected.

The three-dimensional designate and TBM mode (inactive) are only used when task organized with Patriot. The three-dimensional designate causes the HIPIR to search around a point in space centered on the reported target position from a three-dimensional sensor rather than performing the standard box search pattern. It is optimized for use with Patriot and is not recommended for use with the AN/TSQ-73 due to expected ATDL-1 inaccuracies and data update delays. The TBM mode is currently internal to Block 4; however, it requires a specific code to activate it. This code is not available at the brigade or lower levels. With Block 5, the TBM ability is scheduled to be activated at the fire unit level.

The GEOGRAPIC FUNCTIONS menu includes access to points of interest, origins, and line data menus. They provide the capability to enter up to 20 points of interest, 7 hostile or friendly origins, and 8 lines. This data is for display purposes only to give the TO more complete information about the target and environment (see the Geographic Functions illustration). Points of interest can be designated as general, BOCs, fire units, and assets as shown in the Point of Interest Data illustration on page A-16.

EMPLACEMENT DATA

SITE POSITION	zzzzzz zzzzzz		LAT/LONG
DLRP POSITION	zzzzzz zzzzzz		LAT/LONG
SITE ALTITUDE	xxx		KM (MSL)
SITE ATDL ADDRESS	xx		
PRIME TARGET LINE AZ	xxxx		MILS
MAXIMUM SAFE VELOCITY	xxx		MPS
3-D DESIGNATE	x	0 NO 1 YES	
TBM MODE	x	0 NO 1 YES	

GEOGRAPHIC FUNCTIONS

SOURCE NUMBER xx

POINTS:	1 xxx	2 xxx	3 xxx	4 xxx	5 xxx		
	6 xxx	7 xxx	8 xxx	9 xxx	10 xxx		
	11 xxx	12 xxx	13 xxx	14 xxx	15 xxx		
	16 xxx	17 xxx	18 xxx	19 xxx	20 xxx		
ORIGINS:	21 xxx	22 xxx	23 xxx	24 xxx	25 xxx	26 xxx	27 xxx
LINES:	28 xxx	29 xxx	30 xxx	31 xxx			
	32 xxx	33 xxx	34 xxx	35 xxx			

FUNCTION x 0 RETURN 1 DATA 2 DELETE

Friend and hostile origins do not provide ID criteria because the three-dimensional data is not available with the Hawk acquisition radars (see Origin Volume Data illustration below).

Lines include political boundaries, FEBAs, and FSCLs (see the Line Data illustration).

The VOLUMES FUNCTIONS menu (see the Volumes Functions illustration) along with the volume and corridor data menus, provides the information used for target ID and filtering targets from automatic engagement recommendation.

Volume functions contains two sets of three-dimensional volumes numbered 1 to 48. One to 24 are current and 25 to 48 are noncurrent. Only current sets can be displayed on the TDECC. Volumes are classified as active or inactive, and are of three types: weapons control, restricted, and prohibited. The WCV status is FREE, TIGHT, or HOLD (see the Volume Data illustration). The fact that a target has violated a restricted or prohibited volume will remain in the track data file until that track is purged or dropped, and will be used for determining an automatic ID based on a weighting function. A target's WCV status is assessed with the target's ID to determine engagability. For example, an unknown will not be recommended if its location is in a weapons control volume TIGHT. If WCVs overlap, the most restrictive applies (HOLD over TIGHT over FREE).

Corridors include a set tag that corresponds to an ID weight set, and are listed as unidirectional or bidirectional. Because corridors are defined in three dimensions and CWAR data is only two dimensional, volume uncertainty can exist (see the Corridor Data illustration). CWAR targets and remote altitude unknown targets are considered to be in a safe passage corridor if radar coverage may pass within the corridor. Targets that leave corridors no longer carry the friendly weighting.

POINT OF INTEREST DATA

ID xxx

TYPE OF POINT x 1 GENERAL 2 BOC 3 FIRE UNIT 4 ASSET

POINT zzzzzz zzzzzz IN LAT/LONG

FUNCTION x 0 RETURN 1 DISPLAY

ORIGIN VOLUME DATA

ID xxx

TYPE OF ORIGIN x 1 FRIEND 2 HOSTILE

NUMBER OF POINTS x IN LAT/LONG

POINT 1 zzzzzz zzzzzz POINT 4 zzzzzz zzzzzz

POINT 2 zzzzzz zzzzzz POINT 5 zzzzzz zzzzzz

POINT 3 zzzzzz zzzzzz POINT 6 zzzzzz zzzzzz

FUNCTION x 0 RETURN 1 DISPLAY

LINE DATA

ID xxx
TYPE OF LINE x 1 POL-BOUND 2 FEBA 3 FSCL
NUMBER OF POINTS x IN LAT/LONG
POINT 1 zzzzzz zzzzzz
POINT 2 zzzzzz zzzzzz
POINT 3 zzzzzz zzzzzz
POINT 4 zzzzzz zzzzzz
FUNCTION x 0 RETURN 1 DISPLAY

VOLUMES FUNCTIONS

SOURCE NUMBER xx DESTINATION NUMBER xx
SET: CURRENT TACTICAL SET x NON-CURRENT SET x

VOL:								
1 xxx	2 xxx	3 xxx	4 xxx	25 xxx	26 xxx	27 xxx	28 xxx
5 xxx	6 xxx	7 xxx	8 xxx	29 xxx	30 xxx	31 xxx	32 xxx
9 xxx	10 xxx	11 xxx	12 xxx	33 xxx	34 xxx	35 xxx	36 xxx
13 xxx	14 xxx	15 xxx	16 xxx	37 xxx	38 xxx	39 xxx	40 xxx
17 xxx	18 xxx	19 xxx	20 xxx	41 xxx	42 xxx	43 xxx	44 xxx
21 xxx	22 xxx	23 xxx	24 xxx	45 xxx	46 xxx	47 xxx	48 xxx

FUNCTION x 0 RETURN 1 DATA 2 DEL 3 MOVE 4 SELECT

VOLUME DATA

ID xxx STATUS x 0 INACTIVE 1 ACTIVE
ALTITUDE LIMITS (MSL) UPPER KM LOWER XXX KM
TYPE x 1 WCV 2 PROH 3 REST
NUMBER OF POINTS x IN LAT/LONG
POINT 1 zzzzzz zzzzzz POINT 4 zzzzzz zzzzzzz
POINT 2 zzzzzz zzzzzz POINT 5 zzzzzz zzzzzzz
POINT 3 zzzzzz zzzzzz POINT 6 zzzzzz zzzzzzz
WCV STATUS x 1 FREE 2 TIGHT 3 HOLD
FUNCTION x 0 RETURN 1 DISPLAY 2 CORR

CORRIDOR DATA

ID xxx
STATUS x 0 INACTIVE 1 ACTIVE
ALTITUDE LIMITS (MSL) UPPER KM LOWER XXX KM
CORRIDOR SET TAG x
START POINT zzzzzz zzzzzzz IN LAT/LONG
END POINT zzzzzz zzzzzz
DIRECTION x 1 UNIDIRECTIONAL 2 BIDIRECTIONAL
WIDTH xx KM
FUNCTION x 0 RETURN 1 DISPLAY 2 CORR 3 REVERSE

The IOS module provides a capability to store corridor and volume data for a large geographic area and to provide IOT scenarios to complement the 25 scenarios stored in the computer (see the following illustration). The IOS can store up to 16 groups of 24 volumes each in addition to 25 IOT scenarios. The TO can only access the noncurrent volume set to transfer volume data from the IOS to the computer. Once transferred, normal procedures are used for the transfer to the active set. The submenus for tactical volumes and IOT scenarios are reached through these menus.

IOS FUNCTIONS AND SUBMENUS

IOS FUNCTIONS — IOS INDENTIFIER aaaaaaaaaaaaaaaaaaa
SOURCE NUMBER xx — DESTINATION NUMBER xx
SET: IOS GROUP xx — NON-CURRENT TACTICAL SET

VOL:							
1 xxx	2 xxx	3 xxx	4 xxx	25 xxx	26 xxx	27 xxx	28 xxx
5 xxx	6 xxx	7 xxx	8 xxx	29 xxx	30 xxx	31 xxx	32 xxx
9 xxx	10 xxx	11 xxx	12 xxx	33 xxx	34 xxx	35 xxx	36 xxx
13 xxx	14 xxx	15 xxx	16 xxx	37 xxx	38 xxx	39 xxx	40 xxx
17 xxx	18 xxx	19 xxx	20 xxx	41 xxx	42 xxx	43 xxx	44 xxx
21 xxx	22 xxx	23 xxx	24 xxx	45 xxx	46 xxx	47 xxx	48 xxx

FUNCTION x 0 RETURN 1 DATA 2 ALL 3 MOVE 4 GROUP 5 INDEX

UNCLASSIFIED

IOS INDEX 1 OF 3 — TACTICAL VOLUMES

GROUP	
	1 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	2 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	3 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	4 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	5 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	6 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	7 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	8 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa

FUNCTION x 0 RETURN 1 NEXT

UNCLASSIFIED

IOS INDEX 2 OF 3 — TACTICAL VOLUMES

GROUP	
	9 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	10 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	11 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	12 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	13 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	14 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	15 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
	16 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa

FUNCTION x 0 RETURN 1 NEXT

UNCLASSIFIED

IOS INDEX 3 OF 3 — IOT SCENARIO NUMBERS

1 xxxx	6 xxxx	11 xxxx	16 xxxx	21 xxxx	26 xxxx
2 xxxx	7 xxxx	12 xxxx	17 xxxx	22 xxxx	27 xxxx
3 xxxx	8 xxxx	13 xxxx	18 xxxx	23 xxxx	28 xxxx
4 xxxx	9 xxxx	14 xxxx	19 xxxx	24 xxxx	29 xxxx
5 xxxx	10 xxxx	15 xxxx	20 xxxx	25 xxxx	30 xxxx

FUNCTION x 0 RETURN 1 NEXT

UNCLASSIFIED

The HPI/LAUNCHER menu provides control of parameters for the HIPIR and launchers, as shown in the illustration below.

The minimum launcher elevation angle is the minimum value allowed for launcher elevation during a firing due to terrain or site restrictions. Firing cutouts, input at the launcher, provide additional restrictions for launcher elevations allowable for firing at specific azimuths.

The HIPIR cyclic EMCON is used when the threat of an ARM launch is highly probable and the use of sector scan is desired. It reduces the amount of radiation, and also the probability of detecting a target, to increase site survival when sector scan is activated.

The launcher model enable is used when the system is in SAFE to simulate up to six real launchers and provide simulated missile availability (three per launcher). This capability allows the system, when tracking live targets, to recommend engagements and fire simulated missiles, thereby enhancing operator training. The system does not provide recommendations, nor allow missile firings, without available missiles. The "hot" missile count is reported on ATDL, and the FDC will consider the AFU out of action when it is at zero.

The silent fire mode enable is used only in the TEST mode for the level 2 ISC launch sequence test to validate specific launcher features. It has no impact on the silent firing capability of the system when tracking a target with TAS.

CWAR SECTORS provides the capability of inputting the system primary sector of interest (PSOI). The blanking sectors are used to inhibit false alarms occurring in specific azimuth regions (blanking sectors) from being processed, at the cost of also inhibiting any real targets occurring in this same azimuth region. Targets inside the PSOI are rank ordered higher than those outside. However, all self-defense range targets within 360 degrees around the site are prioritized regardless of in or out of sector. The capability to inhibit benign and jamming targets within a blanking sector exists. This causes the local and ATDL reporting of any jammer within the suppressed sector to be inhibited. However, benign targets continue to be detected and reported. Up to four jam suppression sectors may be designated.

Although the capability to inhibit benign tracks in the same manner as jammers is provided, it is not recommended for use.

The CWAR Sectors menu illustration on page A-20 also provides the capability to inhibit helicopter track processing in specific azimuth sectors and to remotely reset the CWAR temporal CFAR map (helicopter detection threshold).

A false helicopter symbol from a rotating device which cycles on and off (such as an air conditioner) cannot be eliminated by resetting the temporal CFAR map. For this purpose, up to four helicopter blanking sectors are provided. These blanking sectors function in the same manner as the jammer blanking sectors described above. True helicopters as well as false helicopters in this sector will also be suppressed.

Three sets of adjustable ID weight sets are available for use by the automatic target recognition algorithm. Weights are set for corridors; prohibited

HPI/LAUNCHER DATA

MINIMUM LAUNCH ELEVATION	xxxx	MILS	
HPI CYCLIC EMCON	x	0 NO	1 YES
LAUNCHER MODEL ENABLE	x	0 NO	1 YES
(AVAILABLE ONLY IN SAFE MODE)			
SILENT FIRING MODE ENABLE	x	0 NO	1 YES
(AVAILABLE ONLY IN TEST MODE)			
HPIA FREQUENCY	xxxx	IN HZ	
HPIB FREQUENCY	xxxx	IN HZ	

UNCLASSIFIED

volumes (PVs); restricted volumes (RVs) IFF Mode 1, 2, 3A, and 4 responses; and MSV for both local and remote tracks. Hawk Block 3 thresholds are half the values of the Block 4 and Patriot thresholds, so the ID weights must be halved as shown in the table below.

Currently Hawk cannot enter volumes with multiple attributes. If a PV needs both prohibited and restricted attributes, such as Patriot uses, then that volume of space must be entered as both a PV and an RV. That way that airspace will be weighted in the same manner for Hawk as it is for Patriot.

Because Hawk Block 3 does not process overlapping volumes, the prohibited volume weight recommended for Hawk is the total of the overlapping volumes, divided by two (remember that Block 3 has half the threshold of Block 4 and Patriot). When operating with Hawk Phase III, Block 4, the same weights may be used as the Patriot weight set 3.

CWAR SECTORS

BLANKING TYPE x	START	1 BENIGN STOP	2 JAMMER (AZ IN MILS)	3 BOTH START	4 NONE STOP
PRIMARY SECTOR	xxxx	xxxx			
BLANKING SECT 1	xxxx	xxxx	HELI SECT 1	xxxx	xxxx
BLANKING SECT 2	xxxx	xxxx	HELI SECT 2	xxxx	xxxx
BLANKING SECT 3	xxxx	xxxx	HELI SECT 3	xxxx	xxxx
BLANKING SECT 4	xxxx	xxxx	HELI SECT 4	xxxx	xxxx
RESET TEMPORAL CFAR MAP			0 NO 1	YES	
CWAR SHIM	xxxxxx				

ID WEIGHT FUNCTIONS AND ID WEIGHT DATA

ID WEIGHT FUNCTIONS

SET NUMBER x (1, 2, OR 3)

CURRENT SET NUMBER x

FUNCTION x 0 RETURN 1 DATA 2 SELECT

UNCLASSIFIED

ID WEIGHT DATA

SET NUMBER x

	CORR	PROH	REST	IFF-1	IFF-2	IFF-3	IFF-4	VEL
LOCAL	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
REMOTE	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx

UNCLASSIFIED

The SELF-DEFENSE menu (see the illustration below) contains the threat order number (TON) threshold, the range, the altitude, and the residual weapons control status.

Self-defense firings take precedence over any other engagement. An unknown or hostile target is classified as a self-defense threat if it satisfies all of the following criteria:

- Detected by CWAR or below a specified altitude.
- Within a close range initialized by the TO.
- Approaching fire unit
- Low-threat order number.

This menu also contains the residual WCS. This is the airspace not contained in any WCV. The status of this volume must be defined to ensure that all targets are processed against a consistent set of criteria.

The DISPLAY OPTIONS menu illustration below provides the option of placing the auxiliary readout (ARO) display at one of two different locations on the screen and also provides the option of a GEOREF grid or no grid display.

Tactical Display and Engagement Control Console

Several improvements have been made to the TDECC. The most significant improvement is in the capability to display air control measure symbology and mapping symbology on the TCO panel (see the following two display diagrams on page A-22). The operator enters the data for the displays into the data base by means of tabular entries. However, the need still exists for planners to ensure that correct data is provided to AFP personnel making the tabular entries. In addition, the RO panel has been changed to improve the display of VTG and target data on a single display (see the RO Display illustration on page A-23).

A new microprocessor has been added with an expanded memory. An improved TDECC display provides selectable range expansion of the PPI presentation. New displays provide critical tactical information such as maps, weapons control volumes, and alphanumeric target and engagement data.

The new multifunction display replaces the RO's A-scope. It provides a simultaneous display of HIPIR target data, HIPIR modes, and VTG video from the optical tracking sensor. Each of the five categories of display occupies a different area on the display scope.

SELF-DEFENSE CRITERIA

THREAT ORDER NUMBER THRESHOLD xx

RANGE xxxx KM

ALTITUDE xxxx KM

RESIDUAL WEAPON

CONTROL VOLUME x 1 FREE 2 TIGHT 3 HOLD

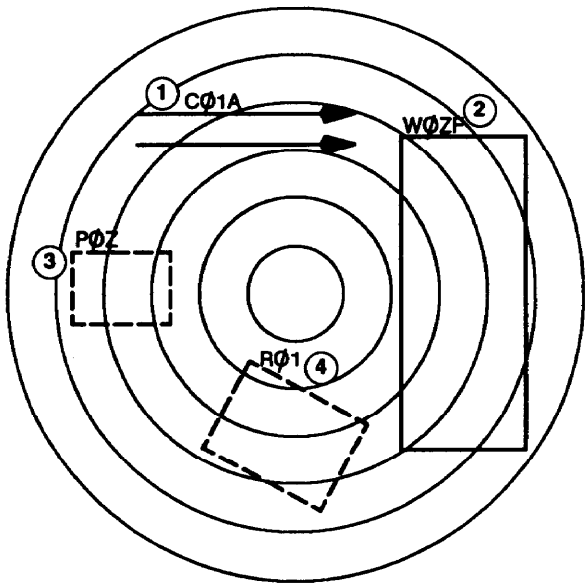
DISPLAY OPTIONS

ARO POSITION X 1 SOUTH 2 NORTH

MAP GRID X 1 GEOREF 2 NONE

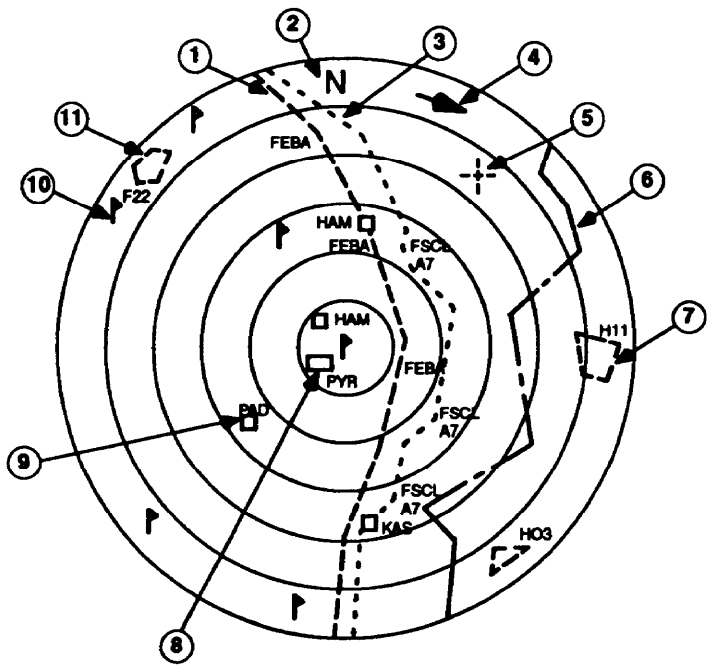
UNCLASSIFIED

TCO AIR CONTROL MEASURE SYMBOLOGY DISPLAY



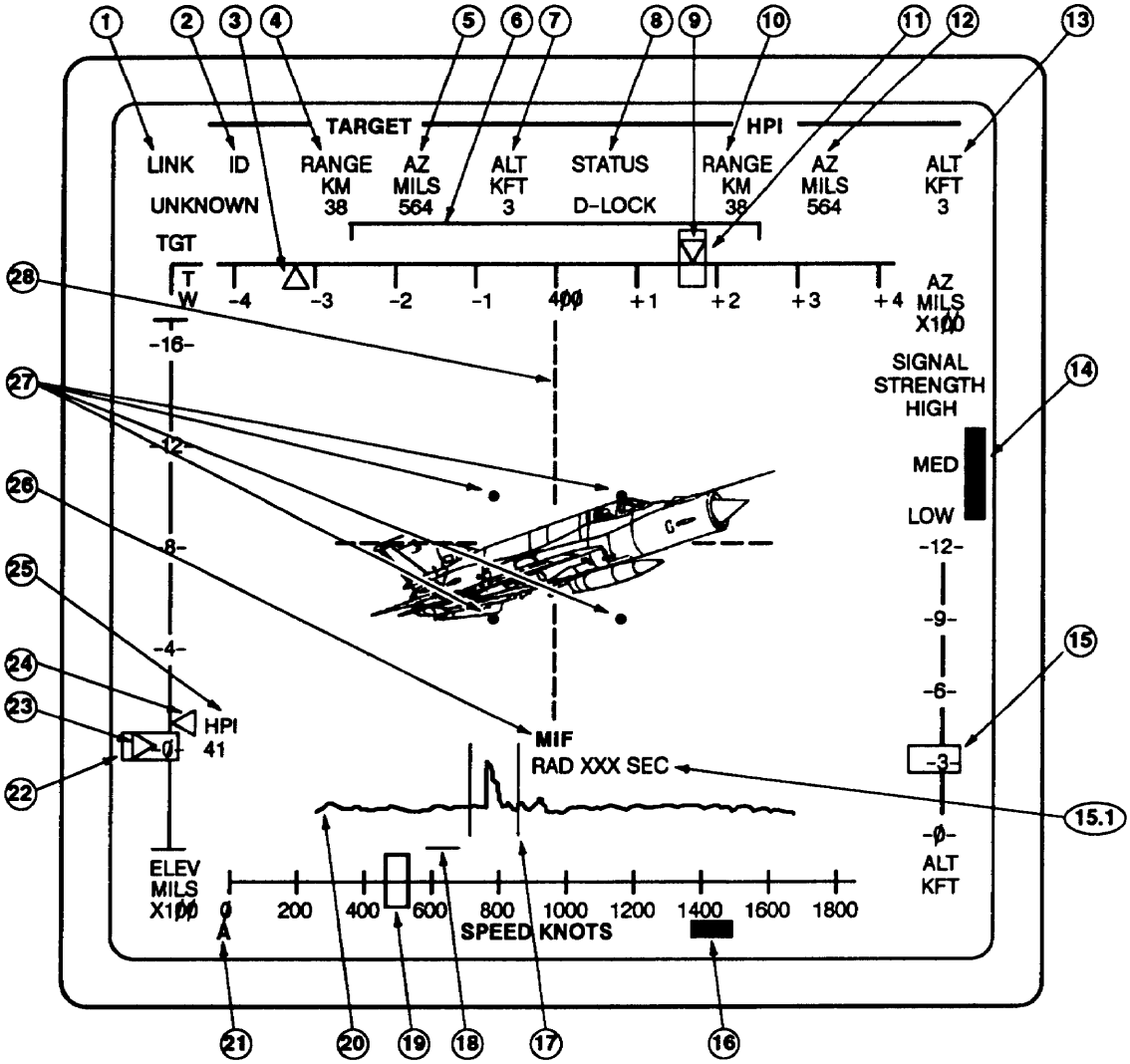
Legend:
1. Safe passage corridor
2. Weapons control volume
3. Prohibited volume
4. Restricted volume

TCO MAPPING SYMBOLOGY DISPLAY



Legend:
1. FEBA
2. N-zero mils
3. FSCL
4. ATDL pointer
5. Hook symbol
6. Political boundary
7. Hostile origin
8. Defended asset
9. General point
10. Fire unit
11. Friendly origin

RO DISPLAY



Legend:

1. Link status readout
2. TARGET ID readout
3. Azimuth TW pointer
4. TARGET RANGE readout
5. TARGET AZ readout
6. Azimuth search bar
7. TARGET ALT readout
8. HPI STATUS readout
9. TGT azimuth pointer
10. HPI RANGE readout
11. HPI azimuth indicator
12. HPI AZ readout
13. HPI ALT readout
14. SIGNAL STRENGTH indicator
15. ALT indicator
15.1 RAD or SIL indicator
16. Auto track indicator (VTG)
17. HIPIR lock indicators
18. Manual speed cursor
19. Speed indicator
20. Spectrum analyzer/power map display
21. Approach/recede indicator
22. HIPIR elevation indicator
23. TGT elevation pointer
24. Elevation TW pointer
25. HPI elevation readout
26. MIF (missile-in-flight) indicator
27. Tracker gate markers (VTG)
28. HIPIR LOS cross

Note: All target data is hypothetical and is shown for illustration purposes only. VTG presentation is disproportional in size to target range data.

The Hawk unit will be operating against a potentially target dense ECM environment in which local acquisition radar target detection ranges and available reaction time may be greatly reduced. To reduce the operator burden in this environment, the display range is selectable between 120, 80, and 40 kilometers. This allows increased resolution within the region of critical interest to the fire unit in a typical wartime scenario.

Fire unit alignment to a common reference point is critical to the successful engagement of hostile targets, especially remote tracks. It is a local function performed during site emplacement, then rechecked periodically. Alignment may be accomplished in EMCON silent. The corrected azimuth to align all elements of the fire unit is entered into the PCP ADP and into the radar microcomputers. In addition, radar and launcher limit values, including HIPIR minimum elevation box search and site altitude, are entered into the HIPIR. When possible, PADS or GPS should be used for site location and north reference. The following alerts may occur in the ARO alert line under the given situations:

• ENGAGE HELICOPTER VIA MANUAL ASSIGN-a response to an attempt to assign a CWAR helicopter using ENGAGE OTHER. Helicopters should be assigned using MANUAL ASSIGN.

• ACTION MAY DESTROY MISSILE IN FLIGHT--only used when missiles will be destroyed upon the next action the TCO would take based upon the computer recommendation. Typically, this alert is shown if a LASHE preemption engagement is recommended and a missile is in flight in an ongoing pencil beam engagement. At this point, the TCO still has the option to refuse or do nothing about the current recommendation, thus preserving the missiles in flight. If time to intercept for the pencil beam engagement is long, the TCO may select to allow the missile to be destroyed in favor of engaging the high–threat LASHE targets.

• POSSIBLE DEGRADED MISSILE PERFORMANCE--the HIPIR is tracking a target at less than the minimum launcher pointing angle and although the FIRE light is illuminated the probability of missile seeker lock is degraded. The TCO should consider this if the missile count is low or the terrain forces the target to increase altitude as it approaches.

• TRACK NOT WIDE BEAM ENGAGEMENT--the TCO has hooked a target and pressed WIDE BEAM ENGAGE OTHER and the hooked target is not within LASHE range or current antenna coverage.

• ENGAGING A FRIEND PROTECTED TARGET—there is a friendly aircraft in the vicinity of the engaged target. The TCO should wait until the friend has cleared the path of the hostile aircraft before firing.

• NO RADAR DETECTING ASSIGNED TARGET—the acquisition source is no longer tracking the target. The TCO should see if there are other targets in the immediate vicinity and redirect the search if there are.

• WIDE BEAM FAILURE IN EFFECT--the HIPIR cannot support the LASHE engagements.

There are several menus available through the ARO to provide additional target information to the TCO. The track data menu contains the track data and ID data menus (see the following two illustrations).

Threat assessment is an interactive process between the system and the TCO (see Threat Assessment on Situation Display illustration). The purpose of threat ordering, which aids threat assessment, is to prioritize the sequence in which targets are engaged to optimize the number of hostile targets killed.

There are separate threat order number lists for different targets such as ABT and LASHE. A high-threat list is displayed on the ARO by operator selection. it provides information on the top 10 ordered threats and their current posture and ID. Helicopter targets are also threat ordered, but at a very low-threat value due to the absence of range and range-rate data. Thus, these targets do not appear as high threats and are not recommended by the computer for engagement. TBM targets are not evaluated for engagement until after apogee.

Collective Protection Equipment

The collective protection equipment (CPE) provides protection for both PCP personnel and equipment during operations in a nuclear, biological, and chemical warfare environment. Personnel are protected by working in a controlled air supply. Contaminants from the outside air are removed by a gas and particulate filter unit. After being filtered, the outside air under positive pressure is fed through the air conditioner into the shelter. A protective entrance enclosure which is erected around the PCP shelter door provides additional protection when it is necessary to enter or exit the PCP. An M43 detector unit and an M42 alarm unit provide a warning to PCP personnel

TRACK DATA

ID DATA

LTN: nnn RANGE: nnn KM AZIMUTH: nnnn MILS
ATN: xxooo IOT TN: nnn

IFF: nx xxxxxxxxxxxxxxxxxxxxxxxx EST NEXT CHAL: xx SEC

ID: xxx - CON
OPERATOR ID: xxx <====
AUTO ID: xxx
REMOTE ID: xxx
ID COMMANDED: x

x : CORRIDOR STATUS
x : PROHIBITED VOLUME
x : RESTRICTED VOLUME
x : MAX SAFE VEL EXCEEDED
x : JAMMER HISTORY

TCO TRACK DATA/ID DATA TABULAR DISPLAYS

TRACK DATA

LTN: nnn ID: xxx SOURCE: xxxxx
ATN: xxooo REMOTE ID: xxx RAID SIZE: xxxx
POSITION: xxxxxx xxxxxxx TON: nnn

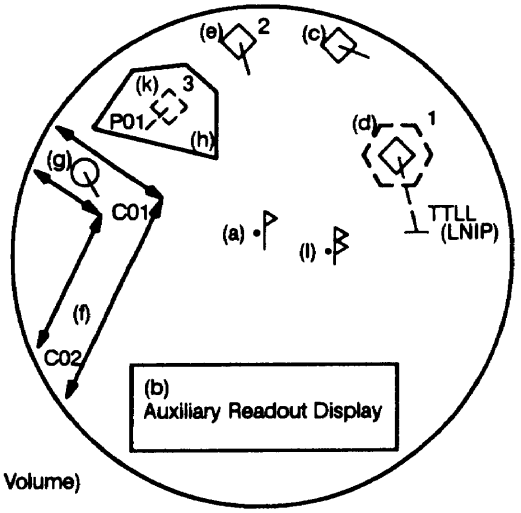
ENGAGE STATUS: xxxxxxx
IFF MODE: nx xxxxxxxxxxxxxxxxxxxxxxxx

RANGE: nnn KM HEADING: nnnn MILS AZIMUTH: nnnn MILS
RANGE RATE: nnnn MPS SPEED: nnnn MPS ALTITUDE: nnnn KM

FOLLOWER SOURCE 1: xxxxx 2: xxxxx 3: xxxxx 4: xxxxx

THREAT ASSESSMENT ON SITUATION DISPLAY

Legend:
(a) Hawk Site
(b) Auxiliary Readout Display (ARO)
(c) Hostile Target (Low Threat Receding) With:
Speed/Heading Vector
(d) Hostile Target (Most Threatening) (Steady) With:
To-Be-Engaged Modifier (Symbol Blinking)
Time to Last Launch (TTLL)
Launch Now Intercept Point (LNIP)
(e) Hostile Target (Second Most Threatening) With:
Speed/Heading Vector
(f) Safe Passage Corridor (Bidirectional)
(g) Friend Target (In Safe Passage Corridor)
(h) Weapons Control Volume
(k) Hostile Target (Not Eligible for Engagement) (in Weapons Control Volume)
(l) Battalion



that chemically contaminated air is present. This equipment (see the following illustration) improves NBC defense measures for the platoon.

Integral Operator Trainer

The integral operator trainer (IOT), can simulate tactical situations for specific training of the RO, TCO, or both, using scripted scenarios. In addition, the AFP can design its own scenarios, but software contains 25 preprogrammed training scenarios. While using the IOT, the instructor has the capability of using the site tactical maps, modifying the maps, or using scripted maps for training. If the maps are modified for training, they do not change within the data base. The instructor can also act as the FDC and can issue engagement orders as well as preemptive commands.

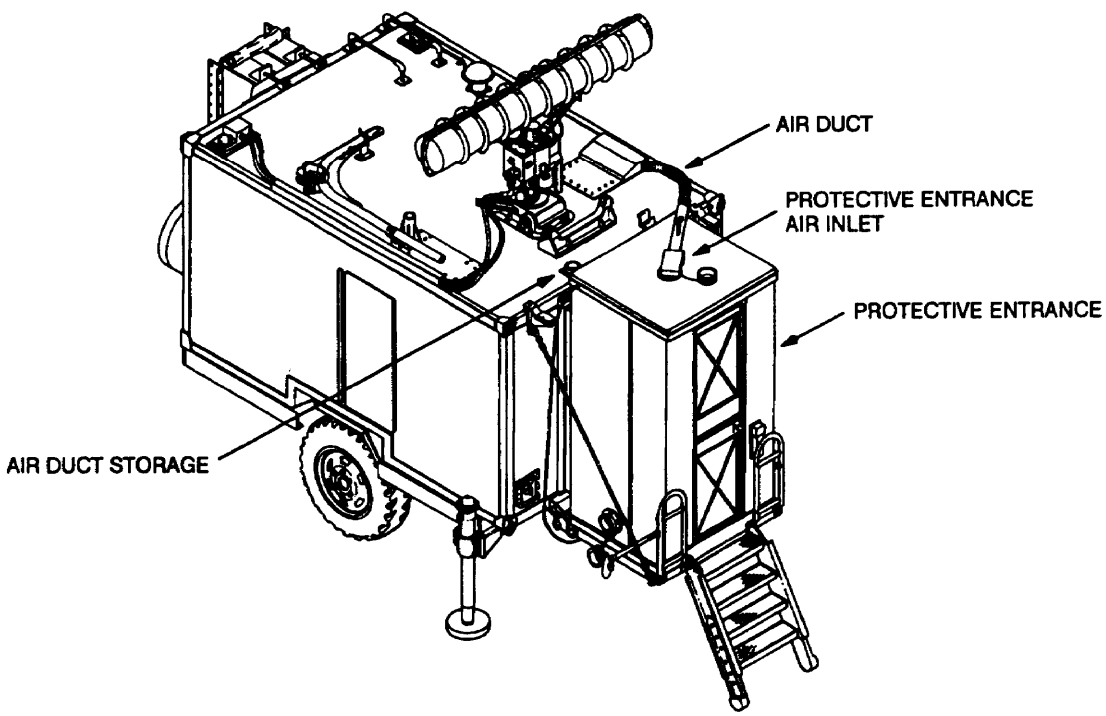
The IOT generates simulated targets of various aircraft types and performs complete system simulation. A generator module is used during IOT operations. Under IOT software control, the HIPIR doppler generator module outputs a complex audio signal simulating the HIPIR tracking radar doppler return. The detection ranges are realistic due to a function of target size. This module and the IOT program simulate the track and audio effects of the following tactical and ECM targets:

- Jet aircraft.
- Helicopters.
- Formation aircraft.
- Horizontal and vertical weaves.
- Wild Weasel attacks.
- Air-launched missiles.
- ECM aircraft (SOJs and SSJs).

The IOT contains simulation models of the CWAR, HIPIR, PAR, IFF, launchers, and missiles. The IOT operates with either the ATDL command links or with the tactical operations center role performed by a trainer using the RCU to provide realtime inputs.

Remote control unit. The remote control unit (RCU) is a hand-held interactive terminal used as an input-output device. It allows a rapid transition from training to tactical operations.

PCP CPE PHASE III



Pulse acquisition radar The PAR simulation model consists of the following functions:

- Initialization.
- Status monitor.
- Signal strength model.
- BCP I/O function.
- Digital signal processor/PAR module.
- Radar mode control.
- Transmitter frequency.
- RCU mode control.

CWAR. The CWAR simulation model consists of the following functions:

- Initialization.
- Status monitor.
- Radar mode control.
- Report mapping.
- Track while scanning.
- PCP I/O processing.

HIPIR. The HIPIR simulation model includes functional modes of—

- Silent and ready.
- Pencil beam assignment.
- Manual assign.
- Sector scan.
- LASHE.
- ECCM controls and displays.

IOT. The IOT does not allow VTG operations.

ATDL. The ATDL simulation trains the TO in engagement commands, remote track symbology and engagement, ID conflict resolution, ECCM, and communications procedures with higher headquarters. For the IOT to operate, the system must be tactically emplaced, oriented, aligned, and initialized. The Block 3 scenarios do not function properly with the Block 4 system.

HAWK SYSTEM LIMITATIONS

Hawk units have certain limitations. Units must be aware of these limitations and must plan operations to reduce their impact on mission accomplishment. These limitations include cabling, line-of-sight requirements, signatures, masking terrain, equipment preparation time, and launcher reload.

Cable Length

The Hawk system uses a large number of power and data cables. The Phase II assault fire platoon uses six power and eight data cables along with communications antenna cables. This extensive cabling limits dispersion of items of equipment (see the Cable Layout illustration on page A-28). An overall comparison of Phases II and III is made in the Hawk Phase II and Phase III Comparison illustration on page A-29.

Line-of-Sight Requirement

Line of sight is desired between radars, HIPIR, and launchers; between the LSCB and launchers; and between the fire unit and C2 facility multichannel radio antennas. Alternate procedures and equipment are available if line of sight is not possible, but system effectiveness will be reduced.

Hawk Signatures

The Hawk system produces several significant signatures:

- Smoke from generators and missile backblast.
- Visual signatures from deployed Hawk equipment, support equipment, and trails used for entry and exit to site location.
- Infrared and acoustic signatures from Hawk equipment, especially generators.
- Electronic signatures from Hawk and communications equipment.

Radar Operations

Radar capabilities can be reduced by—

- Mutual masking when radars are too close together (less than 31 meters).
- Terrain masking when topographic features create areas in which aircraft can fly undetected.

Terrain

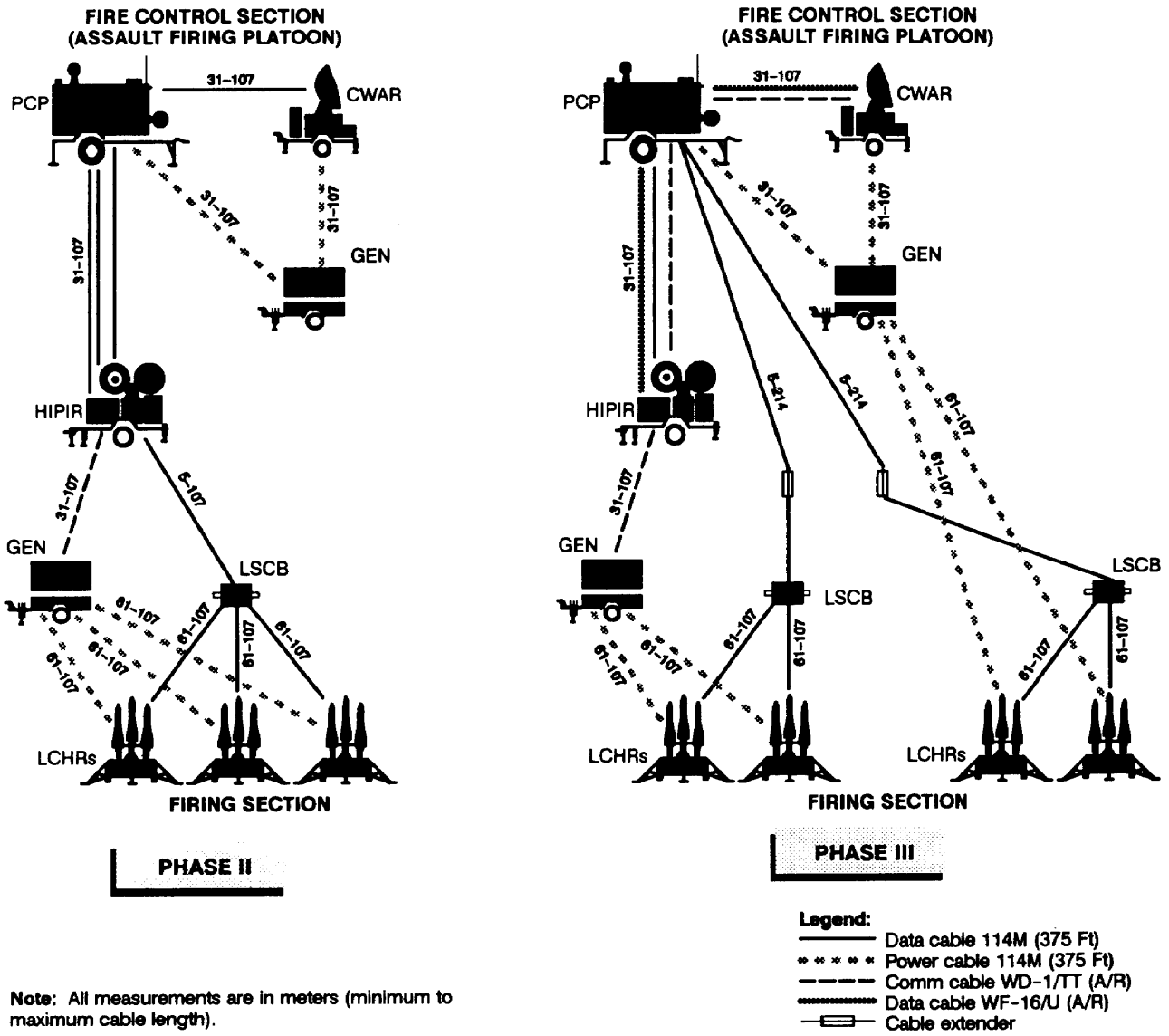
Terrain limits Hawk deployment in the following ways:

- Terrain slope and firmness. Equipment location must have a 10-degree slope or less, have adequate drainage, and be firm enough to support equipment.
- Access. Site support operations require access roads and internal roads.
- Size of area. Phase II minimum site area is 130 by 160 meters. Phase III minimum site area is 120 by 375 meters.

Equipment Preparation Time

Hawk is a mobile system that normally relocates for survivability as the tactical situation dictates. However, each time the unit moves, the system is out of action. Out-of-action time is the sum of the times

CABLE LAYOUT



Note: All measurements are in meters (minimum to maximum cable length).

needed for preparing the platoon to travel, the actual road movement, and the system emplacement. The preparation for travel (march order) time should be daytime 60 minutes and nightime 90 minutes and the system emplacement time is daytime 45 minutes and nightime 90 minutes. The actual travel time will, of course, depend on speed and distance traveled. The effect on the overall defense of moving a Hawk battery can be reduced by moving the battery in platoon echelon. Using this method, one AFP continues its AD mission while the other AFP moves. The amount of time a movement takes is highly dependent on time of day, road clearance, weather conditions, crew training, and the enemy situation. MOPP levels will also degrade movement times. Note Leaders should be aware of the degradation of performance as soldiers become fatigued. Crew rotation should be included in the planning proms. Leaders should also plan for the effects of stress on crew performance. See FMs 22-9 and 26-2 for further guidance on stress and performance.

HAWK PHASE II AND PHASE III COMPARISON

EQUIPMENT		SYSTEM	
		PHASE II	PHASE III
SYSTEM CAPABILITIES	C^3		INCREASED DATA TRANSFER SPEED
	PAR	USED	MAY BE USED WITH PCP
	ROR, ICC, AND BCC	USED	ELIMINATED
	TEST EQUIPMENT	USED	REDUCED, IMPROVED BITE
	LAUNCHER	3 PER AFP	MAY USE 6 WITH AFP
	TRAINING	SIMULATION AN/TPQ-29	ORGANIC IOT IN PCP
	DATA PROCESSING	ICC, PCP, AND MULTIPLE BRUs	MICROCOMPUTER
	TARGET DISPLAY	MULTIPLE TARGETS	MULTIPLE TARGET DISCRIMINATION AND ACCURATE RECEDE TARGET DATA
	MAPPING SYMBOLOGY	TEMPLATE OR OVERLAY	DIGITAL DISPLAY
	AIR CONTROL SYMBOLOGY	TEMPLATE OR OVERLAY	DIGITAL DISPLAY
	SELF-DEFENSE	FIDOC	FIDOC PLUS LASHE
PCP	MULTIPLE ENGAGEMENTS	FIDOC	FIDOC PLUS LASHE
	RO TARGET DATA DISPLAY	VTG, A-SCOPE, MULTIPLE INDICATORS	COMBINED VTG AND DIGITAL TARGET DATA
	ECCM	GOOD	IMPROVED BY ECM WEDGE
	NBC DEFENSE	NON-ORGANIC	M-14 CPE
	DATA PROCESSING	MULTIPLE BRUs	2 MICROCOMPUTERS
	TARGET DETECTION	2 SCANS FOR COMPLETE TARGET DATA	1 SCAN, COMPLETE TARGET DATA
CWAR			MULTIPLE TARGET DETECTION AND DISCRIMINATION
	ECCM	GOOD	IMPROVED
	DATA PROCESSING	MULTIPLE BRUs	MICROCOMPUTER
	TARGET INTERCEPT DATA	ANALOG	DIGITAL
	MULTIPLE TARGET	GOOD	TRACK, DISCRIMINATE, COMMAND MISSILE TO NONKILLED TARGET, WIDE BEAM
HIPIR			
	ECCM	GOOD	IMPROVED
	BITE	GOOD	IMPROVED
	DATA PROCESSING	MULTIPLE BRUs	MICROCOMPUTER

Launcher Reload Time

The missile movement crew (composed of firing section personnel) reloads the launchers with missiles from the missile storage area using the Hawk loader-transporter. Launcher reload time depends on crew proficiency, weather, terrain, and light conditions. A crew should be able to reload a launcher as quickly as possible in existing conditions, per ARTEP 44-497-30-MTP.

HAWK-PATRIOT TASK FORCE

In a task force organization, new capabilities enhance the ICC's capacity to control Hawk AFPs. This section will discuss in detail how to optimize the system when operating as a task force or under a master battalion configuration.

The basic concept of the improvements is to enhance Hawk AFP control under an ICC by automating as much as possible the Hawk tasks of identification, threat assessment, and engagements. The ICC software accommodates the Hawk Phase III improvements of identification, provides increased update rates on specific commands and track assignments, and improves HIPIR search patterns. This provides subordinate Hawk units with the opportunity to reduce reaction time and increase the probability of HIPIR target lock. Major ICC PDB–3 improvements are as follows:

- ICC can control increased number of FUs.
- Improved track management tailored to Hawk sensors.
- Automated fire distribution.
- Improved ID IFF coordination conflict resolution.

NUMBER OF FIRE UNITS

The size of the task force is defined as a function of METT–T and overall system capability. PDB-3 allows a Patriot ICC to control up to 12 subordinate FUs. The combination of FUs that can be controlled is a function of the type of unit. Any Combination of Patriot and Hawk may be assigned to an ICC as long as no more than 6 Patriot FUs are assigned. If all the units are Hawk, then 12 maybe assigned. The ICC can accommodate either Hawk AFPs or a battery configuration with communications directly to the ICC.

IMPROVED TRACK MANAGEMENT

This is provided by the PDB-3 ICC software through Patriot acquisition support to Hawk AFPs which have no local data. Support of the Phase III enhanced HIPIR three-dimensional search capability will be provided on tracks for which the ICC has reporting responsibility. The ICC will increase the track data update rate to Hawk in support of weapons assigned, cover, or engage commands. If Hawk loses lock or is coasting, the ICC will take over reporting responsibility and increase the track data update rate to the Hawk unit, providing a higher probability of the HIPIR reacquiring the target.

AUTOMATIC FIRE DISTRIBUTION

In terms of fire distribution, the Hawk units are integrated into the ICCs to be engaged queue (TBEQ—the recommended target list and FU pairings). Launch now intercept points (LNIPs) are computed for Hawk AFPs, and these AFPs are also considered in the asset defense logic.

An LNIP is computed for each track and a validity check is made for altitude, range, HIPIR doppler cutoff velocity, and missile gimbal limits. If the LNIP is valid, then the Hawk unit is eligible for FU selection. If the LNIP is invalid, the AFP is not considered a candidate until the next reassessment.

IMPROVED ID/IFF COORDINATION

The identification processing has been improved. Phase III Hawk has an automated identification scheme that closely parallels that of the Patriot system. The following paragraphs will provide a detailed explanation of this system and some of the cautions and steps necessary to ensure efficient operations (see the Static Symbology illustration).

An ATDL-1 identity can be accepted automatically at the ICC if the Patriot system is in the automatic ID mode. If the system is in the manual ID mode, the ICC operator will be required to accept or reject all identity changes. If a Patriot track correlates with the ATDL-1 track, the ATDL-1 identity will be used until the Patriot auto-ID system determines a more definite identity. For example, if Hawk sends up an identity of unknown, that will be the target ID. If the track correlates with an unknown Patriot track, the target ID will remain unknown. If the Patriot ID becomes friend, the target ID will automatically change if the system is in the AUTO ID mode. If the system is in the manual ID mode, the ICC operator will be alerted.

STATIC SYMBOLOGY

FUNCTION	SYMBOL	DISPLAYED	OPERATIONAL SOFTWARE INTERACTION REQUIRED
1. GEOREF GRID MARKERS	+AAAA	(a)	NO
2. POLITICAL BOUNDARY	—	4	NO
3. FEBA OR FIRE SUPPORT COORDINATION LINE (FSCL)	—	4	NO
4. RANGE RINGS	—	6[b]	NO
5. GENERAL POINT			
6. FIRE UNIT OR OTHER COMMAND POSTS		20[c]	YES[d]
7. BATTALION			
8. SAFE PASSAGE CORRIDORS			
9. WEAPONS CONTROL VOLUMES		24[e]	YES
10. RESTRICTED VOLUME			
11. PROHIBITED VOLUME			
12. HOSTILE/FRIENDLY ORIGIN		7	NO

Legend:
(a) Grid.
(b) 20-kilometers or 10-nautical mile intervals (selectable during initialization/on-line modification).
(c) Hawk, FAAD, and Patriot.
(d) The location and site address of the battalion is automatically entered and displayed when points are selected where the ATDL link is active. The point is removed when the link is inactive.
(e) Additional entry points (up to 24) stored in auxiliary storage.

Automated conflict resolution has been incorporated in the ICC software based on a series of ID resolution tables. However, ID conflicts can still occur and may require operator intervention.

In the past, the ICC did not perform weapons control volume correlation for Hawk tracks. Hawk tracks were only checked for correlation with the ICC's residual weapons control status. With the fielding of Phase III Hawk and its ability to perform volume correlation, the PDB-3 ICC has been modified to perform weapons control status and volume correlation for Hawk tracks.

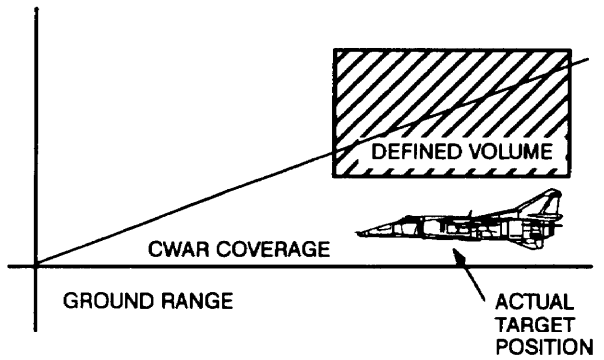
The task force operations officer must ensure that the data base in use has been provided to AFPs in the task force. This may be accomplished by making a hard copy of the Patriot data base and providing this to subordinate AFPs. Phase III Hawk AFPs must perform volume correlation on the same data base as Patriot. Unlike Patriot, the results are not sent over the data link to the ICC; ATDL-1 will not support this. With PDB-3, the ICC has the same weapons control volume correlation as Phase III Hawk. This ensures that both systems maintain the same weapons control status on a particular track.

For tracks with altitude such as a HIPIR track, the ICC correlation will use the altitude provided and perform normal volume correlation. For CWAR and PAR tracks which do not have altitude, correlation occurs if the altitude limits for the radar fall within the altitude limits of the volume. For example, if the altitude limit of the radar is 5,000 feet and the volume is from the ground to 30,000 feet, the target would correlate. However, if the lower limit of the volume is 10,000 feet, the target would not correlate since the radar upper limit in this example is below the volume (see illustration on page A-32).

For correlation with multiple volumes, the most restrictive weapons control status will apply (WEAPONS HOLD over WEAPONS TIGHT over WEAPONS FREE). If the track does not correlate with any weapons control volume, it is checked against the residual status. Since heading and speed criteria are not used in this correlation, Hawk-only targets displayed

at the ICC could carry the wrong weapons control status. For example, if the Patriot data base has a directional WEAPONS HOLD volume, Hawk-only targets processed within that volume will maintain WEAPONS HOLD regardless of the direction in which they are moving.

EXAMPLE OF TARGET ALTITUDE AMBIGUITY



SOFTWARE MASTER BATTALION

The basic concept provides the ICC the ability to function as a brigade masterbattalion C2 element. The software builds on the task force capabilities described below. The master ICC (MICC) controls subordinate ICCs (SICC), AN/TSQ-73 BOCs, and GEHOCs. The major features include--

- Interface with up to nine external battalion elements, of which five maybe subordinate battalions, one higher echelon plus three auxiliary link inputs.
- Brigadewide track management.
- Automatic fire distribution battalion engagement assignment.
- ID/IFF coordination.
- Communications improvements.
- Display enhancements.
- Initialization improvements.

The brigadewide track management function is one of the main benefits of using an MICC as a brigade control element. The MICC will establish and maintain correlation of track data from Patriot and Hawk FUs, subordinate battalions, auxiliary units, and higher echelons. This correlated air picture will be shared, within filter limits, between MICC and subordinate battalions. In general, tracks will be correlated and triangulated at the master battalion and only those tracks which are not being reported will be reported by the MICC to the subordinate battalions. The MICC will accelerate the track data update rate to subordinate ATDL-1 battalions in support of cover and engage commands when the ICC has reporting responsibility and local Patriot track data is available.

TASK FORCE SIZE

As previously mentioned, the factors of METT-T will assist in defining whether to fight as separate battalions or as a task organized force. However, the following are technical and tactical items that must be considered when addressing the advantages and disadvantages of a HIMAD task force.

The terrain and mission will be major factors in deciding whether to fight as pure battalions or to task organize. If there is no requirement for overlapping coverage between Patriot and Hawk, then pure Patriot and Hawk battalion operations may be favored. However, if there is a requirement to have Hawk operate in Patriot coverage, then task force organizing should be strongly considered. This places both weapon systems under the same automated fire direction center (FDC)--the ICC--which provides improved track correlation, target identification, threat assessment, weapons assignment, automatic engagements, and friendly protection. These enhanced functions result in more positive target identification and increase system responsiveness and survivability.

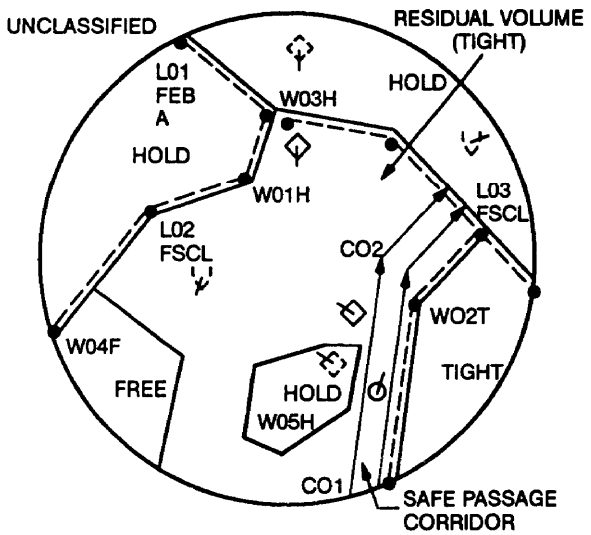
The basic philosophy of employing Patriot and Hawk has not changed. Patriot is emplaced as the base piece and augmented by Hawk. The Hawk emplacement should be 10 to 30 kilometers forward in valleys and low areas not covered by Patriot. This will assure that the Patriot air picture is provided to Hawk and that Hawk will cover the areas not covered by Patriot. Hawk can also be deployed on the flanks and rear of the Patriot FUs to protect them from aircraft attacking out of their sector. In a TBM-heavy environment, the Hawk units should be emplaced within 20 kilometers and forward of the Patriot fire unit to provide TBM protection.

HAWK AFP

Hawk AFPs will initially operate centralized to the ICC. With the introduction of Phase III Hawk, both systems have the capability of performing volume correlation in support of weapons control and passive identification (see the Weapons Control Volumes illustration). Task force operations officers must ensure that the data bases generated for the mission consider the Hawk elements assigned. Hawk now has the ability

to enter, via tabular display, the following: restricted volume, prohibited volume, safe passage corridors, safe velocity, and weapons control volumes HOLD, TIGHT, and FREE. The weights associated with each volume are initialized by the Hawk operator via the Remote Control Unit, and stored in memory.

WEAPONS CONTROL VOLUMES



Hawk Block 4 software has the same point totals necessary to achieve the same identifications as Patriot. It should be noted that the Hawk auto-identification process does not have a point total for Unknown-Assumed Friend. Hawk will repeat this ID if it has been received and accepted. Hawk will treat this track in the same manner as Patriot does—it will not be considered for automatic engagement.

The restricted volume is entered in the Patriot system as a hostile volume with a restricted attribute and entered in Hawk as a single restricted volume. The prohibited restricted volume will be entered in the Patriot system as a hostile volume with prohibited and restricted attributes, but must be entered into the Hawk system as two separate volumes. The LLTR and other corridors will be entered as single special corridors in both the Patriot and Hawk systems. The WEAPONS FREE area will be entered as a single weapons control volume in both systems.

As previously mentioned, there is no point sum for Unknown-Assumed Friend in the Hawk system. The ID resolution tables inherent in the ICC result in a like identification being provided to both systems.

Both Patriot and Hawk operators must be trained to work together to ensure that the HIMAD task force functions properly. Training and familiarization should be conducted in the following areas:

- Site surveys, emplacement, and initialization.
- ICC commands and Hawk responses.
- Terminology.
- Track management and ID correlation.
- Accuracy of data.

ICC COMMANDS AND HAWK RESPONSES

The ICC may send commands initiated by the computer or by operator action. At the Hawk AFP, it may be difficult to tell whether a command was operator or computer initiated. Patriot TDs and TDAs, used to directing the fires of Patriot batteries over data link with little or no voice direction, will find that initially they must talk to Hawk AFPs more frequently. The Air Picture Symbology, HIPIR Status illustration depicts the symbology used in the PCP.

AIR PICTURE SYMBOLOGY, HIPIR STATUS

SYMBOL NAME/DESCRIPTION	SYMBOL
HIPIR UNASSIGNED	A
HIPIR SEARCH	A
HIPIR COAST (BLINKING SYMBOL) (LOSS OF LOCK)	A
HIPIR A TRACK POSITION (LOCK-ON)	A
ACKNOWLEDGED ATDL ENGAGE COMMAND (HIPIR A)	A–E
ACKNOWLEDGED ATDL COVER COMMAND (HIPIR A)	A–C
ACKNOWLEDGED ATDL HOLD FIRE COMMAND (HIPIR A)	A–HF
ACKNOWLEDGED ATDL CEASE FIRE COMMAND (HIPIR A)	A–CF
ACKNOWLEDGED ATDL CEASE ENGAGE COMMAND (HIPIR A)	A–CE
ACKNOWLEDGED ATDL ENGAGE RIPPLE COMMAND (HIPIR A)	A–ER
LASHE SECTOR (LINES RADIATE FROM CENTER TO 40 KM)	<
QUEUED ATDL COMMAND	{

Engage

In the semiautomatic engagement mode, the Patriot ICC presents a list of targets to the TDA. This list, called the to be engaged queue (TBEQ), is in order of threat and gives a recommendation on which AFP to use. The TDA reviews the recommendations and issues ENGAGE commands to the subordinate units. This "Shoot-off-the-queue" method of engagement is the preferred way to engage. In the automatic engagement mode, the computer issues engagement commands from the same TBEQ, and the TDA can override the decisions of the computer. This method is normally used only when the number of targets available for engagement exceeds the ICC crew's capacity to handle the situation in the semiautomatic mode.

By design, the ICC will not allow an ENGAGE command to be sent to a Hawk AFP unless the target is engageable by Hawk. The target will produce an IN RANGE within a specified time. This is because emission control for Hawk HIPIR radars is extremely important. Issuing an early ENGAGE command would require unnecessary radiation by the HIPIR before the command could be executed.

In addition, the ICC will not issue an ENGAGE on a jam strobe that is not range resolved. When the Hawk HIPIR locks on a jammer or the RO uses manual range controls, the AFP will report a jam strobe to the ICC. Since the ICC will not issue an ENGAGE command, the situation must be dealt with verbally. The AFP must tell the ICC what is going on with the track and request direction. In some cases, it may be possible to standardize actions to be taken by the AFP, so that the ICC knows what is happening, thus reducing the need for talk. It is important for Hawk operators to understand what actions will produce the jam strobe at the ICC, and that such a strobe inhibits the ICC's target correlation, shared ID, and the issue of an ENGAGE command.

Cover

The COVER command can only be issued manually by hooking the target, designating the desired AFP, and sending the command. Unlike the ENGAGE command, COVER can be sent on any target, approach or recede, with one exception: it will be rejected if the target is beyond the system range.

Cease Fire

The ICC may apply a CEASE FIRE by hooking the target and pushing the switch indicator. If the HIPIR is assigned to that target a CEASE FIRE will be received at the AFP. A CEASE FIRE may also be manually or automatically applied to a target by control echelons above the ICC to which a data link exists.

During an air battle, an ICC automatically generated CEASE FIRE can occur. Without any Hawk operator action, a CEASE FIRE will be sent to the AFP whenever it does not respond within a specified time period to the ENGAGE or COVER command. The response that will inhibit the issue of the automatic CEASE FIRE is WILCO. If the AFP does not respond, the TD receives a no response alert and a CEASE FIRE is issued automatically.

Hold Fire

The ICC can send a manual or an automatic HOLD FIRE to a target in the same way as a CEASE FIRE. Every time the HIPIR reports its status to the ICC, the ICC will send a HOLD FIRE command to the AFP. If theTCO or RO sends a CANTCO or REJECT, and the HIPIR stays assigned to the target, it will appear momentarily that the HOLD FIRE was removed. However, within seconds, another HIPIR report will be sent to the ICC and the HOLD FIRE will be reissued.

The ICC sends an automatic HOLD FIRE, if the HIPIR is assigned to a track with an ID of Unknown-Assumed Friend. For Phase III AFPs, the letters AF will appear on the second page of the track data tab and the symbol U will appear as dashed, not recommended. These tracks will continue to be displayed on the Phase III Hawk high threat list, if appropriate.

HOLD FIRE will be issued automatically whenever the HIPIR is assigned to an ID friend track or if the target ID is changed while the HIPIR is tracking it. The HOLD FIRE in the last case will be issued immediately and usually before the ID change is visible and the TDECC FRIENDLY TRACK lamp is illuminated.

Cease Engage

The ICC operator can issue a CEASE ENGAGE to a specific AFP, but since this is not a command that the Patriot system uses there is no switch action for it. The TD issues the CEASE ENGAGE command using the Hawk engagement summary tab.

A CEASE ENGAGE will be issued automatically in two circumstances. First, if the HIPIR is assigned to a remote told–in track which is being dropped for lack of radar track updates. The ICC will issue the CEASE ENGAGE command to keep the AFP from continuing to search for a track on which it cannot provide Legitimate location data. If the Hawk RO has detected a track at this azimuth and location and if the HIPIR was originally assigned based on an ENGAGE or COVER command, then it is possible that the

CEASE ENGAGE is invalid. This must be coordinated verbally between the TO and the TD. Second, when the ICC has determined that the current HIPIR assignment is not as critical as another, it will issue a CEASE ENGAGE. Instead of waiting for the AFP to become free, the ICC looks for a timely response. It will automatically issue the CEASE ENGAGE command to free up the HIPIR for a new engagement. This CEASE ENGAGE for a higher priority target is observably different from the one above in that the Hawk TO will observe a queued command symbol "0" on a different target at the same time the CEASE ENGAGE is displayed.

Terminology

There are certain terms which cause confusion during task force operations. Some common examples are:

• Engagement. Hawk considers the process of assigning the HIPIR through to the termination of an assignment to be an engagement whether or not there is a missile fired. Patriot uses the term only in relation to firing a missile.

• Tracking. Patriot considers itself tracking if a track data file has been established. Hawk considers tracking a HIPIR lock on a target.

• Reboot versus reset the computer. For Patriot and Hawk FU operators, rebooting the operational program may be required, especially with a data link problem. For AN/TSQ-73 operators, rebooting is about a 10-minute process that involves complex data entry. Resetting the computer may help the AN/TSQ-73 if it experiences a program lockup.

• If a Hawk AFP takes over the reporting responsibility on a track, it retains the ID and engagement status on that track. If the ICC does not agree with the correlation, then its correlation "damage control" will try to correct the whole problem and keep any errors from being retained permanently once an error is identified.

• Accuracy of data. The track data the ICC receives from a Patriot battery is extremely accurate. Phase III Hawk takes advantage of this accuracy. The Phase III Hawk HIPIR will be assigned to a Patriot track and will be directed to a point in space versus performing a standard search. When the Phase III Hawk HIPIR is assigned, an auto assignment (rather than manual) should be made to get the benefit of faster lock-on times for the HIPIR. If the HIPIR does not lock-on quickly, and the target is not maneuvering through zero doppler or is not masked to the AFP by terrain, then system alignment may be faulty. Hawk AFPs should be sited by Patriot survey teams whenever task organized under the ICC.

APPENDIX B

Platoon Checklists

This appendix contains checklists to aid the platoon leader and his chain of command. They are general in nature and should be used as a basis for additional requirements.

PRECOMBAT CHECKLIST

The precombat inspection checklist is outlined below. Use remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR PRECOMBAT

Individual Soldier Readiness	Remarks
1. TA-50 inventory.	_____
2. Weapon cleaned and zeroed.	_____
3. Briefed on–	
a. Safety, to include hearing and RF radiation.	_____
b. Cold or heat injuries.	_____
c. Situation and mission.	_____
d. SOFA.	_____
4. LBE.	_____
a. First aid kit.	_____
b. Canteen with water.	_____
c. Ammunition pouches and magazines.	_____
d. M258A1/A2 kit.	_____
e. Protective mask with combat filters.	_____
5. ID card, ID tags, and operator's ID card (OF 346).	_____
6. MOPP gear available.	_____
7. Personal military clothing and hygiene items (A and B bags).	_____

CONTENTS

EQUIPMENT READINESS CHECKLIST

The equipment readiness checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR EQUIPMENT

	Remarks
1. Publications for vehicles and equipment.	
2. Logbooks, dispatches, and load plans.	
3. Prime movers.	
a. PMCS performed and deficiencies noted and corrected (DA Form 2404).	
b. OVM present and serviceable.	
c. Chains present and serviceable.	
d. Fuel tank topped off.	
e. Fuel can present, full, and secured.	
f. Water can present, full, and secured.	
g. Fire extinguishers present, updated, and sealed.	
h. First aid kit present and complete.	
i. Unit designations covered.	
4. Trailers.	
a. PMCS performed and deficiencies noted and corrected (DA Form 2404).	
b. Brake hose connectors clean, serviceable, and operational.	
c. Brakes checked with prime mover.	
d. Lights operational.	
e. Load properly secured or prepared for road march.	
f. Safety chains present and serviceable.	
g. Unit designations covered.	
5. Loader-transporters.	
a. PMCS performed and deficiencies noted and corrected (DA Form 2404).	
b. Load test on loader and missile handling bars current.	
c. Tracks serviceable.	
d. Track tension correct.	
e. Fuel tank topped off.	
f. All lights operational.	
g. All access plates properly installed.	
h. Fire extinguisher present, updated, and sealed.	
i. Loader straps (16) present.	
j. Loader ramps (2) present and proper pins present.	
k. Unit designations covered.	

CHECKLIST FOR EQUIPMENT (CONTINUED)

Remarks

6. Hawk equipment.
   a. PMCS performed and deficiencies noted and corrected (DA Form 2404). _____
   b. Data and power cables serviceable with all cable covers present. _____
   c. Cable reels present and serviceable. _____
   d. RL-31s present and serviceable. _____
   e. Headsets and extension cables present, serviceable, and operational at all end items of equipment. _____
   f. Radars have all covers and they are in serviceable condition. _____
   g. Launcher hatches and covers present and in serviceable condition. _____
   h. PCP van clean and free of debris. _____
   i. PCP ancillary equipment present and serviceable. _____
   j. Ground rods and straps present and serviceable at all equipment. _____
   k. Sledgehammers, 12- or 16-pound present, serviceable and available for all equipment. _____
   l. LSCB present, serviceable, and operational. _____
   m. Missile storage pallets present, serviceable, and with all latches and pins clean and serviceable. _____
   n. Missile storage pallets properly mounted on vehicles or trailers. _____
   o. Equipment tents available, complete, and serviceable. _____
   p. PLL available and loaded per battery SOP. _____
   q. M2 aiming circle present, serviceable, and operational per TM 9-1290-262-10. _____

7. Generators.
   a. PMCS performed and deficiencies noted and corrected (DA Form 2404). _____
   b. Fuel tanks full. _____
   c. All covers present and properly secured. _____
   d. Fire extinguisher present, updated, and sealed. _____
   e. Check for oil, fuel, or hydraulic leaks. _____
   f. Ground rod and strap present and serviceable. _____
   g. Sledgehammer, 12- or 16-pound present and serviceable. _____

8. Communications equipment.
   a. Radios and intercom present and operational. _____
   b. All connectors and receptacles clean and serviceable. _____

CHECKLIST FOR EQUIPMENT (CONTINUED)

Remarks

c. Grounding straps secure. _____
d. Equipment properly secured on vehicles and van. _____
e. Antennas, cables, and matching units complete and serviceable. _____
f. TA-312 or TA-1 present and serviceable. _____
g. AN/PRC-77 complete and operational. _____
h. Applicable batteries and spares on hand. _____
i. AN/GRC-103 complete and operational. _____
j. AN/GRC-106 complete and operational. _____
k. AN/VRC-46 and -47, and ancillary equipment complete and operational. _____
l. Vinsons and keying devices secure and operational. _____

9. Weapons.
   a. All weapons clean and serviceable. _____
   b. All machine guns have spare barrels, spare bolts, asbestos gloves, and cartridge extractor. _____
   c. .50-caliber machine-gun headspace and timing gauge available and serviceable. _____
   d. Weapon cleaning equipment on hand. _____
   e. Basic load of ammunition available for issue for individual- and crew-served weapons. _____

10. MANPADS (Stinger).
   a. PMCS performed and deficiencies noted and corrected (DA Form 2404). _____
   b. IFF code book present and codes loaded. _____
   c. Basic load of missiles (3 BCUs per missile) present and secured on prime mover. _____
   d. Spare IFF batteries present and serviceable. _____
   e. Programmer, interrogator set AN/GSX-1 IFF programmer (1 per 2 teams) available and serviceable. _____
   f. Code key generator (1 per 2 teams) available and serviceable. _____
   g. Harness, guided missile equipment transport, available and serviceable. _____
   h. AC generator (1 per 2 teams) available and serviceable. _____

OPERATIONAL READINESS CHECKLIST

The operational readiness checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR OPERATIONAL READINESS

	Remarks
1. Platoon alert plan current and functional.	
2. Platoon alert roster current.	
3. Platoon leader or platoon sergeant ensures–	
a. Vehicles are loaded according to load plans.	
b. Vehicles are topped off.	
c. Vehicles have dispatches or logbooks.	
d. Current PMCS and DA Form 2404.	
e. All drivers have valid operator's licenses.	
f. SOIs are current.	
g. MRE rations properly distributed and resupply coordinated.	
h. Plans and coordination for hot meals are made.	
i. Plans and coordination for refueling are made.	
j. Key personnel briefed.	
k. Vinsons loaded with appropriate codes.	
l. Warning order issued to platoon.	
m. Spot-checks of equipment, personnel, and individual knowledge are conducted.	
n. Supply and service facilities have been located and coordination is completed.	
o. Rehearsals as needed.	

PLATOON LEADER'S EQUIPMENT CHECKLIST

The platoon's leader's equipment checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR PLATOON LEADER'S EQUIPMENT

	Remarks
1. Field manuals.	
a. FM 44-1.	
b. FM 44-100.	
c. FM 44-18.	
d. FM 44-90.	

CHECKLIST FOR PLATOON LEADER'S EQUIPMENT (CONTINUED)

	Remarks
2. Maps and overlays in map case.	
3. Grease pencils and acetate.	
4. Flashlight with blue filter and extra BA-30s.	
5. Watch.	
6. TSOPs.	
a. Division.	
b. Supported element.	
c. Battalion.	
d. Battery.	
7. Blank forms.	

BRIEFING CHECKLIST FOR OPORD AND RSOP

The platoon's leader's checklist for OPORD and RSOP is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR OPORD AND RSOP

	Remarks
1. Briefing checklist for OPORD (FM 101-5).	
a. Situation.	
(1) Information on threat and friendly situation.	
(2) Terrain and expected weather.	
(3) Supported unit's mission and objectives.	
(4) Location of sister unit and other ADA units in area.	
b. Mission.	
(1) Explain unit mission.	
(2) Explain what is expected of platoon.	
c. Execution.	
(1) Explain tactical plan.	
(2) Assign and explain section or individual tasks as necessary.	
(3) Explain commander's intent, coordinating instructions, and subunit missions.	

CHECKLIST FOR OPORD AND RSOP (CONTINUED)

Remarks

d. Service support.
   (1) Administrative. _____
   (2) Rations. _____
   (3) Ammunition (conventional and missile). _____
   (4) Medical. _____
   (5) Casualty evacuation. _____
   (6) POL and water. _____

e. Command and signal.
   (1) EMCON SOE. _____
   (2) Radio frequencies and call signs. _____
   (3) CP location (battery, battalion, and supported unit). _____
   (4) Next leader in platoon leader's absence (platoon chain of command). _____

2. Briefing checklist for RSOP. Brief the mission/friendly/enemy situation.
   a. Primary, alternate, and supplemental locations and routes. _____
   b. Terrain and environment (weather NBC). _____
   c. EMCON (SOE). _____
   d. Radio frequencies and call signs. _____
   e. Action to take if attacked. _____
   f. Convoy procedures (see Convoy Checklist, page B-13). _____
   g. Movement time. _____
   h. Uniform for movement (MOPPs 1 to 4). _____
   i. Strip maps. _____
   j. Answer questions. _____

RSOP TEAM CHECKLIST

The RSOP team's checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR RSOP TEAM

Remarks

1. Personnel.
   a. OIC and NCOIC. _____
   b. Driver (RTO). _____
   c. Security team. _____

CHECKLIST FOR RSOP TEAM (CONTINUED)

Remarks

d. Equipment guides (minesweeping team, NBC team, and reaction force). _____
e. Communications personnel (VHF operator and tactical wireman). _____
f. Road guides. _____

2. Equipment.
a. Truck, cargo, 2 1/2- or 5-ton, 6x6. _____
b. Truck, utility, with radio set, AN/VRC-46 or AN/VRC-89 with secure device. _____
c. Mine detector, metallic and nonmetallic. _____
d. Mine detector, metallic AN/PSS-11. _____
e. Chemical agent automatic alarm and power supply. _____
f. Radiacmeter, IM-174/PD. _____
g. Telephone set, TA-312/PT or TA-1. _____
h. Antenna group, RC 292 or equivalent. _____
i. UHF antenna mast set. _____
j. WD-1 telephone cable. _____
k. Measuring tape. _____
l. Marking stakes and sledgehammer. _____
m. M2 aiming circle. _____
n. Equipment for preparation of coverage diagrams. _____
o. Maps of area. _____
p. Binoculars. _____
q. Camouflage screen systems. _____
r. Individual weapons and ammunition. _____
s. Two M-203s and ammunition. _____
t. Individual protective and load-bearing equipment. _____
u. Machine gun 7.62-mm, with tripod, extra barrel, and asbestos gloves. _____
v. Night vision sight, AN/PVS-4 individual-served weapon. _____
w. Rations and water for three days minimum. _____
x. POL for three days minimum. _____
y. SOI. _____
z. NBC marker kit. _____

3. Route acceptability.
a. Overhead clearance. _____
b. Roadway width and trafficability. _____
c. Bridge classification. _____
d. Fording sites. _____
e. Areas for dispersion. _____

CHECKLIST FOR RSOP TEAM (CONTINUED)

	Remarks
f. Easily distinguishable landmarks.	
g. Cover and concealment.	
h. Route clear of mines and NBC hazards.	
4. Location acceptability.	
a. Size of area (minimum for Hawk equipment, Phase II, 130 by 160 meters, or Phase III, 120 by 375 meters).	
b. Slope less than 10 degrees.	
c. Radar field of view along PTL (radar clutter).	
d. Clear field of fire.	
e. Cover and concealment.	
f. Surface firmness (consider weather).	
g. Accessibility.	
h. Free of mines and NBC hazards.	
5. Position layout.	
a. Determine PTL and KRPs.	
b. Disperse equipment.	
c. CWAR has terrain priority.	
d. Line of sight exists for alignment (preferred).	
e. Equipment positioned within cable lengths.	
f. PCP door faces away from radars.	
g. Generators positioned to minimize radar interference.	
h. CP location close to PCP.	
i. Ground security within platoon capabilities (area considered).	
j. Chemical detectors deployed.	

COORDINATION CHECKLIST

This checklist is provided for coordination at the supported unit TOC. The platoon leader will visit all staff sections and exchange information. He will also pass information to his adjacent platoon and the battery CP.

CHECKLIST FOR COORDINATION

	Remarks
1. S3.	
a. Frontline trace.	
b. Friendly air and ground situation.	

CHECKLIST FOR COORDINATION (CONTINUED)

Remarks

c. AD assets available in AO. _____

d. Coordinate integration of early warning as applicable– _____

(1) To FAAD units. _____

(2) From Patriot. _____

(3) From AF sensors. _____

Note: Coordinate integration of Hawk air picture to provide early warning to FAAD assets. (Also check for sharing of air picture from Patriot or USAF sensors.)

2. S2.

a. Current enemy situation. _____

b. Intelligence requirements. _____

c. Intelligence preparation of the battlefield (IPB). _____

3. NBC officer.

a. NBC situation. _____

b. Location of deliberate or hasty decontamination points. _____

4. CE officer.

a. Current SOI requirements and changes. _____

b. EW activity. _____

c. EMCON parameters. _____

5. S4.

a. Coordinate rations (if not already coordinated by parent unit S4). _____

b. Coordinate POL (if not already coordinated by parent unit S4). _____

c. Coordinate ammunition resupply (conventional and missile). _____

d. Coordinate services and other classes of supplies as needed. _____

Notes:

1. Platoon leader should attend all supported unit briefings.

2. Keep the supported unit informed on AD engagements and fire unit status.

3. Keep the supported unit informed of ADWs, hostile criteria, and WCS.

GROUND DEFENSE CHECKLIST

The ground defense checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR GROUND DEFENSE

	Remarks
1. Positions have cover and concealment.	
2. Positions are fortified and have overhead cover, if situation permits.	
3. Positions have communications with CP.	
4. Positions have range cards.	
5. Positions are located a sufficient distance from equipment for RF and backblast safety.	
6. Evaluate for gaps in defense and cover unavoidable gaps with alarms or claymores.	
7. Crew-served weapons and M203s cover likely avenues of approach.	
8. Reaction force available and ready.	
9. Reaction force has manpack communications available, seviceable, and operational.	
10. Spare batteries available for communications equipment used in perimeter defense and reaction force.	
11. Ensure perimeter personnel know challenge and password.	
12. Ensure SOI and EMCON SOE are known and adhered to.	

PLATOON CP CHECKLIST

The platoon CP checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR PLATOON CP

	Remarks
1. Locate the CP to ensure communications with–	
a. PCP.	
b. Battery CP.	
c. Supported unit.	

CHECKLIST FOR PLATOON CP (CONTINUED)

Remarks

d. Perimeter guard posts. _____
e. Maintenance team. _____

2. CP location checked for NBC hazards prior to occupation. _____

3. Use available cover and concealment and or camouflage as necessary. _____

4. Establish communications with CP per EMCON parameters. _____

5. Observe COMSEC and ECCM procedures:
   a. Adhere to EMCON parameters. _____
   b. Enter net per SOI and SOP. _____
   c. Operate in assigned net. _____
   d. Establish net discipline. _____

6. Submit reports as required. _____

7. Follow maintenance SOP to ensure quick response. _____

8. Follow and execute all aspects of OPORD and ensure platoon does the same. _____

9. Plan, coordinate, and request resupply of all supply classes as necessary. _____

10. Know the following and exchange with higher, adjacent, and supported unit:
    a. Frontline trace. _____
    b. Friendly air and ground situation. _____
    c. Enemy air, ground, NBC, and EW situation. _____
    d. Location of decontamination points. _____
    e. SOI requirements and changes. _____
    f. EEI or priority intelligence requirement. _____

11. Pass all urgent information to higher, adjacent, and supported units. _____

12. Know and display on map the current adjacent platoon, support unit, and supported unit location (or other information as needed). _____

13. Brief platoon sergeant or successor on plans and operations so he can take over in your absence. _____

14. CP location checked for NBC hazards prior to occupation. _____

CHECKLIST FOR PLATOON CP (CONTINUED)

Remarks

15. Ensure adequate security measures are taken for classified documents and other sensitive items. _____

16. Ensure soldier hygiene and soldier care (includes rest and crew and guard rotation). _____

CONVOY CHECKLIST

The convoy checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR CONVOY

Remarks

1. Air defense coverage is maintained by MANPADS per TSOP. _____

2. Ground security is maintained per TSOP. _____

3. Drivers and assistant drivers briefed on–
   a. Safety. _____
   b. Speeds during convoy. _____
   c. Routes, primary and alternate (marked on strip map). _____
   d. Action if attacked or ambushed. _____
   e. Action if vehicle malfunctions. _____
   f. Action during halts. _____
   g. Responsibilities of trail vehicle. _____
   h. Air guard responsibilities. _____

4. Vehicles, trailers, and loads checked and corrected on the spot (Hawk equipment march ordered properly). _____

5. Vehicles formed in AFP order of march. _____

6. Vehicle and trailer–
   a. Unit markings covered. _____
   b. Bows and canvas removed. _____
   c. Mirrors and other reflective surfaces covered. _____
   d. Lights operational. _____
   e. Brakes operational. _____
   f. Fuel tanks full. _____

CHECKLIST FOR CONVOY (CONTINUED)

	Remarks
g. Fuel and water cans present and full.	
h. Floors sandbagged.	
7. MANPADS teams briefed on convoy AD coverage.	

TASK FORCE/SUPPORTED UNIT CHECKLIST

The task force/supported unit checklist is outlined below. Use the remarks column to indicate the status of the individual item being checked.

CHECKLIST FOR TASK FORCE/SUPPORTED UNIT

	Remarks
1. Coordinate move with parent unit.	
2. Coordinate move with supported unit.	
a. Obtain radio frequencies/call signs.	
b. Obtain radar frequencies.	
c. Obtain mission.	
d. Obtain scheme of maneuver.	
e. Obtain net assignments.	
f. Obtain air and ground IPB.	
g. Obtain CP location.	
h. MOPP level.	
i. Logistics support.	
j. Priorities.	
k. Intelligence on the enemy.	
3. Coordinate with task force.	
a. Obtain radio frequencies/call signs.	
b. Obtain radar frequencies.	
c. Obtain mission.	
d. Obtain scheme of maneuver.	
e. Obtain net assignments.	
f. Establish link with C^2 structure.	
g. Obtain IPB.	
h. Logistics support.	
i. Priorities.	
4. Provide supported unit or task force with the following information:	
a. Your Alpha roster.	
b. Your vehicle listing.	
c. Logistical support required.	
d. Call signs and frequencies.	
e. Recommendations for AD employment.	

APPENDIX C

Hawk System Transportability

One of the AD employment principles is mobility. The Hawk system is highly mobile because it can be transported by land, air, or sea. Mobility will enable the Hawk system to survive in the dynamic AirLand Battlefield. The mission of the AFP will dictate the mode of transport and training requirements. TMs for the Hawk end items contain the information and procedures for preparing or rigging the end items for movement. FMs 55-12, 55–15, 55-65, and 55-450–1 contain detailed information on transporting the Hawk system. Hawk planners should note that the AFP will normally deploy as an element of its parent Hawk battalion. Certain missions may require the AFP to deploy as an element of a task force. Planners should plan to support the platoon with resources and manpower for loading and unloading.

CREW TRAINING

Crews used for loading Hawk equipment onto the transport vehicle should be trained as a team. Crew integrity should be maintained whenever possible. Training should stress safety first.

TRANSPORTABILITY

The Hawk system is mobile and is moved on land by organic prime movers. The Hawk system is transportable by rail, sea, and air. Transporting the AFP by other than organic prime movers requires the platoon leader to do the following:

- Coordinate with battery movement officer.
- Adhere to battery SOP for movement.
- Ensure personnel manifest, load plans (correct number of copies), and necessary documents are properly prepared.
- Ensure vehicles and trailers are mechanically sound and clean.
- Ensure vehicle and generator fuel tanks, fuel cans, fuel storage tanks, and tank and pump units are filled or purged as necessary.
- Ensure equipment and loads on vehicles are secure and meet height and width standards.
- Secure sensitive or classified equipment and materials in a secure container (CONEX).
- Check for proper marking of sensitive and hazardous material containers (classified items or ammunition).
- Ensure drivers have updated OF-346 and are familiar with hand signals and safety requirements.
- Check all vehicles and equipment after loading for proper tie-down.
- Ensure correct weight classification is displayed on all equipment.
- Brief all personnel on safety.

Note: Some missions may involve land movement to a port for sea movement. In such instances, equipment and containers should meet sea movement standards for packing, height, and width.

LAND TRANSPORTABILITY

The AFP is capable of being transported by rail or truck transport to meet mission requirements. Normally rail or truck transportation is used when distance or time requirements prohibit the use of convoy procedures.

CONTENTS

AIR MOVEMENT

The AFP can be transported by aircraft, both air transport or helicopter. C-130, C-141, or C-5A aircraft are used for transporting AFP equipment. Load plans by aircraft type need to be prepared in advance for units with contingency missions. CH-47 helicopters are used to transport AFP equipment as sling or internal loads.

SEA MOVEMENT

The AFP is transported by ship to meet certain mission requirements. Sea movement will normally inelude another mode of transportation to the port of embarkation. Prepare equipment for sea movement initially even if equipment will convoy to the port of embarkation.

AIR MOVEMENT CONTROL OFFICER FOLDER

Each AMCO keeps an air movement folder which normally contains the following:

• Personnel manifest, prepared in three copies (see the Sample Personnel Manifest illustration). One copy is provided the aircraft crew chief, one for higher headquarters, and one for unit files. (Blank personnel manifest forms should be available when not conducting an operation or exercise.)

• Equipment load cards, usually prepared in three copies (see the Sample of Equipment Load Card illustration on page C–3). One copy is retained in the vehicle, and one copy provided to the battery and battalion AMCO. (Blank equipment load forms should be available when no operation or exercise is going on.) Standard loads for selected items should be developed to ensure that necessary equipment is transported.

• Current platoon or battery roster.

• Platoon or battery equipment list and standard dimension and weight tables.

• Appointment orders for AMCO and AMNCO.

• Air item status reports.

• Unit airmobile SOP.

• List of applicable references and materials.

• Unit load table (see the Sample of Unit Load Table illustration on page C-3). During operations, provide copies to battalion and brigade AMCOs. Include unit load tables in the unit operation plan or order and prepare them in conjunction with the supporting aviation unit. Develop standardized load plans for unit elements which normally include airmobile operations. (Standardized loads and blank forms should be available when not conducting an operation or exercise.)

• Load planning guides (see the Load Planning Guide illustration on page C-4). During operations, one set is maintained by the battery and one set is provided to battalion. (Blank forms should be available when not conducting an operation or exercise.)

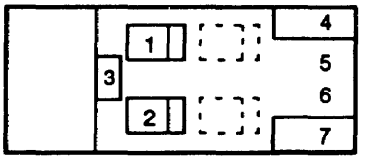
• Air movement coordination checklist. This checklist is used by the AMCOs pathfinders, and Army aviation personnel. It provides a means of ensuring the coordination of major details concerning the operation. The AMCO Checklist illustration on page C-4 shows checklist format.

SAMPLE PERSONNEL MANIFEST

MANIFEST			DATE:	
NAME	SSN	RANK	UNIT	REMARKS
ARNOLD, JAMES D	123-45-6789	E3	B/2-44 82	Troop Leader
ZIGGY, JOHN D.	987-65-4321	E3	B/2-44 82	
PETERSON, HOBART K.	111-00-0000	E2	HHB, 42 BDE	

SAMPLE OF EQUIPMENT LOAD CARD

5/4-TON TRUCK



FRONT

VEHICLE =:
VEHICLE WEIGHT:
DRIVER:
ASST DRIVER:

ITEM	WEIGHT	ITEM	WEIGHT
1. Asst Driver	240	7.	
2. Driver	240		
3. AN/VRC-46	58		
4.			
5. Tactical File Cab	50	SUBTOTAL	
6. TA-50	100	TOTAL (Veh Wt + Subtotal)	

BACK

Notes: 1. Use 5" x 8" index cards for load card. Draw outline of equipment on front.
2. Indicate with a number any item not included in basic equipment weight.
3. Enter the weight and short description of item indicated on the card front.
4. Total load by adding additional items to vehicle weight.

SAMPLE OF UNIT LOAD TABLE

UNIT LOAD TABLE
A Btry, 2 Bn, 82 ADA Page___of___

CHALK	UNIT	INTERNAL LOAD	EXTERNAL LOAD	REMARKS
1	A/2-82	4 PAX WT 5/4 TRK WT	CONEX WT	TOTAL WT = _____lb

LOAD PLANNING GUIDE

HEADQUARTERS (Btry, Bn, ADA)		LOCATION (Coordinates of PZ)		LOADING BEGINS (Time)		SECTION/CHLK NO. (Indicate unit section)
A. PAX	WT	B. INT EQUIP	WT	C. EXT EQUIP	WT	D. SLING REQUIREMENTS
SMITH (E6)	250	5/4 Trk (A1)		CONEX Container		15,000-lb capacity nylon chain leg sling. (1 10,000-lb capacity sling).
JONES (E5)	250					
W1		W2		W3		TOTAL W (W1 + W2 + W3)

AMCO CHECKLIST

1. Location of the PZ: Pri _____ Alt _____
2. Location of the LZ: Pri _____ Alt _____
3. A/C formation _____ Time interval _____ Type of A/C _____
   Number of flights _____ Number of A/C _____ ACL of A/C _____
4. Pilot briefing: Time _____ Location _____
5. Safety briefing: Time _____ Location _____
6. Operation briefing: Time _____ Location _____
7. Evaluation of PZ: Pri _____ Alt _____
8. Evaluation of LZ: Pri _____ Alt _____
9. Location of LZ assembly points and markings: _____
   Type markings _____
10. PZ marking: _____
11. Flight routes into the objective: Pri _____ Alt _____ Alt _____
12. Call sign: AMCO _____ Alt _____
    LZ/PZ _____ Alt _____
13. Frequencies: Pri _____ Alt _____
14. Ground unit call sign: Pri _____ Alt _____
    Frequencies: Pri _____ Alt _____
15. Land signals: _____
16. Marking of obstacles: _____
17. Location of aid station: _____
18. Location of PW collection point: _____
19. Fire support: _____
20. Evacuation plan: _____

    Escape and evasion plan: _____
21. Location of friendly units in the area: _____
    _____, _____

22. Weather: _____ Ceiling _____ Temp _____
    High _____ Low _____ Visibility _____ EENT _____
    BMNT _____

23. Support personnel required: _____ Unit: _____
    Location: _____ Time and how deployed? _____

APPENDIX D

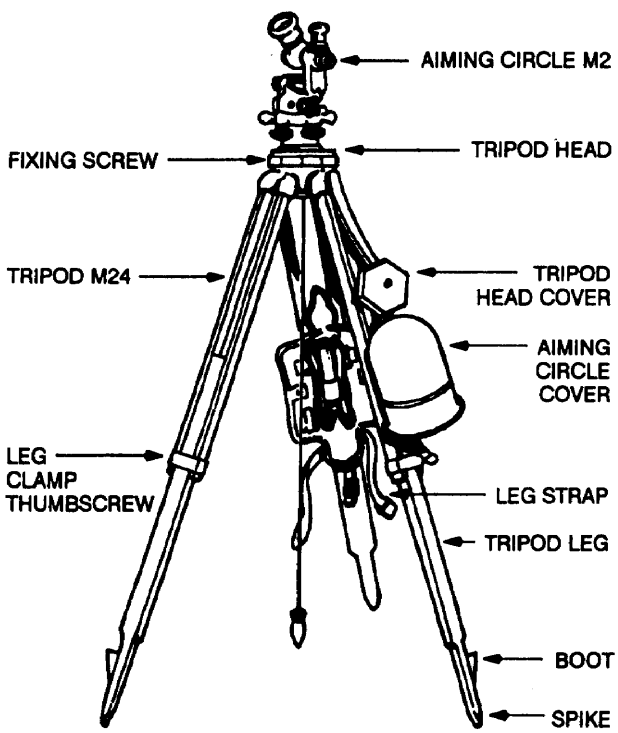
Operation of the M2 Aiming Circle

The M2 aiming circle is used in the Hawk platoon to orient the platoon radars to true north. An understanding of how to employ the aiming circle is important, because even a small error can result in the platoon being unable to perform its mission (see FM 6-2 for aiming circle operations). For the layout of Hawk AFPs, refer to TM 9-1430-2535-10.

EMPLACEMENT

The emplacement of the tripod on firm ground is imperative since it should provide a firm, level, and steady base for the aiming circle. Remember, the equivalent of a mil error at the aiming circle is one meter at one kilometer. Emplace the tripod and aiming circle by using the following procedure (see M2 Aiming Circle illustration).

M2 AIMING CIRCLE



Step 1. Unstrap the tripod legs and loosen the leg clamp thumbscrews.

Step 2. Extend the legs so that the tripod head is approximately chest high, and tighten the leg clamp thumbscrews.

Step 3. Spread the legs approximately 18 inches apart, and plant the feet firmly in the ground.

Step 4. Adjust the legs' length so that the tripod head is approximately level. Remove the tripod head cover.

Step 5. Open the baseplate cover of the aiming circle and thread the tripod guide screw assembly into the aiming circle until it is firmly seated.

Step 6. Remove the aiming circle cover and place aiming circle cover on tripod head cover to prevent damage to the aiming circle cover and loss of the aiming circle cover.

CONTENTS

LEVELING

It is important to ensure proper leveling of the aiming circle to achieve accurate measurements. The following is a step-by-step procedure on the leveling of the aiming circle.

Step 1. Loosen the three leveling screws to expose about 1/4 inch of thread (see Aiming Circle Detailed Views illustration below).

Step 2. Rough level: Make minor adjustments to the length of the legs until the bubble in the circular level is totally within the red circle. (See Aiming Circle Detailed Views—Left Side View illustration below.)

Step 3. Fine level the aiming as follows:

• Rotate the aiming circle in azimuth until the tubular horizontal level vial is between and parallel to any two leveling screws (see First Position—Leveling the Aiming Circle illustration on page D-3).

• Grasp the two leveling screws between thumb and forefinger of each hand and turn so that the thumbs move toward or away from each other. (The bubble will move in the same direction as the left thumb.) Center the bubble (see First Position—Leveling the Aiming Circle illustration).

• Rotate the aiming circle in azimuth (1600 mils) until the horizontal level vial is perpendicular to the third leveling screw (see Second Position—Leveling the Aiming Circle illustration).

• Center the bubble using the third leveling screw only. (See Second Position—Leveling the Aiming Circle illustration.)

Note: Repeat the fine level steps until the bubble remains centered in both positions.

• Rotate the aiming circle 3200 mils from the first position (see Third Position—Leveling the Aiming Circle). If the bubble remains centered, rotate the aiming circle 3200 mils from the second position (see Fourth Position—Leveling the Aiming Circle illustration). If the bubble remains centered, rotate the aiming circle throughout 6400 mils. The bubble should remain centered; if it does, the aiming circle is level. Note: If the bubble is not centered when the aiming circle is rotated to the third position, the level vial is out of adjustment. To compensate, perform all of the following steps.

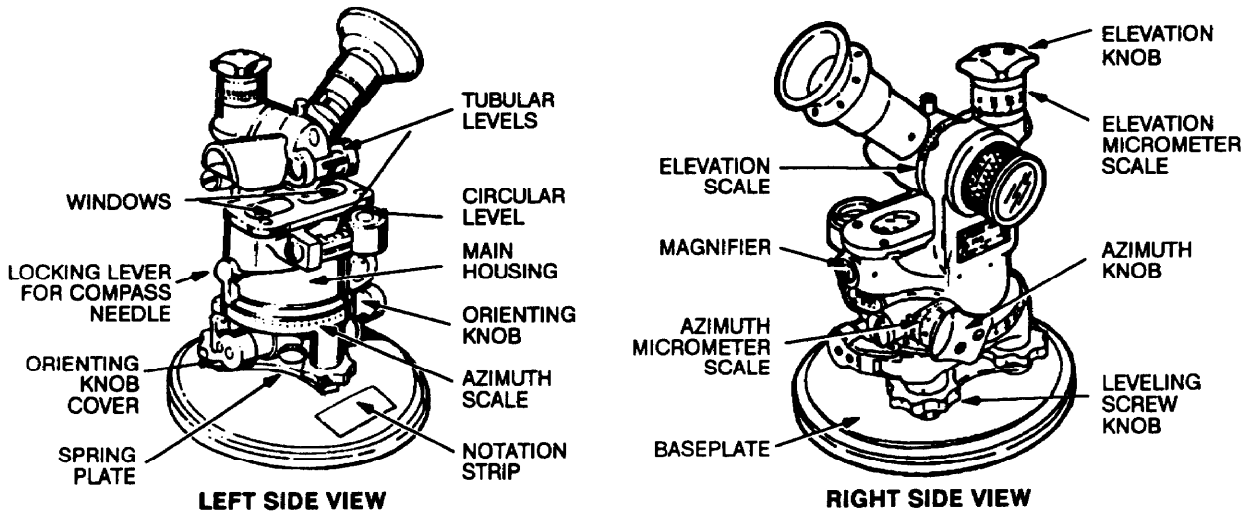
Step 1. With the aiming circle in the third position, move the bubble halfway back to the center of the vial using the initial two leveling screws (see Leveling the Aiming Circle illustration).

Step 2. Rotate the aiming circle to the fourth position and move the bubble halfway back to the center of the vial using the third leveling screw (see Leveling the Aiming Circle illustration).

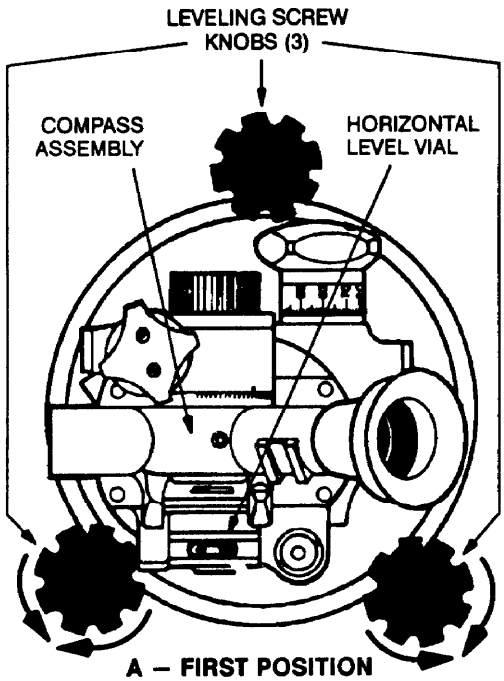
Step 3. Rotate the aiming circle throughout 6400 roils. If the bubble does not move more than one graduation, the aiming circle is considered level.

Note: If the bubble does move more than one graduation, repeat the leveling procedure. If it continues to displace by more than one graduation, the aiming circle should be turned in for repair.

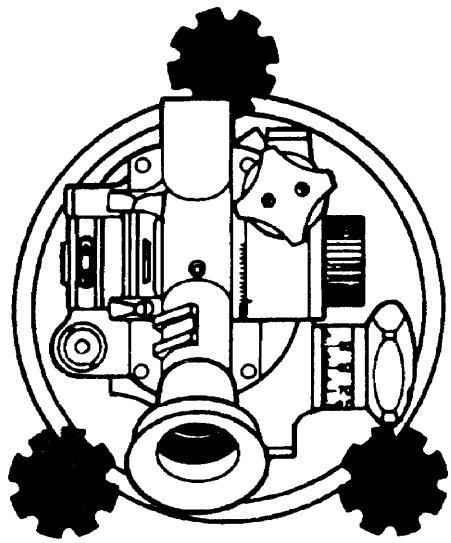
AIMING CIRCLE DETAILED VIEWS



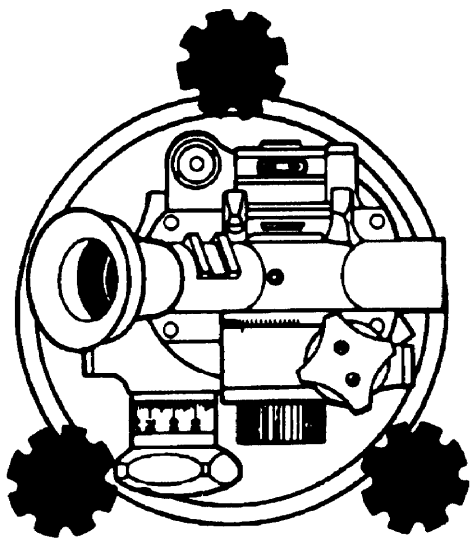
LEVELING THE AIMING CIRCLE



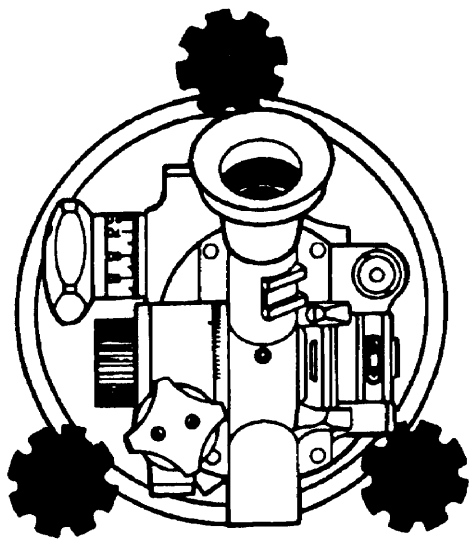
A – FIRST POSITION



B – SECOND POSITION



C – THIRD POSITION



D – FOURTH POSITION

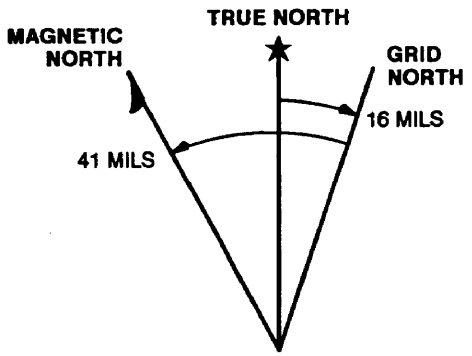
ORIENTING TO TRUE NORTH

The declination diagram on the 1:50,000 map shows the angles between magnetic grid, and true north. Because Hawk is oriented to true north and the needle on the aiming circle seeks magnetic north, it is the angle between true and magnetic north that is required. In the Declination Diagram illustration, the angle between true north and magnetic north is 25 mils west.

The annual magnetic change must also be taken into account. Going back to the example above, if the annual change is 2 mils easterly and two years have passed since the year of the diagram, then the current declination angle would be 21 mils west.

To find the declination constant, if the declination angle is westerly, subtract it from 6400 mils, and if the angle is easterly, add it to O mils. Therefore, in the example the declination constant would be 6379 mils.

DECLINATION DIAGRAM



ORIENTING THE AIMING CIRCLE

Metal objects in the close vicinity of the aiming circle may affect the magnetic needle and decrease accuracy. The following is a step-by-step procedure on the orienting of the aiming circle.

Step 1. Set the azimuth scale and the azimuth micrometer at the predetermined declination constant.

Step 2. Using the throw-out mechanism of the orienting knob, turn the aiming circle until the magnetic needle locking-lever is pointed in the general direction of north.

Step 3. Unlock the magnetic needle.

Step 4. Using the orienting knob, align the end of the needle with the center etched line as viewed through the magnetic needle magnifier.

Step 5. Lock the magnetic needle and close the orienting knob covers.

Note: For orienting and aligning a Hawk AFP, see TM 9-1430-2535-10.

MEASURING AZIMUTH TO A REFERENCE POINT

In measuring an azimuth to a reference point, it is a good practice to take two or more readings and get an average if time and situation permit. The following is a step-by-step procedure on using the aiming circle to measure an azimuth to a reference point.

Step 1. Using the throw-out mechanism of the azimuth knob, turn the telescope until the vertical line of the reticle is approximately on the reference point.

Step 2. Rotate the azimuth knob to bring the vertical line exactly on the reference point.

Step 3. Read the azimuth to the reference point on the azimuth scale and micrometer.

MEASURING ELEVATION TO A REFERENCE POINT

Perform the following procedure only when elevation readings need to be made (in measuring the elevation to a reference point, the elevation correction angle should be written on the notation strip and should be changed if it is wrong).

Step 1. With the aiming circle level, turn the elevation knob until the bubble in the level attached to the telescope is centered. The elevation scale and micrometer should read zero. If they do not, the elevation reading with the sign reversed is the vertical angle correction and must be added algebraically to all vertical angles measured.

Step 2. Turn the elevation and azimuth knobs until the cross lines are centered on the required point.

Step 3. Read the angle of elevation or depression from the elevation scale and micrometer. If applicable, algebraically add the vertical angle correction.

APPENDIX E

Communications

This appendix briefly discusses the communications equipment and nets that AFP personnel use. For more detailed instructions on the functions and operation of this equipment, refer to the appropriate TMs.

The Hawk communications system provides highly reliable and secure communications. It will provide the near real-time data needed to fight the air battle. The systems include communications facilities for control of the air battle and transmission of an air picture; command and administrative headquarters; and contact with supported and displacing units. The elements of the communications system provide for backup should one part of the system fail.

HAWK COMMUNICATIONS EQUIPMENT

The Hawk battery and platoon have four types of communications equipment. The following paragraphs describe this equipment.

ULTRAHIGH FREQUENCY RADIO

UHF is the primary means of communications for control of the air battle. The radio used in Hawk units is the AN/GRC-103. One AN/GRC-103 is mounted in each PCP and two in the AN/TRC-145. The AN/GRC-103 offers the user 12 secure channels which can carry both voice and digital data. UHF is highly directional and requires line of sight between stations. Therefore, a sound communications plan that considers the effect of terrain is vital to the establishment of an effective UHF net. The AN/GRC-103 illustration on page E-2 shows the front panels.

FREQUENCY MODULATED RADIO

FM radios serve as a backup means of communications for the UHF net. The battalion will establish several FM nets, including the command net and the AD command net. The Hawk battery and platoon have three different configurations of FM radios. The AN/PRC-77 is a lightweight radio that can be man-carried, or when vehicle mounted, is designated the AN/GRC-160. It is often used for communications with the battery Stinger teams. The AN/VRC-46 and AN/VRC-47 can both be vehicle mounted and are mounted in the PCPs and the CPs. Both radios use the RT-524/VRC receiver-transmitter. The AN/VRC-47 also includes an additional receiver, the R-442/VRC, allowing the operator to monitor a second net. The AN/VRC-46 and AN/VRC-47 can both operate remotely using the radio set control group AN/GRA-39. Some advantages of the Hawk FM radios are: use of proper COMSEC procedures make them secure, they are omnidirectional, and they can operate on the move. These factors make the FM radio ideal for use during moves. The main disadvantages of the Hawk FM radios are: they are single channel, they do not carry digital information, and most importantly, they produce a significant RF signature. Because of this signature, emission control considerations such as short transmissions, the use of low power, terrain masking, and eliminating all but critical transmissions are vital. The FM Radio Components illustration on the next page shows the FM radios used by the AFP.

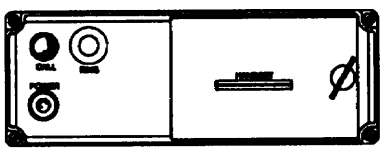
CONTENTS

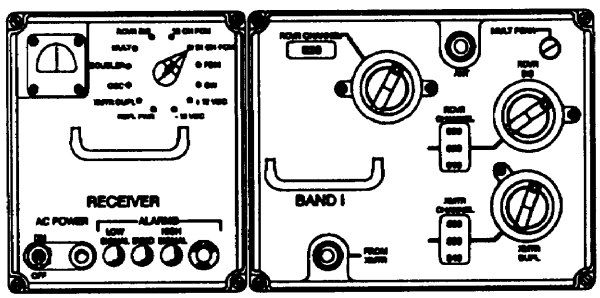
AMPLITUDE MODULATED RADIO

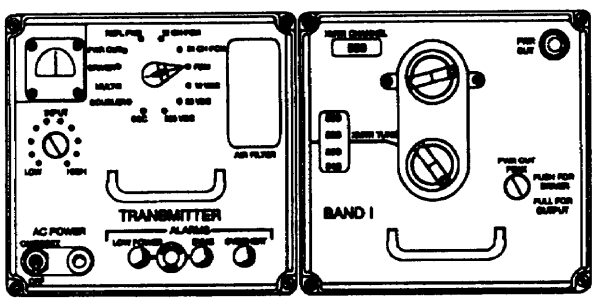
AM radios, like FM radios, function as a backup to the UHF voice channels. The Hawk battery AM radio is the AN/GRC-106A. This radio is single channel, but does not have the capability of secure operations. It is omnidirectional and does not require line of sight. The AM radio (see AN/GRC-106A illustration on the next page) produces RF signature that is very easy for the enemy to intercept. Commanders must take this factor into consideration before using AM radios.

The Hawk Radio Characteristics illustration on page E-3 provides consolidated information about the characteristics of ail of the radios found within a Hawk AFP.

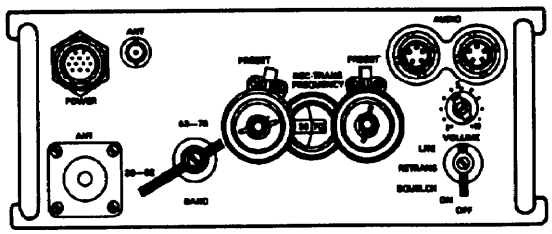
AN/GRC-103



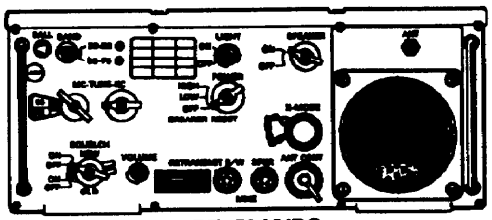




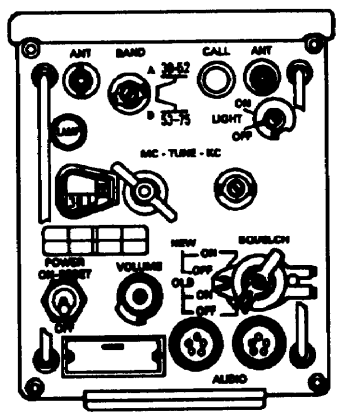
FM RADIO COMPONENTS



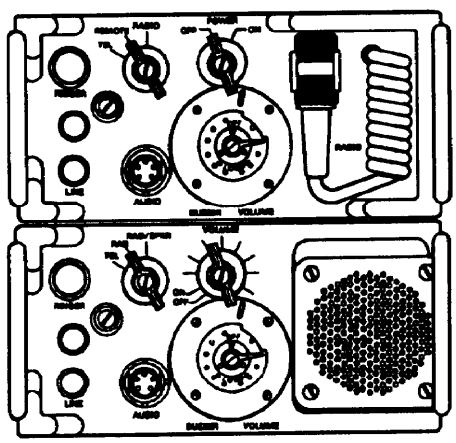
AN/PRC-77



RT-524/VRC

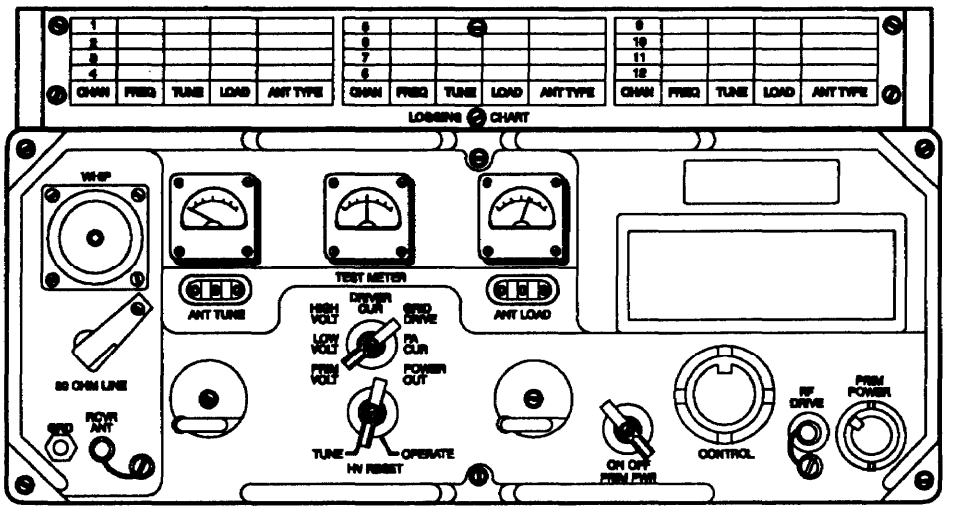


R-442/VRC



AN/GRA-39

AN/GRC-106A



HAWK RADIO CHARACTERISTICS

	AN/GRC-103	AN/GRC-106	AN/PRC-77	AN/VRC-46, -47
RADIO TYPE	UHF	AM	FM	FM
NUMBER OF CHANNELS	Multichannel, 12 secure channels	Single Channel	Single Channel	Single Channel
SERIES	Voice or Digital	Voice	Voice	Voice
PLANNING RANGE	80 KM Line of Sight	Ground Wave Ant: 80 KM Sky Wave Ant: 600-2400 KM	8 KM Line of Sight	Low Power: 8 KM High Power: 41 KM Line of Sight
SECURE CAPABILITY	Yes	No	Yes	Yes
UNIDIRECTIONAL OR OMNI-DIRECTIONAL	Unidirectional	Omnidirectional	Omnidirectional	Omnidirectional
WHERE MOUNTED	PCP, AN/TRC-145	M-36 Series Vehicles Remoted to PCP	Vehicle or Man-Carried	PCP, CP, or Vehicle

SINGLE-CHANNEL GROUND AND AIRBORNE RADIO SYSTEM

SINCGARS is the newest family of radios in use by the US Army. The SINCGARS radios make use of extensive large scale integration (LSI) circuitry, including microprocessors. A key element in the radios, the frequency synthesizer, uses new techniques to generate the required frequencies. It also provides facilities to enable the sets to operate with conventional radios. SINCGARS operate in the 30-to 88- megahertz frequency range in 25 kilohertz steps for a total of 2,320 channels. It can operate in either a single channel or frequency hopping mode.

Radio Set, AN/VRC-87

The AN/VRC-87 is a short-range, vehicle-mounted radio set with a solid-state, securable transceiver intended for VHF-FM tactical operations. The AN/VRC-87 is used where the communications range is normally 8 kilometers or less. The configuration is used by the ADA platoon, headquarters battery, and similar applications. The capabilities are the same as the AN/PRC-119 manpack radio, except the AN/VRC-87 cannot be used in a dismounted role. The AN/VRC-87 replaces the AN/VRC-64 radio (see the AN/VRC-87, -88 illustration below).

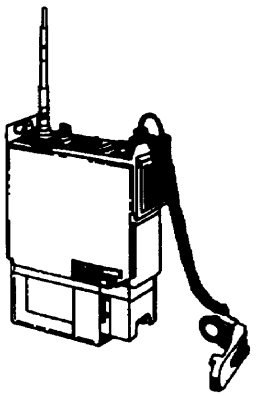
Radio Set, AN/VRC-88

The AN/VRC-88 is a vehicle-mounted radio that has a manpack, antenna, and a battery case as additional components. The radio can be removed from the vehicle, and by installing the antenna and battery case, can be reconfigured as an AN/PRC-119 manpack radio. The AN/VRC-88 has a 4-kilometer range and may be operated from a vehicle or in a dismounted configuration. It provides more channels, reduces operator burden, and increases equipment reliability. The AN/VRC-88 is used by soldiers to communicate from vehicles or from dismounted positions. It is the replacement for the AN/GRC-160 radio. See the AN/PRC-119 Manpack Radio illustration below.

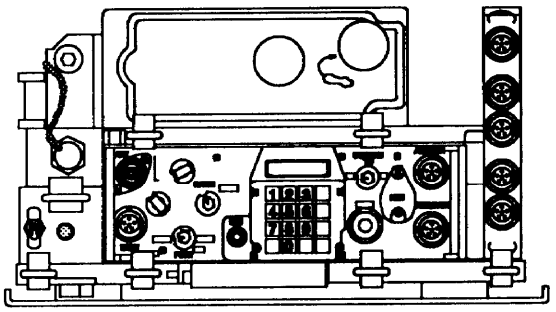
Radio Set AN/VRC-89

The AN/VRC-89 is a vehicle-mounted, dual configuration consisting of one short-range and one long-range, solid-state, securable transceiver intended for VHF-FM tactical operations. The AN/VRC-89 provides long-range (up to 35 kilometers) and short-range (up to 8 kilometers) operations in two nets simultaneously. The AN/VRC-89 is a dual radio configuration mounted in a single vehicular mount. It replaces existing AN/VRC-47 configurations, as well as separate configurations of AN/VRC-64 or AN/VRC-46 in a single vehicle. The AN/VRC-89 is basically two vehicular–mounted, short-range radio sets with an added power amplifier that provides one of the radio sets with a long-range communications capability up to 35 kilometers (see the AN/VRC-89, -91 illustration below).

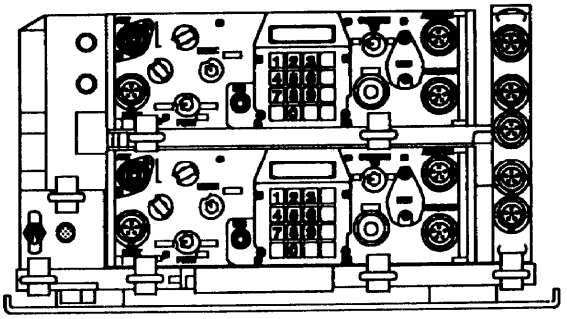
AN/PRC–119 MANPACK RADIO



AN/VRC–87, –88



AN/VRC–89, –91



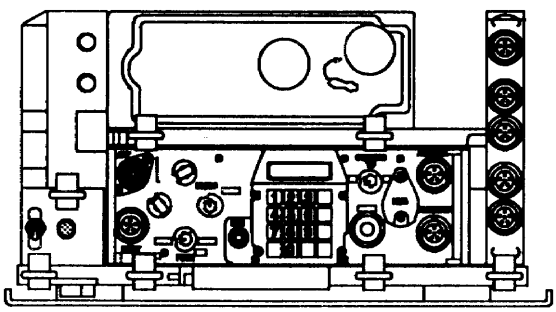
Radio Set, AN/VRC-90

The AN/VRC-90 is a long-range, vehicle-mounted radio set with a securable transceiver intended for VHF-FM tactical operation. The AN/VRC-90 is used where the communications range must normally operate overlong distances (up to 35 kilometers). The AN/VRC-90 vehicular configuration is used by individuals and crews who require continuous, long-range communications in a net. The radio configuration is used throughout the Army at all echelons from corps through platoon. The AN/VRC-90 replaces the AN/VRC-46 radio (see the AN/VRC-90 Vehicle Radio illustration below).

Radio Set, AN/VRC-91

The AN/VRC-91 is a vehicle-mounted, dual-radio configuration consisting of one long-range and one short-range dismountable, solid-state, securable transceiver intended for VHF-FM tactical operations. The AN/VRC-91 provides long-range (up to 35 kilometers) and short-range dismountable (up to 8 kilometers) operation in two nets simultaneously. The AN/VRC-91 vehicular, long-short range manpack configuration provides maximum flexibility. The AN/VRC-91 basically combines the features of an AN/VRC-88 and AN/VRC-90 into a single vehicle installation. The AN/VRC-91 replaces the AN/GRC-160 radio when teamed with the AN/VRC-46 in a single vehicle (see the AN/VRC-89, -91 illustration on page E-4).

AN/VRC-90 VEHICLE RADIO



Radio Set, AN/VRC-92

The AN/VRC-92 is a vehicle-mounted, dual-radio configuration consisting of two long-range, solid-state, securable transceivers intended for VHF-FM tactical operations. The AN/VRC-92 also has an automatic retransmission capability. The AN/VRC-92 is used to meet dual, long-range (up to 35 kilometers) communications requirements. The AN/VRC-92 is also used for VHF-FM retransmission operations. It is basically an AN/VRC-88 with an additional power amplifier mount to provide communications range up to 35 kilometers to the second radio system. This configuration replaces two separate AN/VRC-46 radios in a single vehicle and the AN/VRC-49 radio. Because of the automatic retransmission capability found in each SINCGARS, all AN/VRC-92 configurations are capable of automatic transmission.

SINCGARS Configurations

Hawk units will be fitted with SINCGARS radios. It is anticipated that the latest version of SINCGARS will include integrated communications (ICOM) security devices and will be fielded as soon as practical. The SINCGARS Configurations illustration below illustrates the crosswalk from the AN/VRC-112 series radios to the replacement SINCGARS radios.

SINCGARS CONFIGURATIONS

SINCGARS CONFIGURATION	REPLACES	USE
AN/PRC-119	AN/PRC-77, -25	MANPACK
AN/VRC-87	AN/VRC-64, -53	VEHICULAR SHORT RANGE
AN/VRC-88	AN/GRC-160, -125	VEHICULAR SHORT RANGE (DISMOUNT)
AN/VRC-89	AN/VRC-12, -47	VEHICULAR SHORT RANGE AND LONG RANGE
AN/VRC-90	AN/VRC-46, -43	VEHICULAR LONG RANGE
AN/VRC-91	AN/GRC-160 AND AN/VRC-46	VEHICULAR SHORT RANGE (DISMOUNT) AND LONG RANGE
AN/VRC-92	AN/VRC-49, -45	VEHICULAR DUAL LONG RANGE

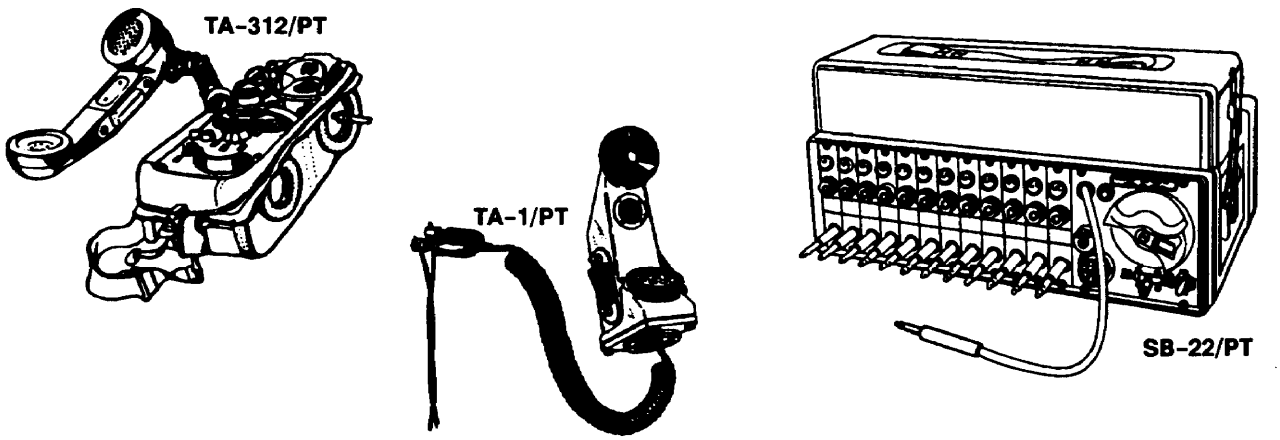
WIRE COMMUNICATIONS

Wire communications provide the primary communications within the Hawk platoon. Land lines connect the perimeter security positions, the CP, and various sections. Wire communications equipment includes the TA–312/PT or TA-1/PT field phones and the SB-22/PT switchboard (seethe illustration below). Communicating by wire produces no RF signature, but users must be aware that wire is not secure since the net can easily be tapped.

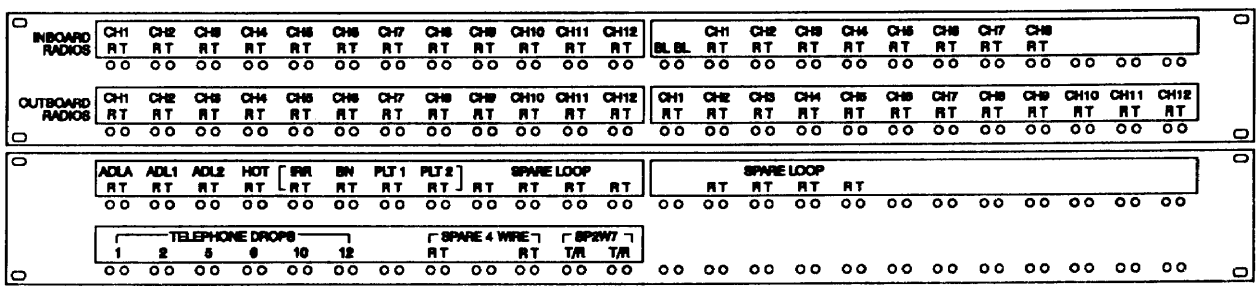
UHF CHANNEL PATCHING IN THE PCP

One item of communications equipment unique to the Hawk system is the patch panel located just above the AN/GRC-103 in the PCP. Because communications personnel maybe unfamiliar with the patch panel, it is important that Hawk personnel understand the fundamentals of its operation. Every battalion should prepare a UHF patching plan to make the best possible use of the UHF system. Patching is the routing of each of the 12 UHF channels to the appropriate user. All 12 channels will enter the patch panel in the PCP (see the Hawk Multichannel Patch Panel illustration below). If an external radio is in use (in an AN/TRC-145 or another PCP), it will be connected to the PCP by a 26-pair cable.

WIRE COMMUNICATIONS EQUIPMENT



HAWK MULTICHANNEL PATCH PANEL



COMMUNICATIONS NETS

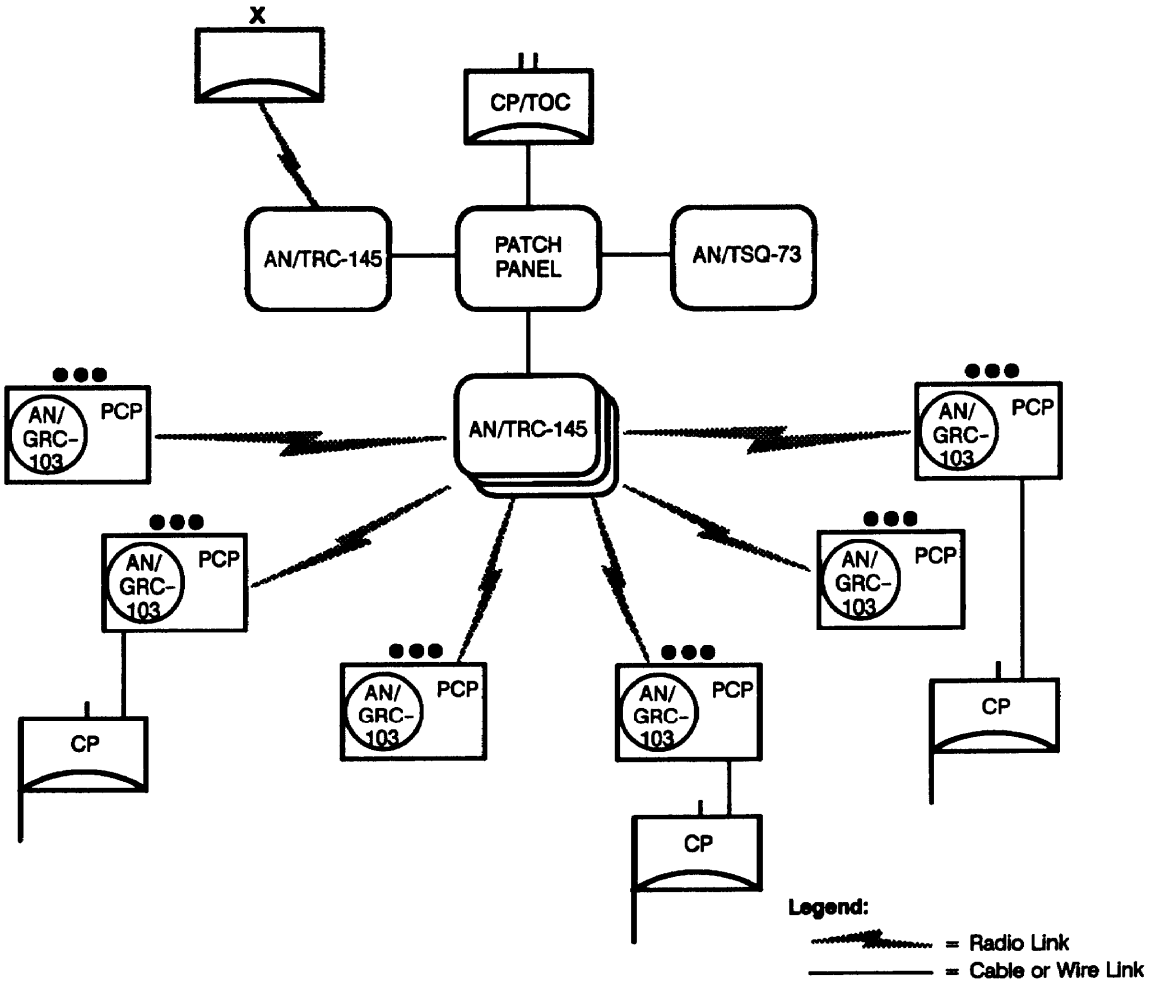
This section describes the communications nets used within the Hawk organization. Hawk AFPs must be capable of communicating to successfully transmit and receive C3I information.

UHF NET CONFIGURATION

The normal configuration of a battalion UHF net connects the battalion to each of the AFPs. A consideration, however, with this configuration is that the battery must maintain some means of communications with its separated AFPs to remain abreast of the platoon status and to ensure that the AFP receives all essential information and support. The UHF links are called shots. Each UHF shot requires a line-of-sight path, direct or relayed, between two stations. The Battalion UHF Configuration illustration below shows a battalion UHF net.

In some cases, METT-T factors may dictate that the commander use a different configuration. In one frequently used configuration, the battalion transmits

BATTALION UHF CONFIGURATION



to one AFP in each battery. The AFP in the battalion net, in turn, relays to the other AFP in its battery. To use this configuration, each battery must have an AN/TRC-145 (seethe illustration below). The commander may elect to combine the two configurations, allowing for two UHF shots to some batteries and one to others.

The multichannel system provides primary Hawk communications. The system establishes 12-channel supports between terminals. Each of the 12 channels supports two-way voice or data transfer.

Army Tactical Data Link-One

The ATDL-1 passes near real-time digital information concerning the conduct of the air battle among the computers in the PCPs and the AN/TSQ-73 at the FDC. The information includes target positions, target identities, system status, missile count, firing commands, and firing platoon actions. There is no backup to these circuits.

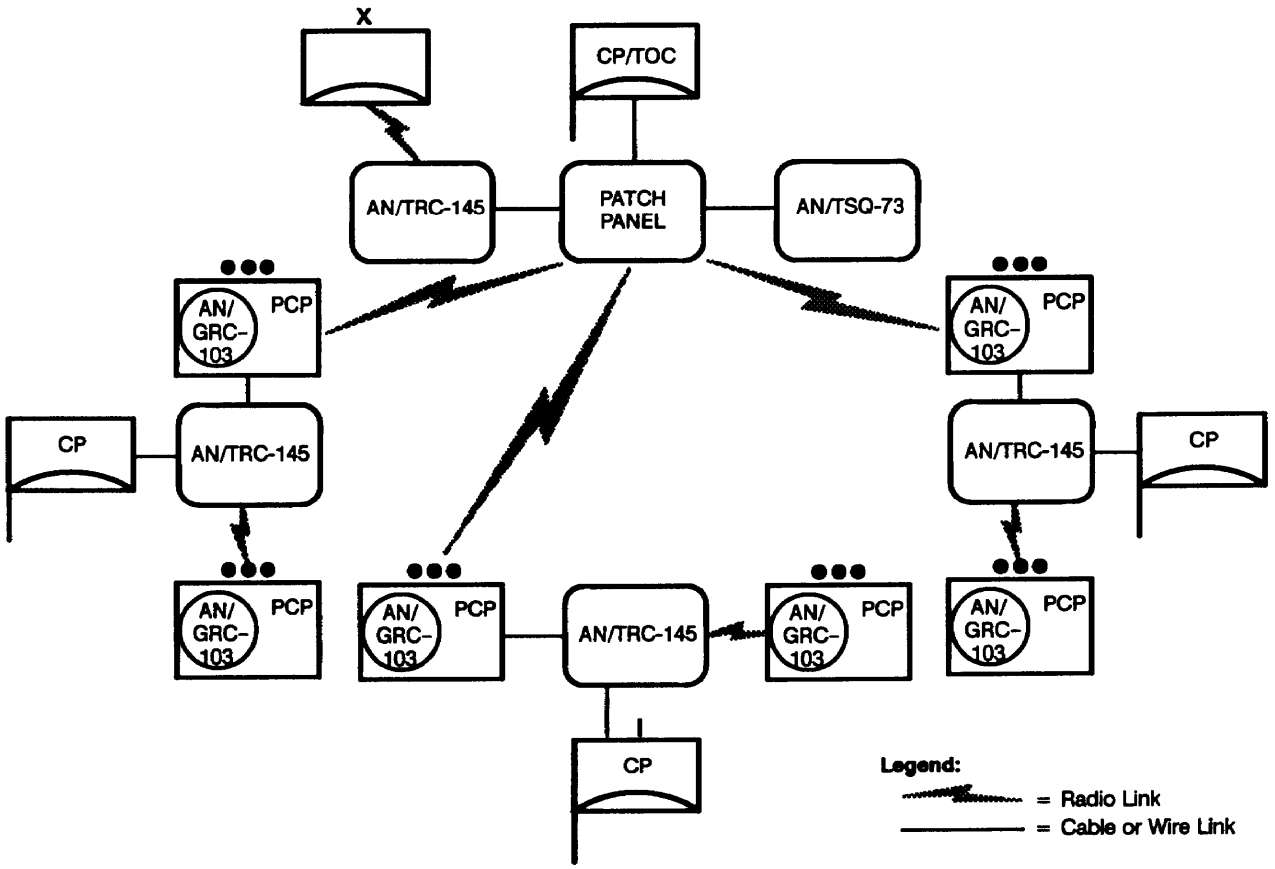
Air Defense Command Net

The AD command net, also called the hot loop or TAC OPS, is the voice exchange net for tactical information not passed by ATDL-1. It is the primary circuit for control of the air battle when the ATDL-1 is not operational. An AM or FM net provides a backup for ADC.

Intelligence Radar Reporting Net

IRR is used to pass AD intelligence and early warning between the AN/TSQ-73 and the PCPs. All of the above circuits connect the PCPs and the AN/TSQ-73. Other circuits are used to pass information between the TOC and CPs. Some of these circuits are: command, NBC, trains, and the message pass line. In addition to the 12 secure channels, there is one nonsecure channel called order wire. Communications personnel use the order wire channel to establish and maintain the circuits.

ALTERNATE BATTALION UHF CONFIGURATION



FM NETS

FM nets serve as a backup means of voice communications for the UHF net. The battalion will establish several FM nets, depending on the tactical situation and FM radio assets. The two predominant nets are the battalion and battery command net. The platoons normally maintain an FM net with their organic Stinger teams.

AM NETS

AM nets can serve as backup for UHF and FM nets. The AM radios are not secure and are omnidirectional, making them the easiest to detect and target. Note: COMSEC, especially authentication procedures, enhance communications security of FM and AM nets.

MOBILE SUBSCRIBER EQUIPMENT

The MSE system is based on a networked architecture that provides voice and data communications support for corps deployed in AirLand Operations.

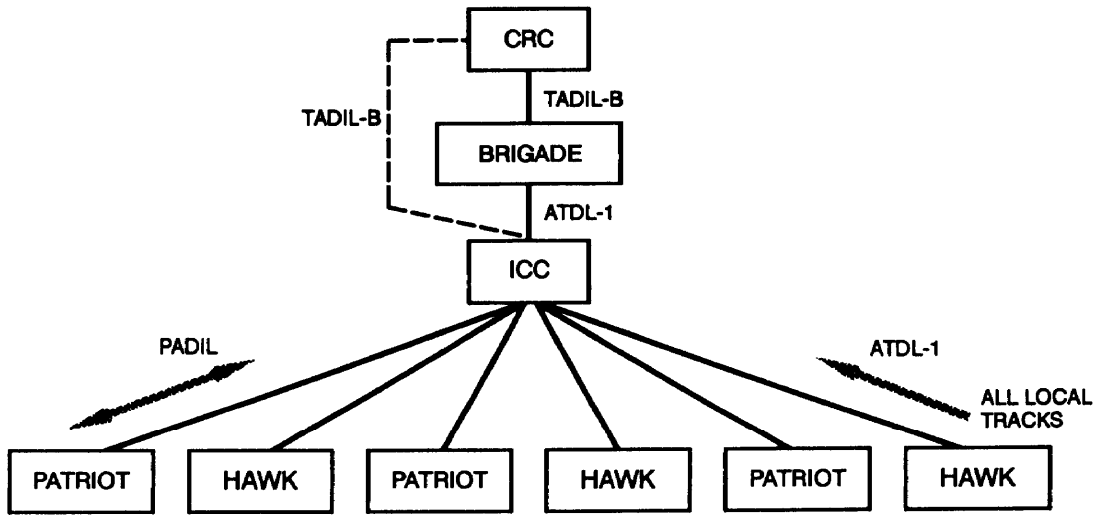
The MSE system interoperates with echelons above corps (EAC), NATO forces, other military forces, and commercial telephone systems through a combination of interface points. The MSE system provides communications that corps and division commanders need to exercise command and control of their forces during AirLand operations.

MSE includes the TA-1035/U and AN/VRC-97. The TA-1035/U provides full duplex digital voice telephone communications and voltage reference signals for data subscribers in the MSE system. The AN/VRC-97 permits mobile, or station, access to the MSE system by providing secure automatic communications throughout the tactical area of operations on a discreet address basis. It acts as a modular type telephone in military vehicles. The TA-838 telephone will be at the platoon level. This telephone will permit the platoon leader to dial into the MSE system.

HIMAD TASK FORCE COMMUNICATIONS

The Hawk battalion normally communicates and exchanges data with Patriot units through the brigade AN/TSQ-73. This Configuration requires no special UHF patching or setup. However, when a HIMAD task force is to be formed. under the command and control of the Patriot ICC, patching, circuit routing, and basic design have to be considered. The HIMAD Task Force Communications illustration below shows a task force communications architecture.

HIMAD TASK FORCE COMMUNICATIONS



MIXED FIRE UNITS UNDER PATRIOT BATTALION ICC CONTROL

In some circumstances, Patriot communications relay groups (CRGs) may be collocated with Hawk AFPs. When this is the case, the AFP will hardwire its 26-pair cable carrying all of its communications from the PCP into the CRG. Hawk communications should then provide their communications link data to the Patriot communicators so that the proper patching in the CRG can be effected. Normally, Hawk ADL will be routed through a modem in the CRG, and from there into the Patriot multirouted data system. The Patriot unit must also at this point ensure that the Hawk AFP receives and implements the proper address so that the ICC will recognize the Hawk data.

Collocating the Hawk AFP with the Patriot CRG entails the following considerations. It reduces logistical and security problems for the CRG crew. Normally, these crews are separated from normal logistical sources for fuel and food, and must provide their own site security. Locating within the perimeter of the AFP improves the security of the CRG and allows the crew to satellite off the logistical resources of the AFP. Hardwiring all of the AFP's communications into the CRG reduces the total number of UHF shots in the task force communications plan by one, and it saves a UHF radio stack for another use. This is especially important when the task force is large and well dispersed. Use of the CRG allows immediate multirouting of Hawk data within the task force and provides the Hawk AFP with the ability to reroute voice circuits in the same manner as a Patriot unit does when a communications node becomes nonoperational. The communications officer must consider the overall communications plan before making the decision to collocate a CRG with an AFP. When making the decision to collocate the CRG with the AFP, the overall communications plan must be considered before defense design. If the AFP locations support the commander's intent, but locating a CRG with that AFP would render it useless to the rest of the battalion, then another solution should be found.

APPENDIX F

Safety

This appendix contains brief outlines of the various hazards and necessary precautions that must be followed to operate the Hawk system. The Hawk system has many operating hazards, but can safely accomplish its mission if proper precautions are taken. Losing trained personnel through negligence is inexcusable.

SOLDIER SAFETY

Soldier safety awareness is a 24-hour operation. AU soldiers should read the safety SOP or safety annex to the battery SOP and perform their daily tasks according to its guidance. Safety awareness starts with a training program which includes identification of hazards (see the Hawk Hazards Chart on page F-2) avoidance measures, and first aid for casualties.

RADIATION

Radio frequency (RF) radiation from radar antennas and associated equipment is a potential hazard to personnel. RF radiation heats body tissues like a microwave oven. It is not cumulative, but if the intensity is high enough or prolonged, it will cause permanent tissue damage. This damage is not immediately apparent. Pregnant service members must be extremely watchful when working near RF sources.

Personnel are prohibited from exposure of RF levels above 10 mw/cm2. This power intensity is present along the axis of each radar's transmitted beam.

Personnel may move in and around the radar to zero range at ground level if they are below the horizontal center line of the antenna. No height restrictions exist to the sides or rear of the antennas.

MECHANICAL-NOISE LEVEL

A mechanical hazard exists at all items of Hawk equipment with moveable parts. The antenna SAFE/OPERATE switch only inhibits electrical movement; mechanical motion is still possible. Hawk equipment is very heavy and the motors are strong. Personnel must not be within movement range of any item that is remotely controlled.

High noise levels are present when Hawk equipment is operating. Motors, air conditioners, and generators produce dangerous levels of noise. Hearing protection is required for prolonged exposure to noise (see AR 40-5).

ELECTRICAL

The Hawk system uses a three-phase, 416 VAC, 60-kilowatt power source. Within the equipment, transformers increase the potentials and voltages significantly. Even low voltages will kill under adverse conditions. Never allow personnel to work on the equipment alone. When possible, shut off the power supply or disconnect the power source before entering components. Even when the power is off, make sure the component and equipment are grounded properly. Use extreme caution around interlocked components. Electrical storms may cause power surges even in de-energized equipment.

CONTENTS

HAWK HAZARDS CHART

HAZARD	EQUIPMENT							
	PCP	IFF	CWAR	HIPIR	LSCB	LAUNCHER	LOADER	MISSILE
RADIO-FREQUENCY RADIATION		X	74m	112m				
HIGH VOLTAGE	X	X	X	X	X	X		
MECHANICAL	X	X	X	X		X	X	
TOXIC CHEMICALS USED FOR PMCS	X	X	X	X		X	X	X
EXPLOSIVES								60m
HIGH-PRESSURE AIR						X		X
HIGH-PRESSURE FLUID				X		X	X	X
FLAMMABLE FLUIDS						X	X	

CHEMICAL

Dangerous chemicals are used during operation and maintenance of the Hawk system. Some are flammable and toxic or corrosive. Care, handling, and first aid instructions are in the front of each TM. A fire hazard exists at all pieces of equipment. Fire extinguishers and safety boards are required in all areas of the system, uprange and downrange.

EXPLOSIVE

Many components in the Hawk system contain explosives or devices capable of exploding. Conditions which may require EOD assistance are described in the following paragraphs.

MISSILE WITH ARMED S&A DEVICE

Prescribed safety and arming checks indicate that the installed S&A device is in an armed condition.

ACCIDENT OR INCIDENT

Missiles which have been subjected to probable damage caused by handling or transportation accidents or by natural elements such as lightning, fire, and windstorm should be considered unsafe. Such missiles may be in storage and shipping containers or on launchers, pallets, or test stands. They may also be in various stages of disassembly.

RECOVERED LAUNCHED MISSILE

This is a missile which successfully left the launcher, but aborted during flight, resultting in ground impact. These missiles must be considered fully armed.

A precautionary waiting period of at least 30 minutes must be taken before performing any EOD procedures on a missile suspected of being armed. The missile is designed to self-destruct by detonation of the warhead upon the loss of on-board electrical power. This power loss may result from dissipation of power or an interruption of power caused by separation of cables or wires.

The vacuum tubes and cathode ray tubes (CRTs) used inside the equipment and the display scopes are

highly vacuumized and may implode when broken. The gases within the tubes may be toxic and or flammable. After an implosion, the glass particles will explode out of the tube area with tremendous force. Personnel should wear protective goggles and gloves when working on the tubes.

LIGHTNING

Lightning damage to Hawk equipment may occur in two ways: direct and indirect lightning strikes. Direct (physical) damage occurs when the item is struck by lightning. Examples are holes and burning damage. Indirect damage occurs when voltages and currents are induced into the electrical circuits through the power and data cables connecting the equipment. The indirect effects of lightning are usually responsible for 80 to 90 percent of equipment damage. A lightning strike several kilometers away from the actual site may cause indirect damage by inducing current levels in cables. In wet and cool environments, the probability of a lightning strike increases. In hot, dry climates such as the Middle East, the probability is lower.

One recommended method to protect the Hawk system from lightning is to erect a lightning rod at each major item. Makeshift lightning rods may be fabricated from utility poles or radio antenna masts. However, this may not be practical. The intrusion of tall lightning rods in the Hawk unit location will increase the probability of detection. The lightning rods will also significantly slow mobility times for march order and emplacement.

Personnel operating inside shelters will be protected from a lightning strike. Those personnel who are standing on the ground nearby or in physical contact with the equipment are in danger. It is recommended that personnel do not work on equipment during a thunderstorm. If the tactical situation permits, then all power and data cables should be disconnetted. This will provide some protection against indirect lightning strike damage to the equipment.

TRANSPORTATION

Extreme caution must be taken during missile transfer not to drop, bang, or otherwise damage the missiles or injure operators. Missile movement safety guidelines must be followed closely during operations in poor visibility or adverse conditions.

Any equipment being transported or moved must be properly tied down per TM instructions. Ensure that the proper number and type of tie-down straps are present and in good condition.

All equipment brakes must be tested periodically. Before operating, ensure that all brakes, lights, and signals work properly. When moving any equipment on site or around troops, ensure that the ground guide has an unobstructed view of the area. Use more than one guide, if necessary.

Prior to convoying equipment, brief all drivers and assistant drivers on routes, safety, speeds, lights, road conditions and expected hazards, air and ground attack probabilities and responses, emergency conditions, and breakdown procedures. Have route control procedures and checkpoints preestablished and briefed. Use strip maps. Ensure that drivers are alert and properly licensed for operating their vehicles.

Safety is a prime concern during both peace and war. Unsafe practices during peace will lead to excessive casualties during hostilities.

APPENDIX G

How to Prepare Radar Coverage Diagrams

This appendix provides detailed procedures for preparing radar coverage diagrams. It presents three methods of preparation: deliberate, hasty, and emergency. It also describes the circumstances in which each may be appropriate.

How effective you are in defending against air attack depends, naturally enough, on what your radars "see." Blind areas caused by terrain masking are undefended areas. Therefore, to establish an effective defense, it is first necessary to determine the impact of terrain on radar tracking and detection capabilities. This terrain analysis is done by preparing a radar coverage diagram.

RADAR COVERAGE

Radar coverage diagrams are graphic representations of the target detecting and tracking capabilities of a radar sited at a specific position. A radar coverage diagram shows the altitude and range at which targets become visible to the radar. For the Hawk systems, coverage diagrams consider terrain masking and earth curvature for 360 degrees around the radar. The illustration on page G-2 is an example of a radar coverage diagram.

Note: Modified 4/3 earth curvature diagram and radar coverage diagram are classified when filled in.

The radar position is the center of the diagram. The concentric rings indicate range from the radar and the radial lines indicate azimuth. The outer plot (---) shows the range at which a target flying 300 meters above the terrain will first unmask and become visible to the radar. The middle plot (0) shows the range at which a target flying 150 meters above the terrain would unmask, and the inner plot ( ) shows the unmask range for targets flying 50 meters above terrain.

TOOLS NEEDED

The tools used to prepare radar coverage diagrams are maps, map profile lines, work sheets, and range detection nomograms. Assign the task of making a coverage diagram as soon as the movement warning order is received and a location is determined.

MAPS

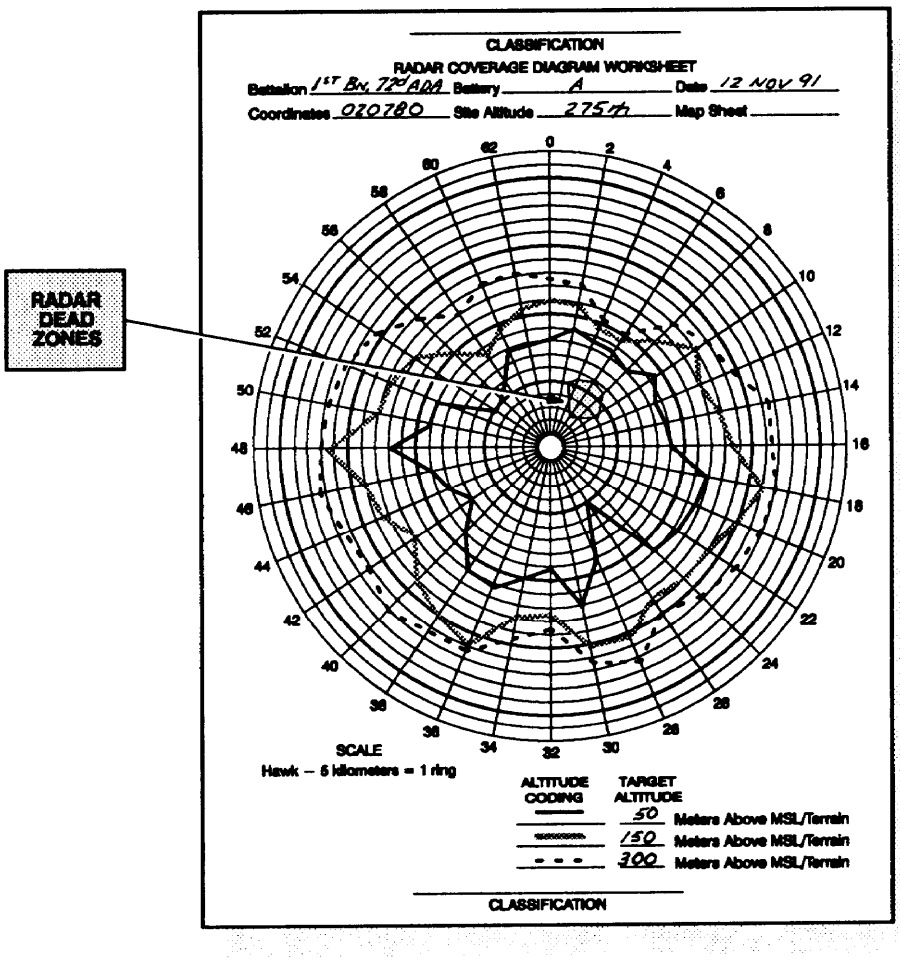
A map is a graphic representation of natural and man–made features on the earth's surface. It is usually drawn to a specific scale and shows the relative positions and sizes of features within an area. Features are represented by symbols, lines, and colors. The largest scale topographic maps available (preferably 1:250,000 or larger) are used to prepare radar coverage diagrams. Smaller scale maps lack the necessary topographic detail.

MAP PROFILE LINES

Map profile lines are plots of elevation and range of prominent terrain features along a specific line of azimuth from the radar. Prominent terrain features are mountains, hills, valleys, buildings, or any other physical object that can mask a target from the radar. Determine elevation using the contour lines, and measure range using the map scale.

CONTENTS

RADAR COVERAGE DIAGRAM



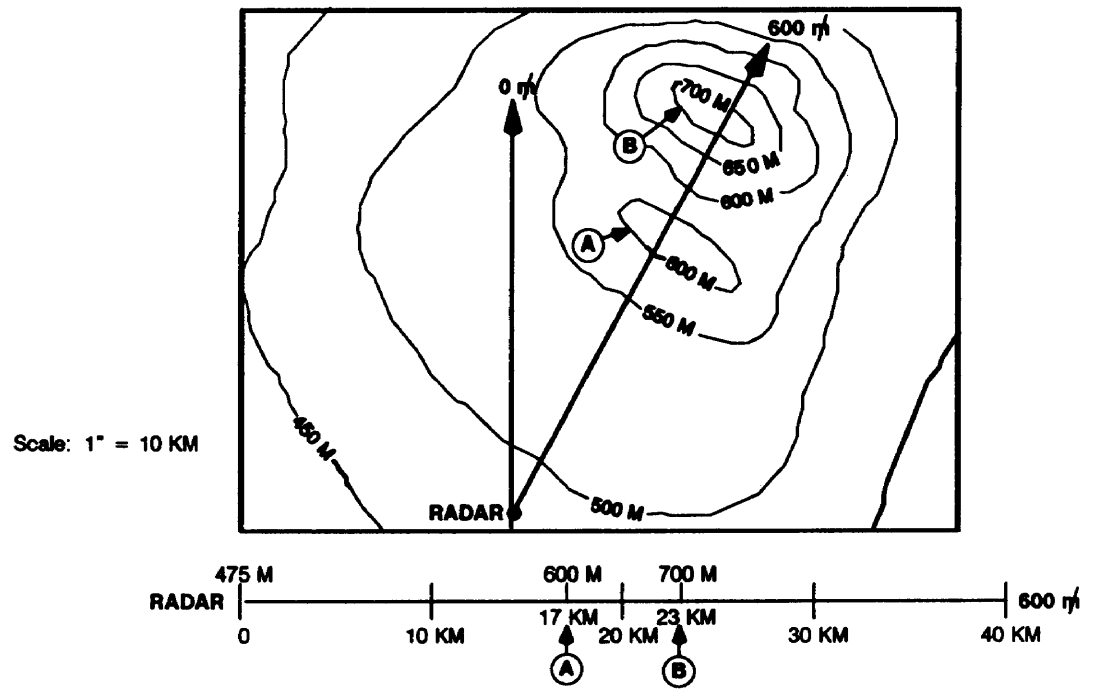
A map profile line for an azimuth of 600 mils is shown in the illustration on page G-3. The radar site is at an elevation of 475 meters. A small hill, with an elevation of 600 meters (point A), is located at a range of 17 kilometers along the 600-mil azimuth line. This hill can mask an aircraft. Also, the 700-meter high hill (point B) at 23 kilometers range will mask an aircraft along the 600-mil azimuth line. Draw a map profile line every 200 mils in azimuth for the full 6400 mils around the radar.

WORK SHEETS

The Modified 4/3 Earth Curvature Work Sheet on page G-4 is a graphic representation of the curve of the earth's surface modified to reflect the propagation characteristic of RF energy. In free space, RF energy travels in a straight line. In the earth's atmosphere, however, the energy travels in a slightly curved path. Due to this beam curvature, a radar detects targets as if they were flying above an earth having a radius 1/3 larger than it actually is. This is how the term "4/3 earth curvature" came about.

When filled in, as shown in the Modified 4/3 Earth Curvature Work Sheet, a 4/3 earth curvature diagram represents the profile of the radar detection capability along a specific azimuth from the radar. Terrain features (heights and depressions) are plotted on the diagram in terms of range and altitude (l). Also plotted

MAP PROFILE



are the radar's location (2), radar baseline elevation(3), radar line of sight(4), and target course line(5). When these data are plotted on the diagram, radar dead zones (6), target detection ranges (7), and radar mask angle (8) can be seen. All of these terms will be explained in the following pages.

The radar coverage diagram work sheet is a polar coordinate chart. When filled in, this work sheet becomes the radar coverage diagram. The chart has radial lines every 200 mils from its center to its outer circle. For Hawk use, the circles represent 110 kilometers in 5-kilometer increments.

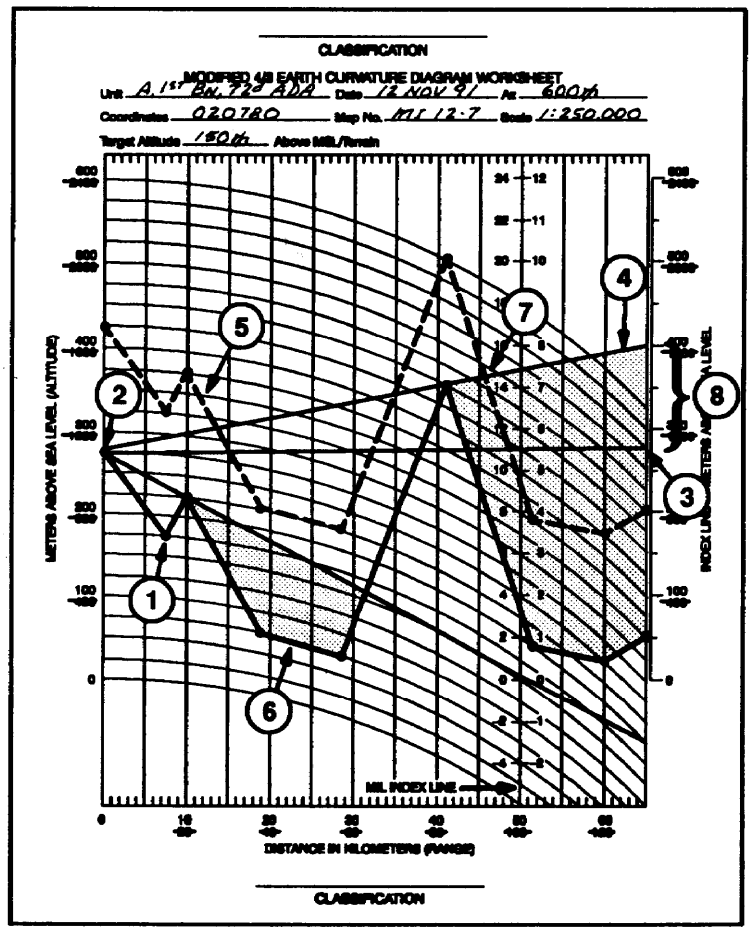
RANGE DETECTION NOMOGRAM

The Horizontal Range Detection Nomogram illustration (page G-5) is used with the hasty method of coverage diagram preparation. It approximates target detection range(s). To use the nomogram target, threat altitude and radar mask angle must be known. Target threat altitude will be listed in your TSOP. It will usually be 50, 150, or 300 meters above terrain. Mask angle is found by using an aiming circle to make a 4/3 earth curvature diagram.

The left side of the nomogram shows target threat altitude. It has two scales: 0 to 12,000 meters in 1,000-meter increments and 0 to 1,200 meters in 100-meter increments. The right side of the nomogram shows mask angle. It is scaled from +50 mils to -20 mils. The center lines on the nomogram show target detection range in meters. The target detection range section of the nomogram also uses two scales: 0 to 300,000 meters and 0 to 30,000 meters.

To use the nomogram, lay a straightedge from the target threat altitude on the left to the mask angle on the right. Read the detection range from one of the center range lines. (If the O to 12,000-meter threat altitude scale is used, read range on the 0 to 300,000-meter range line. If the 0 to 1,200-meter altitude scale is used, read range on the 0 to 30,000-meter range line.) An example of how to use the nomogram is shown on the Horizontal Range Detection Nomogram illustration.

MODIFIED 4/3 EARTH CURVATURE WORK SHEET



CHOOSING THE METHOD

The three methods of preparing radar coverage diagrams are the—

- Deliberate method.
- Hasty method.
- Emergency method.

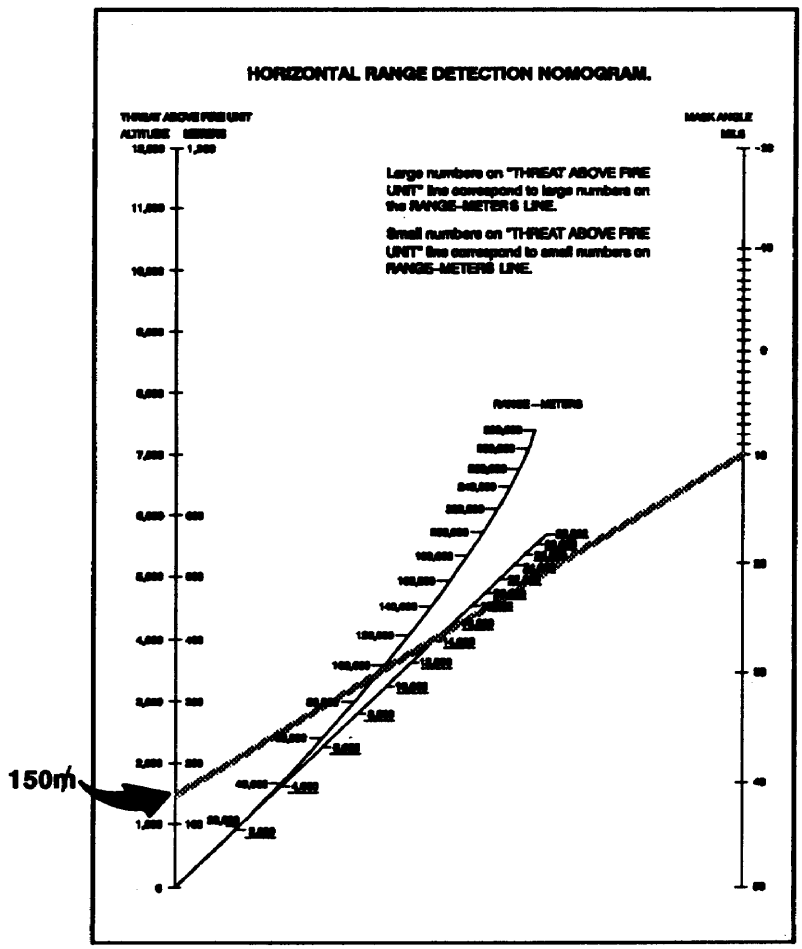
These methods differ in the accuracy of the final product and time of preparation.

The deliberate method is used to evaluate a potential position prior to occupying that position. It is as accurate as the maps of the area allow. It cannot account for close-in masking caused by trees, buildings, or other features not included on the map.

The hasty method provides the most accurate on-site position evaluation of terrain masking. It is the normal method used by Hawk units. However, it should be used in conjunction with the deliberate method when considering a NOE threat.

The emergency method is by far the least accurate and least time-consuming. It is used only when time and the situation demand an immediate evaluation of a position. The result is, at best, a rough approximation of radar coverage.

HORIZONTAL RANGE DETECTION NOMOGRAM



DELIBERATE METHOD

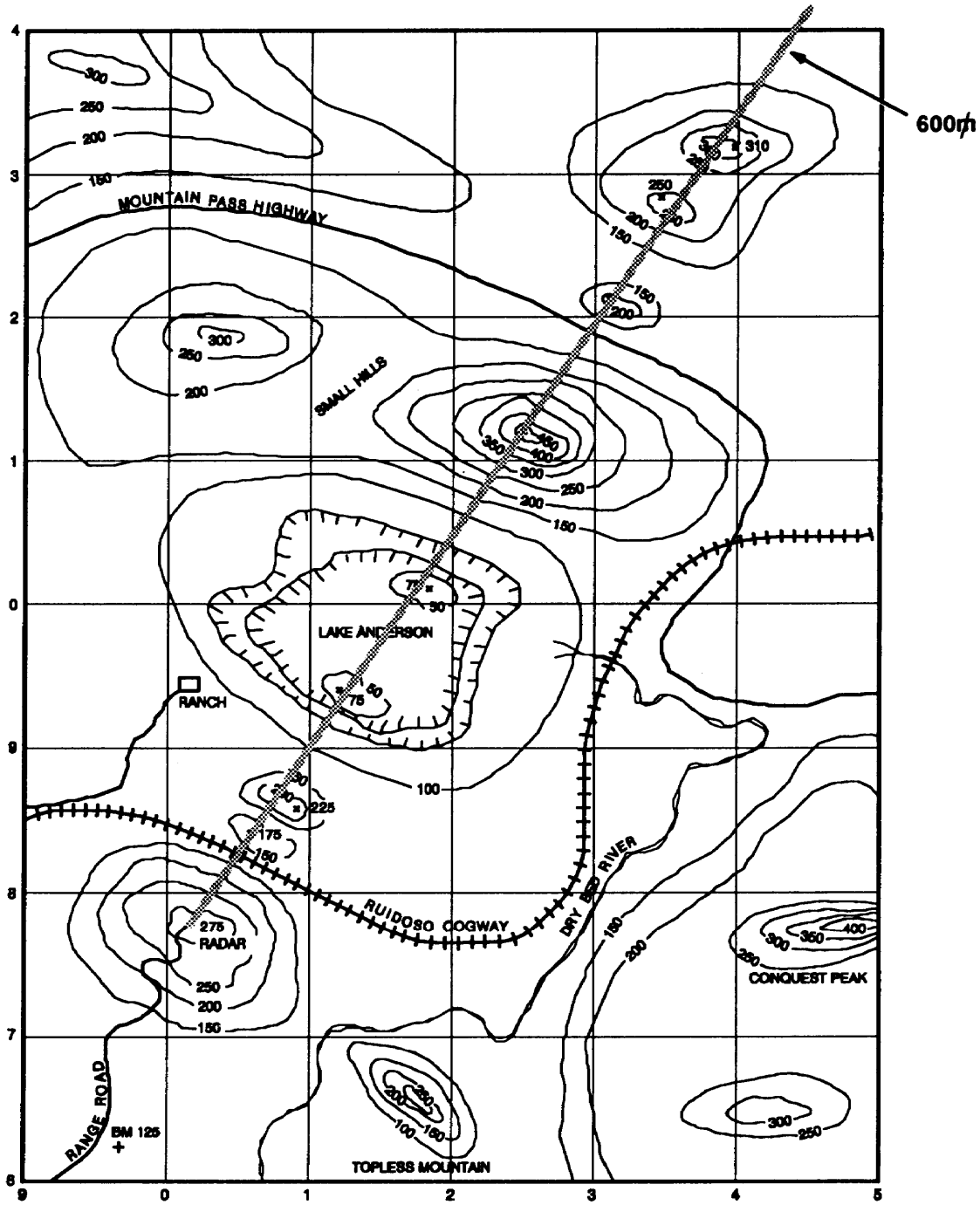
The step-by-step procedures listed here show how to prepare a radar coverage diagram using the deliberate method.

Step 1. Assemble the following necessary materials:

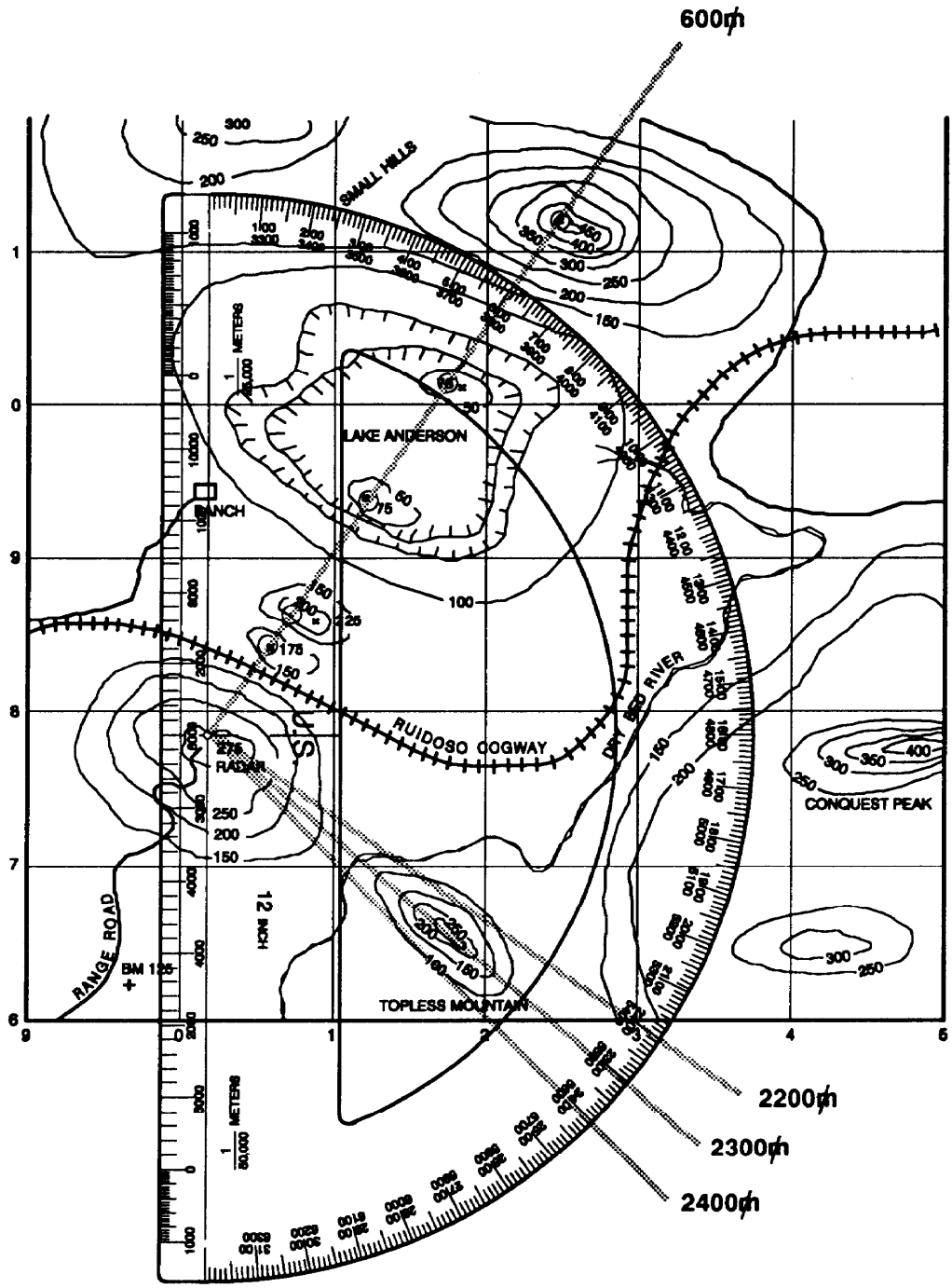
- Map of the area (scale of 1:250,000 or larger).
- Modified 4/3 earth curvature diagrams (one for each azimuth line to be plotted, usually 32).
- Radar coverage diagram work sheet.
- Pencils, paper, straightedge, and protractor (graduated in mils).

Step 2. Prepare the map. Reading to the right and up, plot the radar site on the map (see Map of Area illustration on page G-6). For this example, the coordinates of the proposed site are 020780. Using a protractor, orient on true north and place a pencil dot on the map every 200 mils around the position of the radar. Next, using a straightedge, draw radial lines from the radar through each dot (see Profile Lines on Map Example on page G-7). Label each radial line with its azimuth in mils (200, 400, 600, et cetera).

MAP OF THE AREA



PROFILE LINES ON MAP EXAMPLE



Step 3. Identify prominent terrain features. Look for high and low points along each radial line. Draw a circle around each prominent terrain feature you identify and label each one with a letter (A, B, C, et cetera), beginning with the circle nearest to the radar. If a prominent terrain feature is missed by a normal radial line, draw an additional radial line to intersect that feature. (In this example, an additional radial line had to be drawn at 2300 roils to include Topless Mountain.)

Step 4. Prepare a map profiIe line for each radial line drawn on the map. You will need a straightedge, a pencil, and for each radial line, a sheet of paper. Label each sheet of paper with the azimuth of the radial line it represents. (For this example, we used the 600-mil radial line.) Perform the following steps:

• Label the map profile line with the data you are going to plot: range in kilometers below the line, and altitude in meters above the line.

• Determine the elevation altitude of the radar site from the map contour lines. Label the left end of the map profile line "R" for radar, and write in the site elevation.

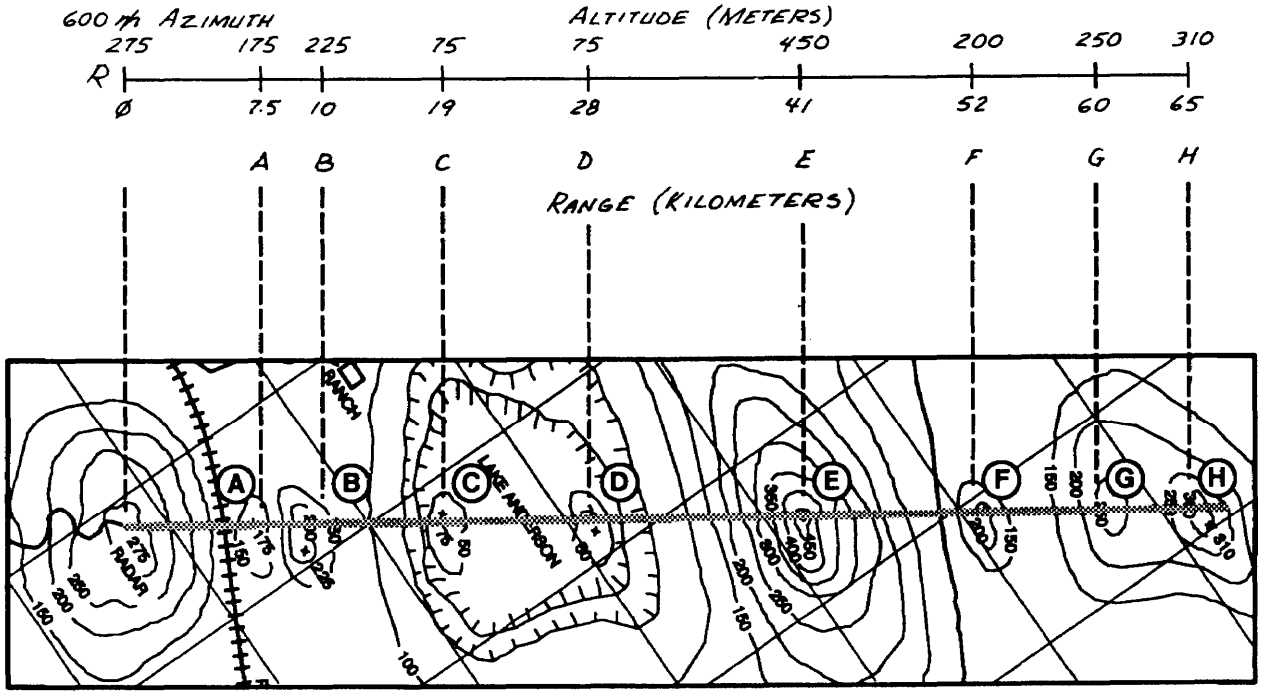
• Measure the range from the radar to the first prominent terrain feature circled on the 600-mil line. Use the distance scale in the map margin. Make a pencil mark at this range on the map profile line and label it with the range and the letter of the terrain feature ("A").

• Determine the elevation of the same terrain feature (again using the map contour lines) and enter it above the pencil mark you made for the range of the feature.

Repeat these procedures for each prominent terrain feature circled on the radial line. When you finish, the map profile line should look like the 600-Mil Radial Line illustration below.

Next, on a separate sheet of paper and using the same procedure, construct map profile lines for each of the radial lines you drew on the map. Label each sheet with the azimuth of the radial line and hold for future use.

600-MIL RADIAL LINE



Step 5. Construct a modified 4/3 earth curvature chart for each map profile line you prepared in step 4. You will need a blank modified 4/3 earth curvature diagram work sheet for each of the map profile lines you prepared. Look at the form and note that—

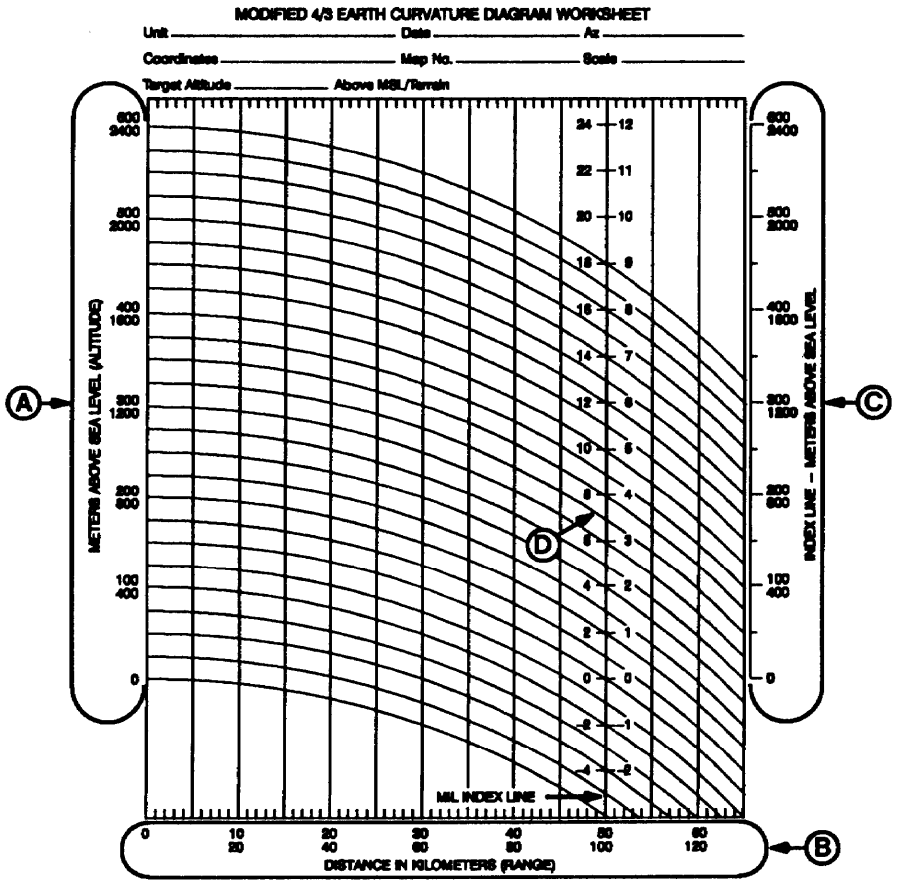
• Two sets of numbers are along the vertical line at the left side of the form. These numbers allow you to plot the elevation of the radar above sea level in one of two scales: 0 to 600 meters and 0 to 2,400 meters.

• Two sets of numbers are along the horizontal line at the bottom of the form. These numbers allow you to plot the range in one of two scales: 0 to 60 kilometers and 0 to 120 kilometers. (Use the smaller set of numbers on the range and altitude scales whenever possible. However, whichever set of numbers you use for one scale, you must also use for the other scale. In other words, if you use the smaller numbers on the altitude scale, you must also use the smaller numbers on the range scale.)

• At the right side of the form is a vertical line labeled "index line meters above sea level." The divisions of this index line have the same scale as those used for the "meters above sea level" line on the left side of the form. Using the smaller numbers, each index division shows 50 meters above sea level. With the larger numbers, each division is 200 meters above sea level.

• At the 50- and 100-kilometer range mark is a vertical line labeled "mil index line." It has two scales: -4 mils to 24 mils, -2 mils to 12 mils. These scales are used to determine the mask angle. The same set of numbers (smaller or larger) that you selected for the altitude and range scales must also be used for the mask angle. The illustration below is a sample of the modified 4/3 earth curvature work sheet.

MODIFIED 4/3 EARTH CURVATURE DIAGRAM WORK SHEET



Fill in the heading of each worksheet with the required information. Next, assemble all the map profile line sheets you prepared earlier. Put them in clockwise order from 0-mil azimuth (0 mils, 200 mils, 400 mils, et cetera).

Decide which set of scales (smaller or larger numbers) to use on the 4/3 earth curvature chart. If it is necessary to plot altitudes above 600 meters or ranges beyond 65 kilometers, use the larger numbers. If not, use the smaller numbers. (For this example, the smaller numbers are used.) Mark through the numbers not used.

Plot the radar on the 4/3 earth curvature chart as follows:

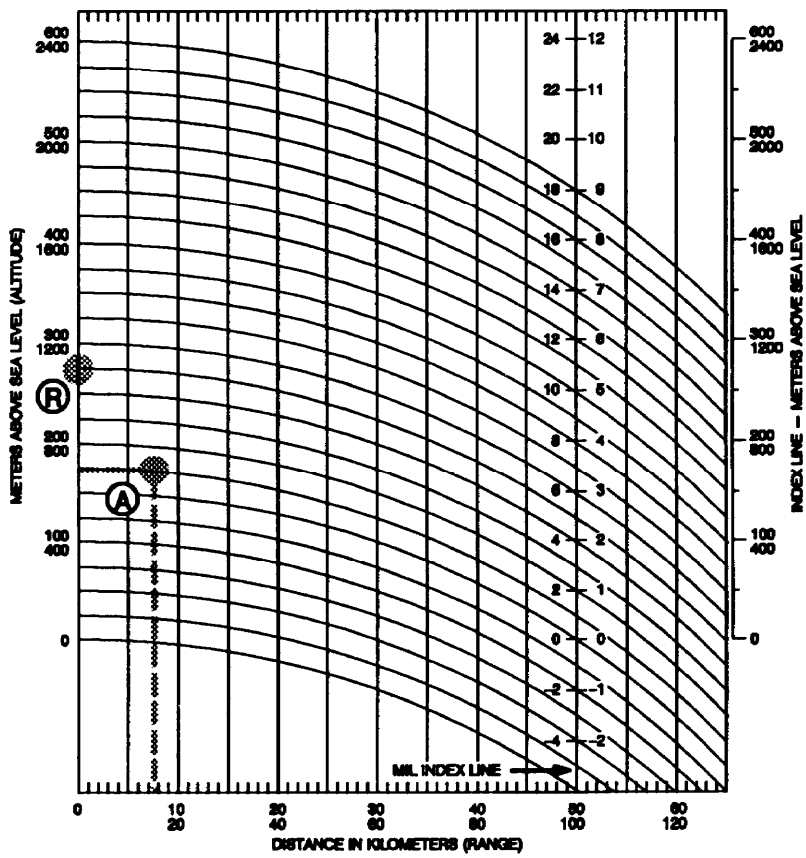
• Select the map profile line sheet for 0-mil azimuth. The radar is the starting point, so its range will always be 0 kilometers.

• Read the radar's altitude from the profile line (in this case, 275 meters).

• Mark the point on the 4/3 earth curvature chart corresponding to the 0-kilometer range and 275-meter altitude. Label this point R for radar (see Radar Plot Example below).

After you have plotted the radar, plot the position of each terrain feature recorded on the map profile line (refer to the 600-mil profile line on the map profile). The first prominent terrain feature(A) is at the 7.5-kilometer range and 175-meter altitude. Find the point corresponding to this range and altitude on the 4/3 earth curvature diagram. Mark and label it "A." In the same way, mark and label the remainder of the prominent terrain features from the map profile line on the 4/3 earth curvature chart.

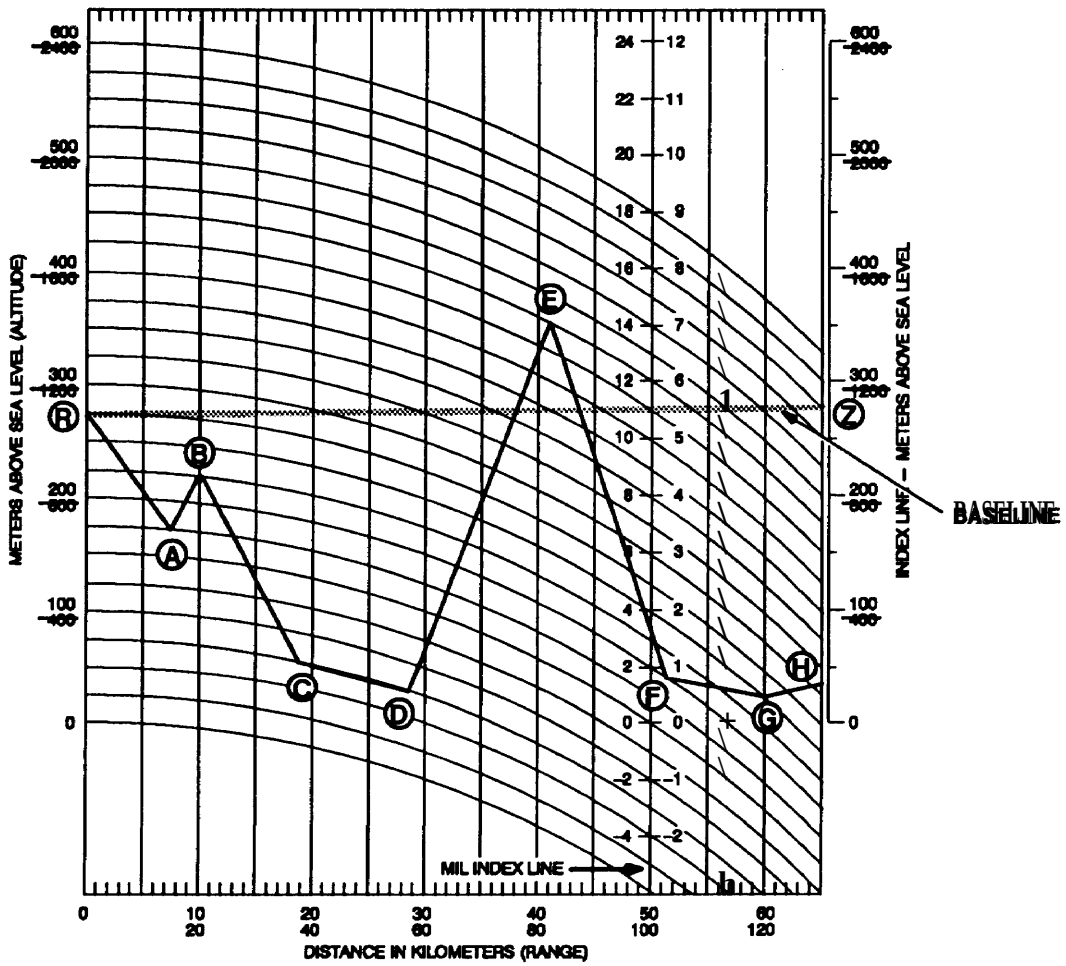
RADAR PLOT EXAMPLE



When you have all the terrain features from the 0-mil map profile sheet on the 4/3 earth curvature, connect the points with straight lines. Use a straightedge to draw a line connecting all or each pair of points in sequence (R to A, A to B, B to C, et cetera). You are now ready to construct the baseline. Mark the point representing the radar's altitude on the right side of the form in the same way as you did on the left side of the form. This point is on the "index line-meters above sea level." Label this point Z. Use a straightedge to draw a line connecting points R and Z. This is the baseline, as shown in the Baseline Example illustration below.

After drawing the baseline, you can determine the mask angle. Lay your straightedge along the "meters above sea level (altitude) line" on the left edge of the form. Using R as a pivot point, rotate your straightedge clockwise until it crosses a terrain feature. In the Mask Angle Example illustration (page G-12), the feature is E. Draw a line from R to this first terrain feature and extend it through the "index line-meters above sea level" line. The line you have just drawn represents the radar's line of sight.

BASELINE EXAMPLE

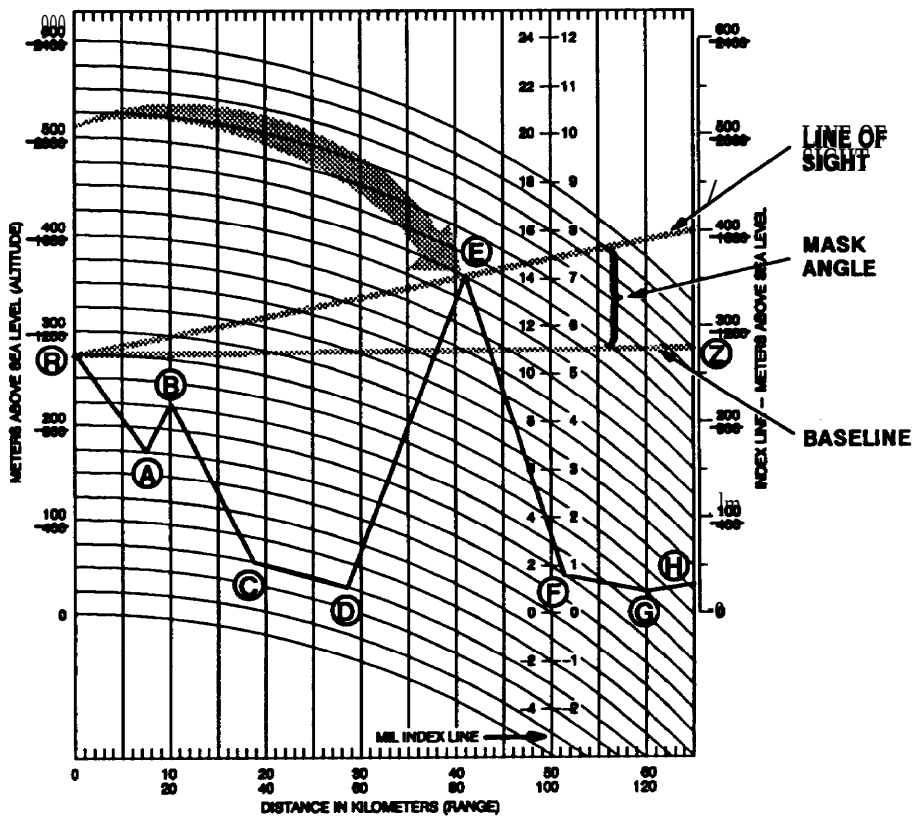


The distance between the points where the baseline (RZ) and the line of sight (RE) cross the "mil index line" represents the mask angle. To read the mask angle, place the edge of a blank piece of paper along the "mil index line." Mark the points where the baseline and the line of sight cross the "mil index line" on the edge of the paper. Slide the paper down the "roil index line" until the lower mark lines up with zero. Record the reading on the "mil index line" where the upper mark lines up with the scale. Be sure to use the same set of numbers (smaller or larger) throughout this process. If the radar's line of sight is above the baseline, the mask angle is positive; if the line of sight is below the baseline, the mask angle is negative. (In the Mask Angle Example illustration below, the mask angle is + 1.8 mils.)

Now you will construct target course lines. First, determine the target altitudes which your coverage diagrams will represent. As stated before, target altitudes are usually 50, 150, or 300 meters. These altitudes can be MSL or AGL values. (This example uses altitudes of 50, 150, and 300 meters AGL.)

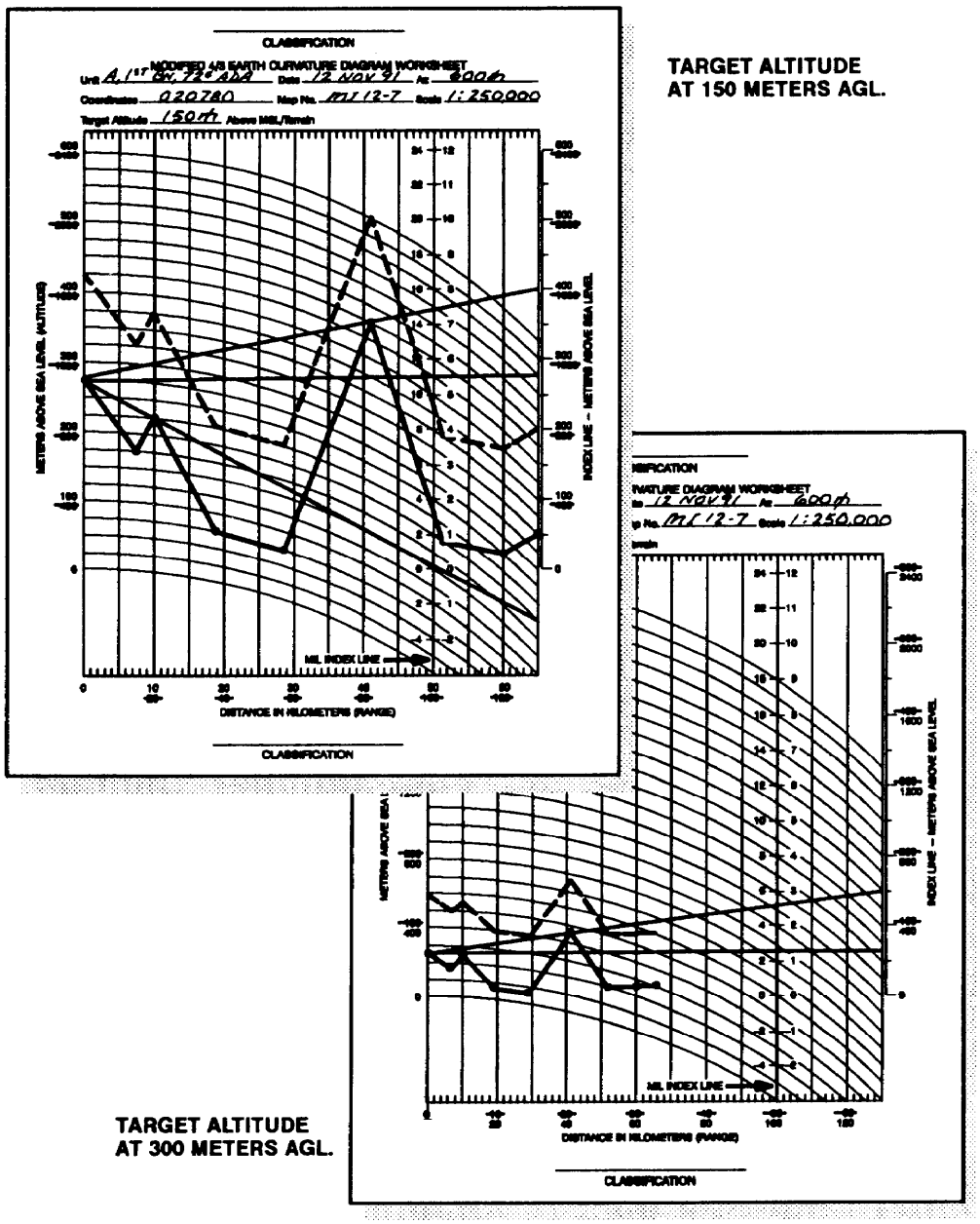
On the "meters above sea level" line on the left of the chart, locate the point corresponding to target altitude. Assume, for example, an altitude of 50 meters AGL. Target altitude is then 50 meters above the radar. In this case, 325 meters since the radar is 275 meters above sea level and the target is 50 meters above that, the target altitude will be 325 meters above sea level. Mark the target's altitude, with a dot, 50 meters above each of the prominent terrain features. Using a straightedge, connect each of the pencil marks in sequence with a dashed line. This is your first target course line. It represents an aircraft flying at a constant altitude above the terrain on a constant heading. In this example, the aircraft flies 50 meters AGL at a heading of 600 mils.

MASK ANGLE EXAMPLE



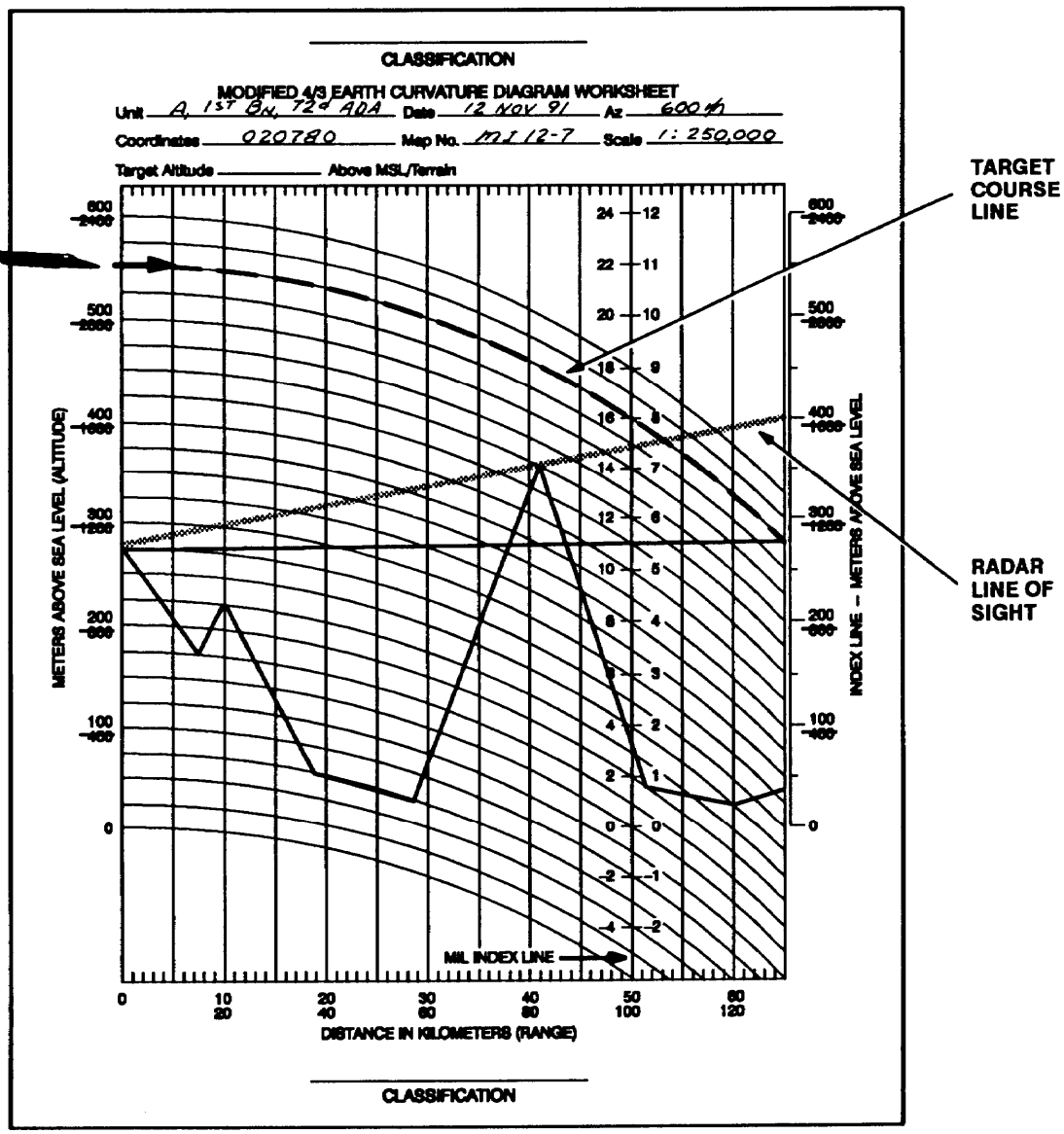
Draw target course lines for each target altitude you want shown. Illustrated in the following diagram below are examples of 150- and 300 meter target altitude course lines. Note in the 300-meter example that the target course line has been plotted using the larger numbers on the "meters above sea level" line. Because of the nature of the terrain, the target course line was too high to be plotted using the smaller numbers.

150- AND 300 -METER COURSE LINES



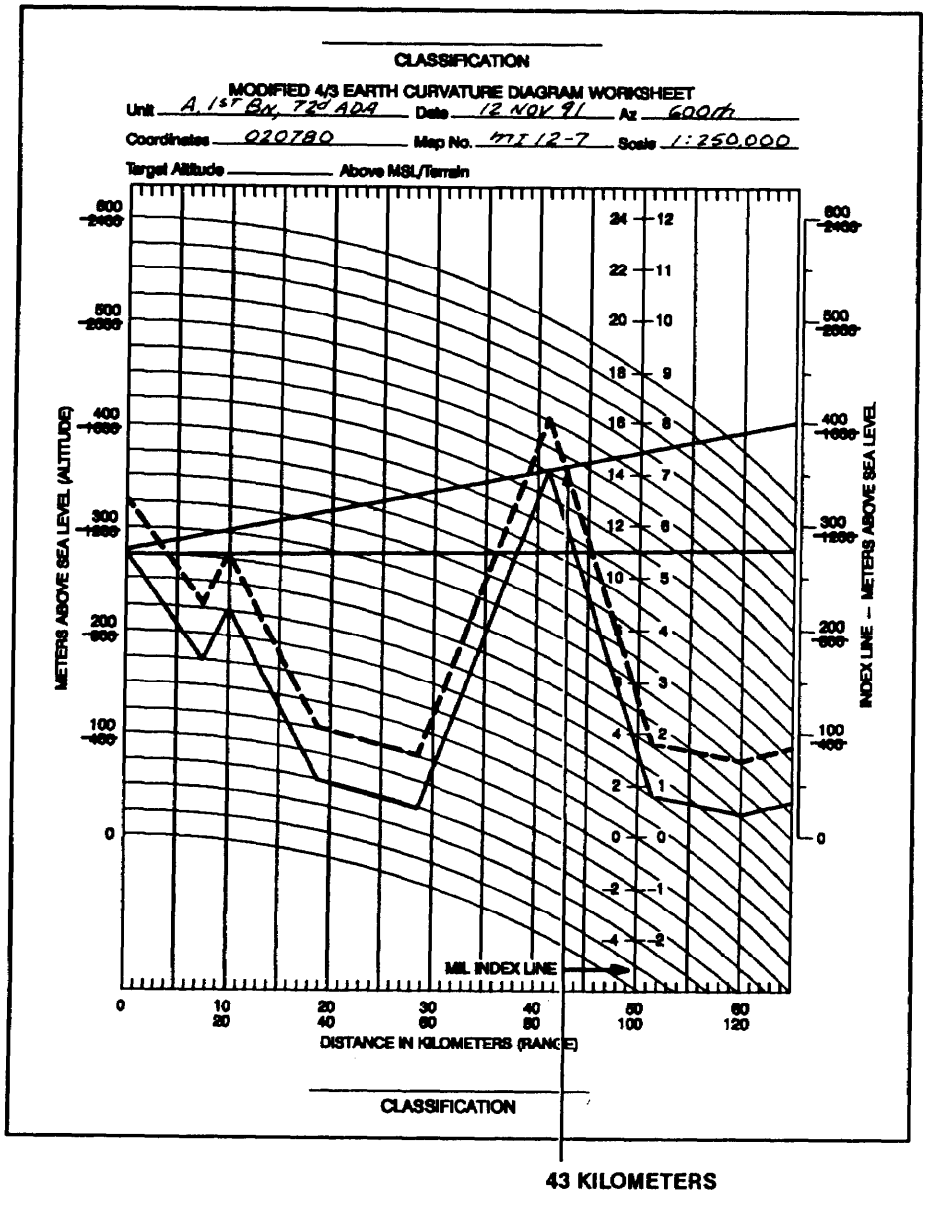
These examples have been target course lines for aircraft flying at fixed altitudes above terrain or constant AGL. If the aircraft flies a course at a fixed altitude above mean sea level or constant MSL, the plot will be different. In this case, the target course line is the curved line on the 4/3 earth curvature diagram at the altitude of the target. In the 550-Meter Course Line diagram below, the aircraft course is at 550 meters MSL.

550–METER COURSE LINE



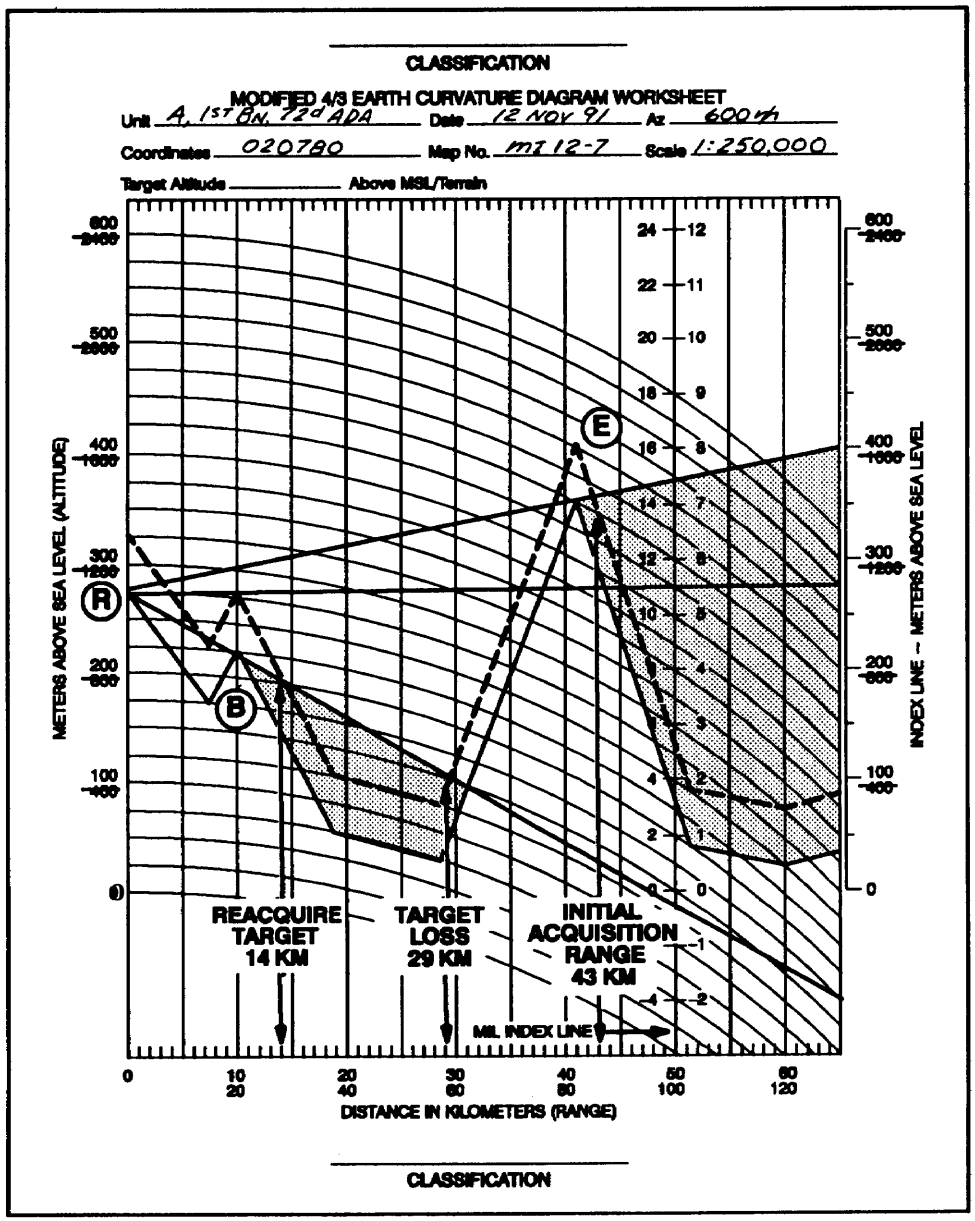
With target course lines drawn, you can now determine the target acquisition point (see Early Aquisition Range diagram below). Find the point on the 4/3 earth curvature chart where the radar line of sight crosses the target course line. Read the acquisition range directly below this point on the range scale at the bottom of the chart. Remember to use the correct set of numbers. This is the acquisition range for an aircraft flying at a specific altitude, either AGL or MSL, on the freed heading. For the 600-mil azimuth example, at 50 meters AGL the target acquisition range is 43 kilometers, 150 meters AGL is 47 kilometers, and 300 meters AGL is 52 kilometers. At 550 MSL, on the same heading, target acquisition is at 54 kilometers.

EARLY ACQUISITION RANGE



The last procedure you must perform in using the deliberate method, prior to constructing the coverage diagram itself, is to identify "radar dead zones." Radar dead zones are volumes of airspaces which are masked from the radar's view by terrain features (see Radar Mask Example diagram below).

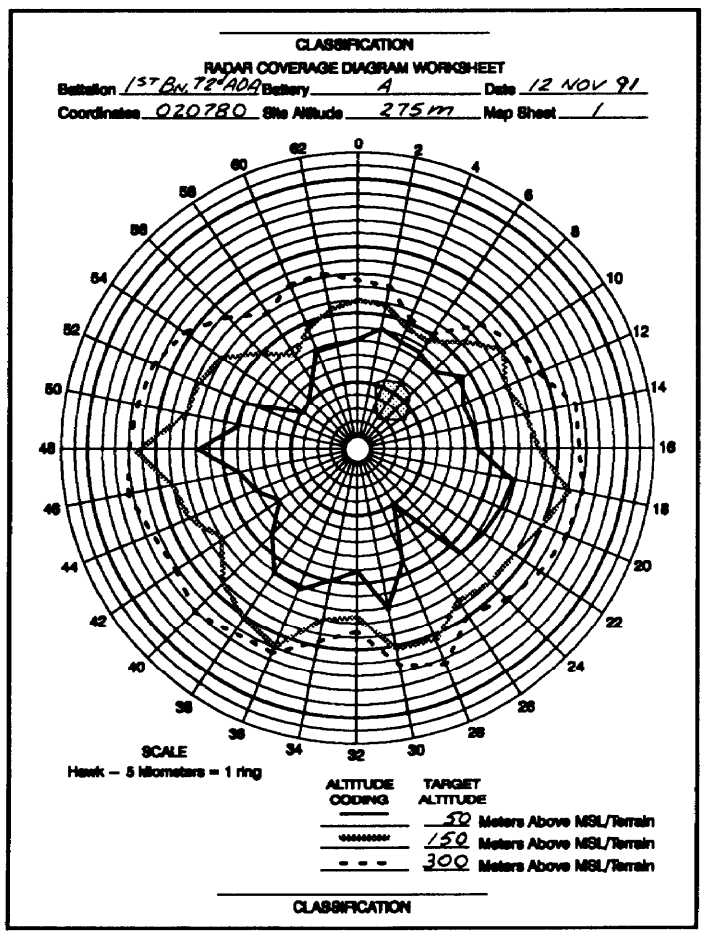
RADAR MASK EXAMPLE



In the radar mask example on page G-16, an aircraft flying at 50 meters AGL is hidden from the radar's view by terrain feature E at ranges beyond 43 kilometers, or beyond the target acquisition range. Using R as a pivot point, pivot a straightedge clockwise from the radar line of sight until it intersects the next terrain feature (point B). Draw a line connecting point R to this terrain feature. Extend the line to the right side of the chart. Repeat this procedure for all other prominent terrain features along the azimuth line. Shade in the areas hidden from the radar's view. These shaded areas represent radar dead zones (see the Dead Zone Plot Example illustration below) produced by terrain features, along a particular azimuth line.

Read the range scale at the bottom of the chart to find the ranges at which the target will be lost and then reacquired. In this example (600-meter azimuth and 50-meter AGL), the aircraft will first be detected at 43 kilometers as it clears feature E. It will remain visible until it enters the radar dead zone caused by feature B at 29 kilometers. It will not be visible until it emerges from this dead zone at 14 kilometers, but it will then remain visible until it crosses over the radar site. You must repeat this entire process for each of the 4/3 earth curvature diagrams, one for each of the azimuths originally plotted.

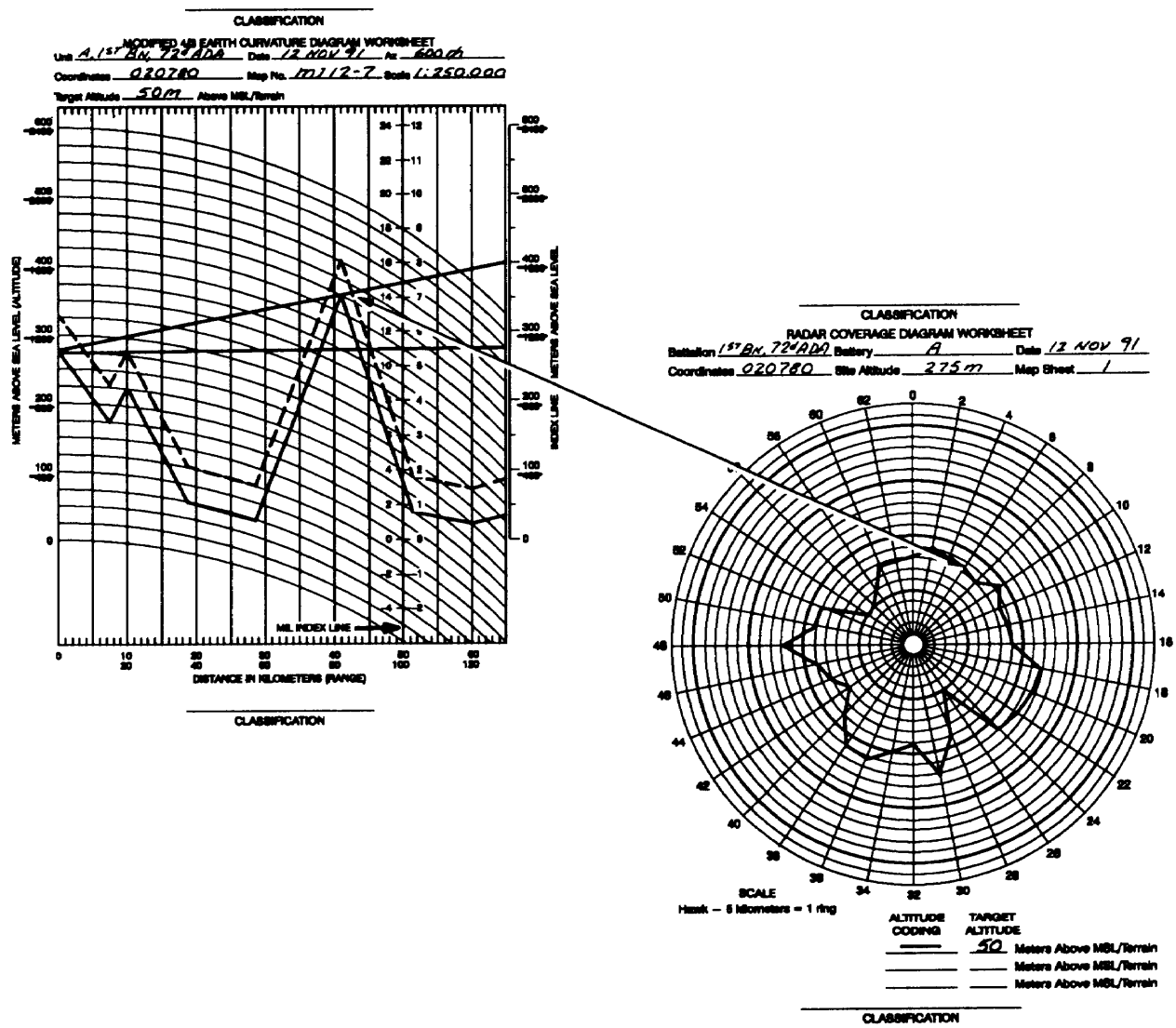
DEAD ZONE PLOT EXAMPLE



Step 6. Construct the radar coverage diagram. Now that you have completed all of the previous steps, you are ready to perform the last step of the deliberate method--constructing the coverage diagram itself. Start with a blank radar coverage diagram work sheet and fill in the heading. Next, select a method of distinguishing different target altitudes on the diagram. For instance, plot SO-meter AGL targets in red, 150--meter targets in black, and 300-meter targets in blue.

Beginning with the work sheet for the 0-MIL azimuth line, transfer the information from each 4/3 earth curvature work sheet to the radar coverage diagram work sheet. The 600-mil azimuth line is again used as an example (see the 4/3 Curvature and Radar Coverage Relationship diagram).

4/3 CURVATURE AND RADAR COVERAGE RELATIONSHIP

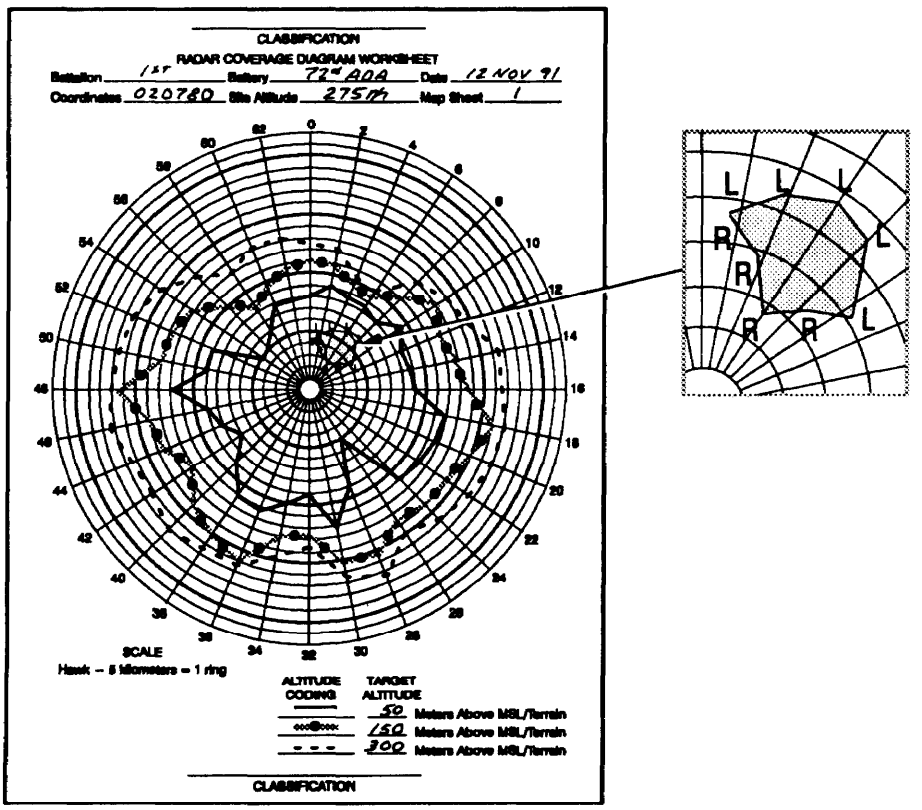


Start with the 50-meter AGL target course line. Read the initial target acquisition range from the 4/3 earth curvature chart and record it on the appropriate azimuth line of the coverage diagram worksheet (43 kilometers at 600 mils azimuth). Repeat this process until you have transferred the initial target acquisition range for each of the 4/3 earth curvature charts to the coverage diagram work sheet. Using a straightedge, sequentially connect all the points plotted. The resulting graph (the Clutter/Coverage Diagram illustration below) now shows the initial target acquisition range for a 50-meter AGL target approaching from any azimuth.

Next, plot the radar dead zones caused by terrain masking inside the initial acquisition range. From each 4/3 earth curvature chart, find the range at which the target is lost behind a mask (29 kilometers in the 600-mil example). Plot this range on the appropriate azimuth line on the coverage diagram work sheet. Label each of these plots with an L to identify them as points where the target is lost. Perform this same process to plot the ranges at which the target is reacquired as it clears the masking terrain. Label each of these points with an R. Connect the L points and the R points for the same terrain feature. (It may be helpful here to refer to the topographic map to identify the particular terrain feature.) The Land R lines should intersect. The enclosed area is the radar dead zone caused by a particular terrain feature.

Repeat this process for each target altitude to be included on the coverage diagram. The end product will be a radar coverage diagram showing the radar's ability to detect, aquire, and track targets flying at the selected altitudes. Finally, determine the security classifiction of the complete radar coverage diagram, stamp it, and handle it according to applicable regulations.

CLUTTER/COVERAGE DIAGRAM



HASTY METHOD

The hasty method of radar coverage diagram construction is most often used when the radar site is evaluated by the unit RSOP party. It is the normal method for use by Hawk fire units. Shown below is the step-by-step procedure for constructing hasty radar coverage diagrams.

Step 1. Assemble the necessary materials:

- M2 aiming circle.
- Horizontal range detection nomogram.
- Radar coverage diagram work sheet.
- Hasty coverage recording work sheet.
- Pencils, paper, and a straightedge.

Step 2. Setup the M2 aiming circle. Emplace the aiming circle on the site selected for the radar as follows:

- Emplace the aiming circle and orient it to true north. (Appendix D provides instructions on the use of the aiming circle.)
- Sight through the telescope and, using the elevation micrometer knob, adjust the aiming circle in elevation until the telescope cross hairs intersect the top of the highest terrain feature visible at that azimuth.
- Read and record the mask angle, as shown on the aiming circle's elevation scale.
- Using the azimuth micrometer knob, rotate the aiming circle to an azimuth of 200 mils.
- Repeat this measuring process every 200 mils for the full 6400 mils around the radar.

A sample recording worksheet is shown below in the following illustration. If a high terrain feature is missed in your normal 200-mil radial measurements, shoot another azimuth to intersect this point.

HASTY COVERAGE RECORDING WORK SHEET

TGT ALT. 150m AGL

HASTY COVERAGE RECORDING WORKSHEET

Battalion 1ST BN, 72d ADA Battery ALPHA Date 12 NOV 91

Coordinates 020780 Site Altitude 275m/h Map Sheet 1

AZIMUTH	MASK ANGLE	UNMASK RANGE
0	1	55,000
200	2	53,000
400	2.5	47,000
600	2.5	46,000
800	0	56,000
5,600	2.5	50,000
5,800	3	43,000
6,000	2.5	47,000
6,200	2	53,000

Step 3. Determine the unmask range for each 200-mil azimuth line:

• Determine the target altitudes to be used to construct the coverage diagram. (This example used 150 MSL.)

• Mark the target altitude (150 meters) on the "threat above fire unit" line of the horizontal range detection nomogram (see the Threat Above AFP Line illustration on page G-22). Zero on this line represents the altitude of the radar.

• Mark the measured mask angle for the appropriate azimuth on the mask angle line of the nomogram. The example uses the 600-mil azimuth line, and the determined mask angle is 10 mils.

• Using a straightedge, draw a line connecting the target altitude and mask angle marks.

• Read the target unmask range from the range scale in the center of the nomogram. Be sure to use the correct set of numbers for all recordings and plottings. For this example, the target unmask range is 14,000 meters.

• Repeat this process for each 200-mil azimuth line. Record the unmask angles on the recording work sheet. If different target altitudes must be considered, the process must be repeated for each altitude.

Step 4. Complete the radar coverage diagram with information from the recording work sheet as follows:

• Fill in the coverage diagram work sheet heading.

• For each azimuth, mark the determined unmask range with a dot.

• Using a straightedge, connect the dots in sequence. The resulting graph is the radar coverage diagram for the target altitude being considered.

Step 5. Repeat the process for each target altitude to be graphed on the coverage diagram. Determine the complete diagram's security classification, stamp it, and handle it according to applicable regulations.

EMERGENCY METHOD

The emergency method of coverage diagram construction is used when an immediate evaluation of a site is required and time or the situation prohibits use of the hasty or the deliberate method. The emergency method provides an estimated radar detection range in all directions from the radar for a target flying a 50-meter AGL. The results are an approximation of radar coverage. Emergency coverage diagrams should be replaced with diagrams arrived at by the hasty or deliberate method as soon as Possible. To use the emergency method, follow the steps below.

Step 1. Assemble the necessary materials:

• A large scale (1:250,000 or larger) topographic map of the area.

• Radar coverage diagram work sheet.

• Pencils, paper, straightedge, and a protractor graduated in mils.

Step 2. Identify prominent terrain features:

• Plot your radar's location on the map.

• On the map, identify and mark prominent terrain features that could mask an approaching aircraft from the radar.

Step **3.** Measure the azimuth and range from the radar to each marked terrain feature as follows:

• Using a straightedge, draw a line from the radar site to each marked terrain feature.

• Using the protractor, measure and record the azimuth of each radar-to-terrain feature line on the map.

• Using the map scale, measure the range from the radar to each marked terrain feature. Add 3 kilometers to each measured range and record. This will be the approximate initial acquisition range.

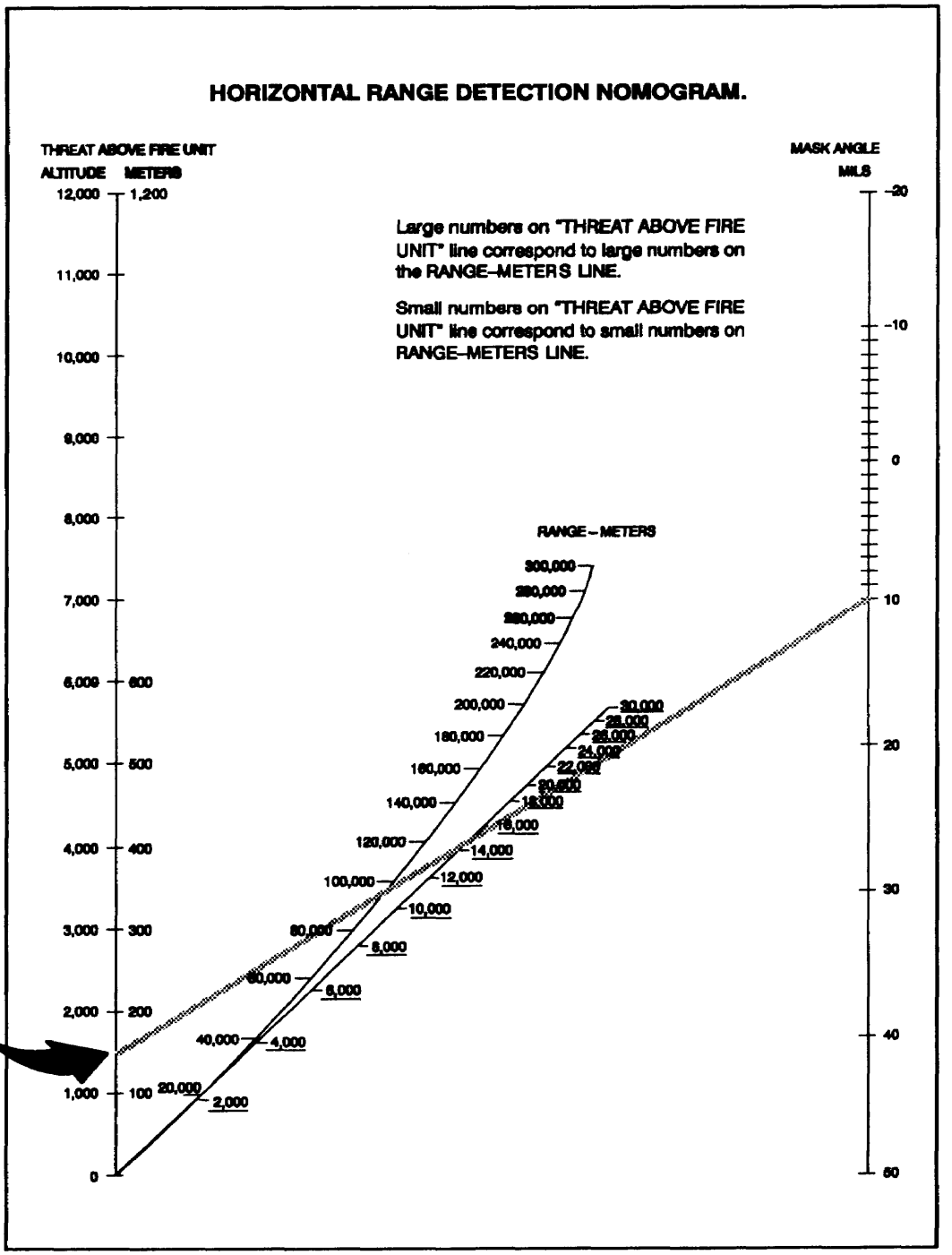
Step 4. Construct the coverage diagram as follows:

• Transfer the range information obtained in step 3 to the radar coverage diagram work sheet by placing a dot at the appropriate location on each 200-mil azimuth line.

• Using a straightedge, draw straight lines connecting the dots in sequence.

Step 5. Determine the security classification of the completed radar coverage diagram, stamp it, and handle it according to applicable regulations.

THREAT ABOVE AFP LINE



APPENDIX H

Intelligence Preparation of the Battlefield

Conducting a well-planned intelligence preparation of the battlefield (IPB) is fundamental to the execution of the air defense artillery mission in AirLand Battle doctrine. It is essential that the Hawk platoon leader visualize what the enemy ground force commander is looking at, to predict when and where he will use his aviation to support his ground operations.

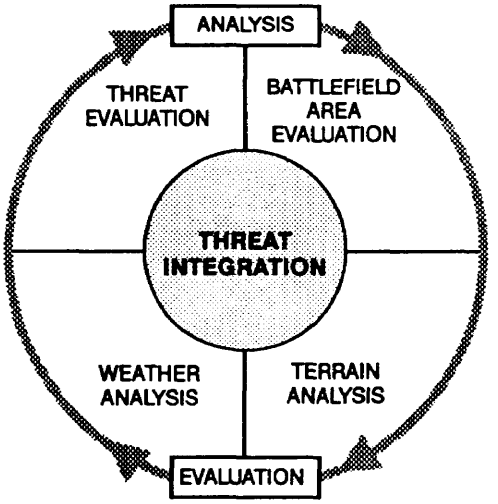
It is important to realize that IPB has different uses. For the ADA brigade, battalion, and Hawk battery commanders, it is a tool by which they can visualize the battle, For the Hawk battery commander and platoon leader, it is used to position their fire units to kill enemy aircraft.

OVERVIEW

IPB is an analytical methodology employed to reduce uncertainties concerning the enemy, weather, and terrain for all types of operations. Without first obtaining and analyzing the ground IPB, the analysis of enemy aerial activity is impossible. The enemy air attack is tied to the ground attack. This appendix dicusses those planning steps that need to be taken to perform an analyis of the aerial dimension of the IPB. The IPB process is depicted in the following illustration.

BATTLEFIELD AREA EVALUATION

IBP PROCESS



The first step in the IPB process is to define the area of interest (AI). The AI for the aerial dimension of the IPB begins with the location of the enemy's freed aviation and tactical ballistic missile (T'BM) facilities and stretches past the FLOT to a maximum depth to which enemy aviation can fly, or fire TBMs into the army forces rear areas. The AI is not confined to the supported unit's boundaries. Aviation can approach from outside the defended sector rather than approach on likely ground avenues of approach. IPB should answer the basic questions of who, what, when, and how. The area of interest varies by type organization as shown in the illustration on page H-2.

CONTENTS

AREAS OF INTEREST

ORGANIZATION	OPPONENT	DEPTH OF AI	WIDTH
DIVISION	ARMY	RW AIRFIELDS AND FIXED TBM SITES TO DEPTH OF 240 KM	METT-T
CORPS	FRONT	ENEMY AIRFIELDS AND FIXED TBM SITES TO CORPS REAR	METT-T

The S2 must also depict the area of operations (AO). The AO is a geographical area where the commander has been assigned the responsibillity and authority to conduct military operations.

Priority intelligence requirements (PIRs) must be defined by the commander to identify critical intelligence gaps. Any activity or characteristic that occurs within the battlefield that significantly impacts on the commander's tactical decisions should be a PIR. Example PIRs are:

- When and where will the enemy attack?
- Where are TBM freed sites located?
- Where is the enemy's main reconnaissance effort?
- Will the enemy employ chemicals in the brigade sector?

TERRAIN ANALYSIS

Terrain analysis is the process used to reduce uncertainties regarding the effects of natural and man-made terrain on military operations. The aerial terrain analysis_ which will identify low-altitude aviation routes into the defended sector in depth, must be superimposed on the ground terrain analysis for the S2 to visualize the air battle. Terrain analysis must be performed throughout the depth of the defended sector, from the FLOT to the supported unit rear boundary.

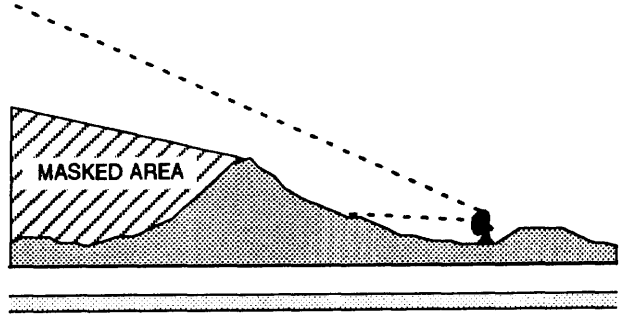
During the terrain analysis the S2 determines where possible enemy drop zones, landing zones, standoff attack orbits may be used and where the low-altitude avenues of approach are likely. These areas are determined using the OCOKA (observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach) method. OCOKA also addresses the terrain's effects on friendly ADA systems and threat aircraft.

To determine enemy air avenues of approach, first find the enemy air staging area. Next, determine probable targets enemy aircraft would attack. Fixed-wing air will take a relatively direct route using valleys and low areas perpendicular to the Flot or flanks between these two points due to the limited fuel on board and the amount of ordnance being carried. Rotary wing aircraft would use low-altitude avenues of approach to the flanks and to the rear of friendly forces. The key variables on the enemy air avenue of approach are METT-T factors and friendly ADA sites. In aerial IPB, the importance of predicting enemy air avenues of approach is paramount.

In Hawk units the platoon leader or the battery commander must next make a line of sight (LOS) overlay. The LOS overlay will determine the ADA fire unit's line of sight against enemy aircraft attacking into sector (see illustration below).

Enemy TBMs and aircraft involved in the independent air operation are generally not subject to terrain restrictions. To determine AA for these threats, the S2 must first determine the likely flight profiles. In the case of TBMs ranges, circular error of probabilities (CEPs) and routes to friendly targets must be determined.

LINE OF SIGHT FOR MASKED TERRAIN



WEATHER ANALYSIS

To determine when the enemy will most probably use his aviation, the analyst must next determine the effects of visibility and ceiling, wind speed, precipitation, temperature, and illumination on the threat and on the friendly force's ability to conduct aviation operations. An example of the weather variables' impact on aviation operations is shown in the matrix in the illustration below.

Weather has a limited effect on **TBMs.** However, the enemy may find it easier to use TBMs without the threat of interdiction when weather conditions inhibit friendly air operations.

THREAT EVALUATION

In the threat aviation evaluation phase, doctrinal templates are used. Doctrinal templates indicate how the enemy would fight if there were no weather or terrain restrictions. During this phase, enemy order of battle files are updated and organized. Order of battle factors include capabilities of enemy aircraft, command and control procedures, tactics, and organization of units.

In aerial IPB, attack profiles are used to predict the phases and type of fixed- and rotary-wing aircraft used in the air operation. It also depicts probable air-to-surface missile (ASM) and surface-to-surface missile (SSM) flight patterns. The Attack Profile Template illustration on page H-4 depicts the different aircraft missions and types of aircraft used in a typical air operation. The vertical bar on the left of the graph indicates the relative altitudes above ground level (AGL) at which the aircraft will fly. The horizontal line on the bottom of the graph depicts the time (in minutes) it takes the aircraft to reach friendly forces. Therefore it depicts the air attack in time and space.

This graphic enables the Hawk air defender to prioritize the air targets. By using the specific parameters such as AGLs, heading, and or speed, a priority for engagements can be established.

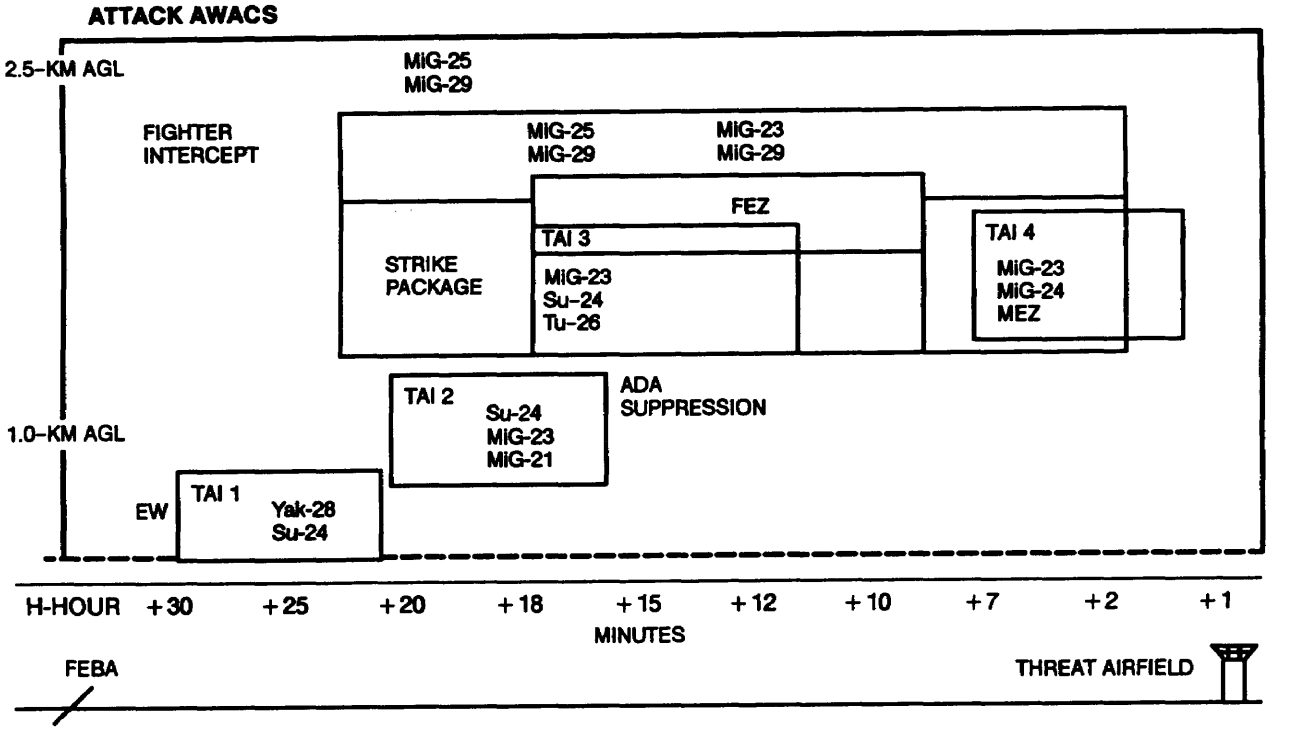
The HIMAD air defender can use this profile to determine the order of the attack aircraft. It is essential that HIMAD air defenders know the order of the aircraft missions and the types of aircraft used.

WEATHER VARIABLES' IMPACT ON AVIATION OPERATIONS

TYPE AIRCRAFT	MINIMUM VISIBILITY AND CEILINGS	WIND SPEED AND DIRECTION[1]	PRECIPITATION	TEMPERATURE AND HUMIDITY[2]	ILLUMINATION[3]
FIXED-WING	5-KM VISIBILITY 2.5-KM AGL CEILING IN HILLY TERRAIN 1.0-KM AGL CEILING IN FLAT TERRAIN	FOR PARACHUTE OPS SPEED MUST BE < 13 KNOTS	SEVERE WEATHER WITHIN 4.83 KM OF TGT WILL HINDER ACQUISITION FREEZING RAIN GREATLY LIMITS LIFT ABILITY	TEMP > 100°F AND HUMIDITY < 80% WILL DEGRADE PAYLOAD CAPACITY	LITTLE AIR TO AIR OR POINT CAS CAPABILITY AT NIGHT EXCEPT FOR NEWEST FW AIRCRAFT
ROTARY-WING	1.85-KM VISIBILITY .9-KM AGL	FOR AIRMOBILE OPS SPEED MUST BE < 30 KNOTS	SAME	SAME	NO CAS WITHOUT ILLUMINATION EXCEPT NEWEST RW AIRCRAFT

Notes:
1. Strong perpendicular winds to air avenue of approach increases difficulty in hitting target.
2. Amount of degradation differs with type aircraft.
3. Newer FW aircraft are Foxhound, Fulcrum, and Frogfoot; newer RW aircraft are Havoc and Hokum.

ATTACK PROFILE TEMPLATE



The next illustration on page H-5 is an RW attack profile template. The vertical bar on the left of the graph shows the expected altitude (above ground level) the RW aircraft are expected to fly. The horizontal bar at the bottom of the graph presents the distance from the enemy airfield to the friendly forces. There are different profiles for each mission and each aircraft.

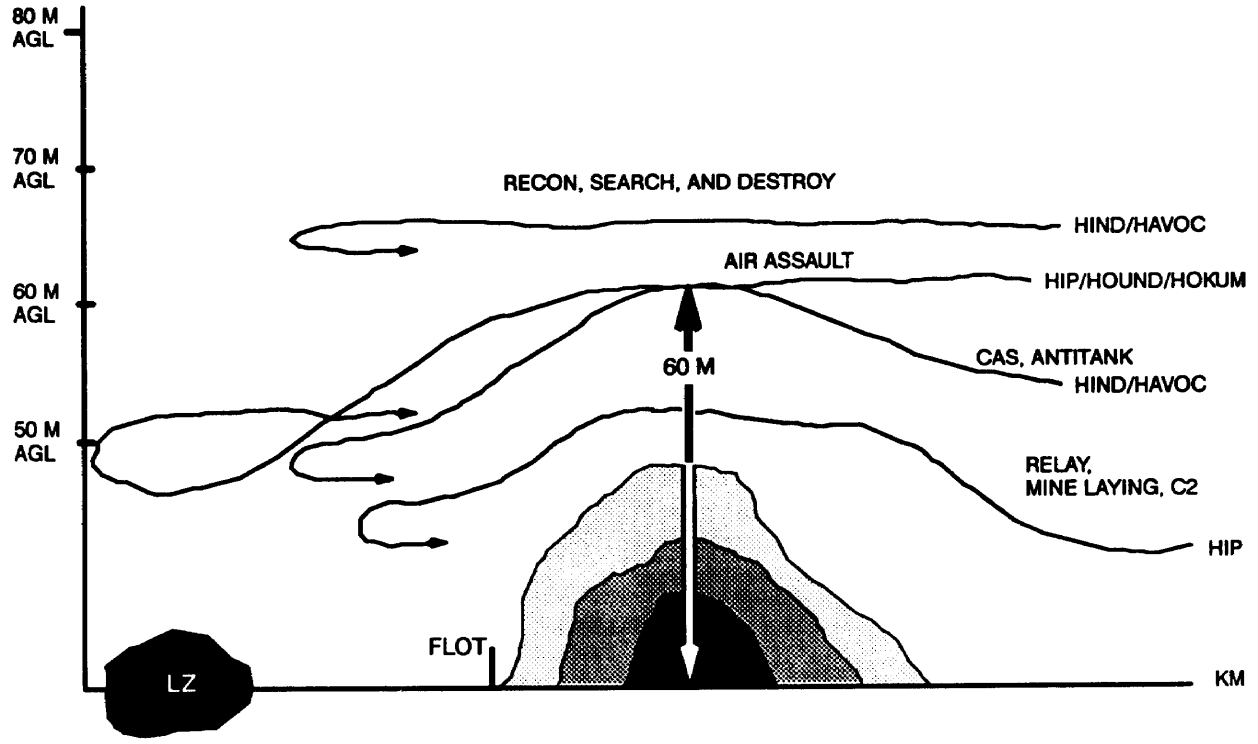
The HIMAD air defender can use the profile to predict the type of mission an incoming aircraft maybe attempting. For example, if a single Hip flies in at nap-of-the–earth altitude, most likely the mission is laying mines, relaying information to another element, or using command and control to direct another aircraft.

Most information on TBMs will come from a national red-time source. However, the ADA S2 must doctrinally template the flight patterns, ranges, and CEP for short-, medium-, and long-range TBMs in the AL This information, once plotted, will enable the HIMAD commander to orient the primary target line (PTL). Due to the short reaction time for TBMs intelligence must focus on launch trends and indicators. Examples of these are weather conditions, location of fixed and or mobile sites, associated radars, command and control vehicles and refueling tankers.

The next step in the threat evaluation stage is target value analysis (TVA). TVA allows the commander to anticipate enemy courses of action and gain initiative. TVA includes determining high-value targets (HVT) and high-payoff targets (HPT).

HVTs are targets which, if successfully attacked by friendly forces, will contribute to the degradation of important enemy battlefield functions. HVTs are assets, operations, or actions which the enemy commander must control or protect. The HVT list is developed by imagining how the enemy will fight, relative to the friendly force mission. The S2 determines the HVR by identifying those assets the enemy commander would consider valuable or critical for the accomplishment of his mission.

RW ATTACK PROFILE



For example, if the S2 is thinking through an enemy attack and knows that the friendly force is in a prepared defense with extensive air defense assets, it is logical to assume the enemy commander will want substantial air defense suppression strikes. Enemy aircraft commonly used in air defense suppression packages (for example, U-24, MiG-23, and MiG-21) become HVTs. The enemy's air attack will be coordinated on the ground with forward air controllers (FACs), radio navigation points (RNPs), and vectoring target designation points (VTDPs). These command and control points are critical to the enemy air operation and are also HVTs.

HPTs are HVTs which, if successfully attacked, will contribute to the success of friendly operations. The HPTs are determined by the commander and S3 by prioritizing the HVTs during the war-gaming process. Once the HVT list is compiled, the S2 gives the list to the S3, FSO, and commander. Then, from the perspective of friendly forces, the HPT list is compiled. The HVTs that meet the requirements of being acquirable, attackable, and capable of ensuring friendly success are designated as HPTs. The HPTs will be targeted at a later time for successful accomplishment of the friendly force's mission.

For example, the two air attack HVTs stated earlier (the air defense suppression aircraft and the command and control) would be prioritized and listed as HPTs. The commander would determine that without the listed aircraft, ADA suppression would be impossible. However, if the command and control structure were destroyed or disrupted, the attack could still occur. Therefore, the HPTs would be listed in priority as follows: MiG-23, MiG-21, SU-24, FAC, RNP and VTDP.

THREAT INTEGRATION

Threat integration is the final and possibly the most important phase of the IPB process. In this step, the analyst compiles all the information gathered to create a situation template. A situation template is a doctrinal template arrayed on the map with weather and terrain restrictions applied (see the Aerial IPB Situation Template illustration on page H-7).

The next step in threat integration is to develop an event template. The event template is a collection plan in graphic form (see the Ground IPB Event Template illustration on page H-8). It identifies areas which confirm or deny enemy courses of action. These areas are called named areas of interest (NAIs). NAIs can be a specific point or an area on the map.

In ground IPB only, the NAIs are sent to the division or corps on a collection plan as a request that those specific areas be monitored. These NAIs become part of the reconnaissance and surveillance plan. Once in the surveillance plan, the NAIs can be dropped from the template. Ground IPB also incorporates timed phase lines (TPLs). The TPLs depict the expected times of movement of the maneuver forces, which then predict expected times for different courses of action and reaction.

In aerial IPB, NAIs selected by ADA units can be monitored by their own assets. For this reason, aerial NAIs are left on the templates. The aerial portion of the battle is much more fluid and dynamic than the ground battle. Once aircraft and TBMs are spotted, the reaction time is very minimal. The aircraft and TBMs are acquired on the radar scope and fired upon almost instantly. TPLs are not necessary on the aerial portion of IPB. For ease of identification, ground NAIs and aviation NAIs are identified by different symbols as shown in the illustration on page H-8.

The final phase of threat integration is developing the decision support template (DST). The DST is the intelligence estimate with the operations plan depicted in graphic form. It identifies critical events relative to location, time, and the current situation which require tactical solutions. The DST is the synchronization tool that brings the entire staff together. The DST does not dictate decisions to the commander; rather, it identifies when critical decisions must be made. The aerial DST includes NAIs, target areas of interest (T's), and decision points (DPs). Aerial NAIs, usually along air avenues of approach, should be integrated with the ground scheme of maneuver in the DST

For Patriot units, aerial NAIs maybe quite large relative to NAIs for FAAD units. For example, if the G2 identifies a region 50 by 500 kilometers in area as a Possible source of short-range TBMs, that would be designated as an NAI for a Patriot battalion.

TAIs are areas where interdiction of enemy forces by maneuver, fires, or jamming will eliminate or reduce a particular capability, course of action, or will require the enemy to expend unusual amount of resources to continue operations (see the Decision Support Template on page H-9).

Finally, decision points are depicted on the DST to indicate where critical decisions must be made by the commander. These decision points may or may not be the same as NAIs in ground IPB. The fluid and dynamic pace of air operations reduce the ADA commander's reaction time to much less than that of a maneuver commander.

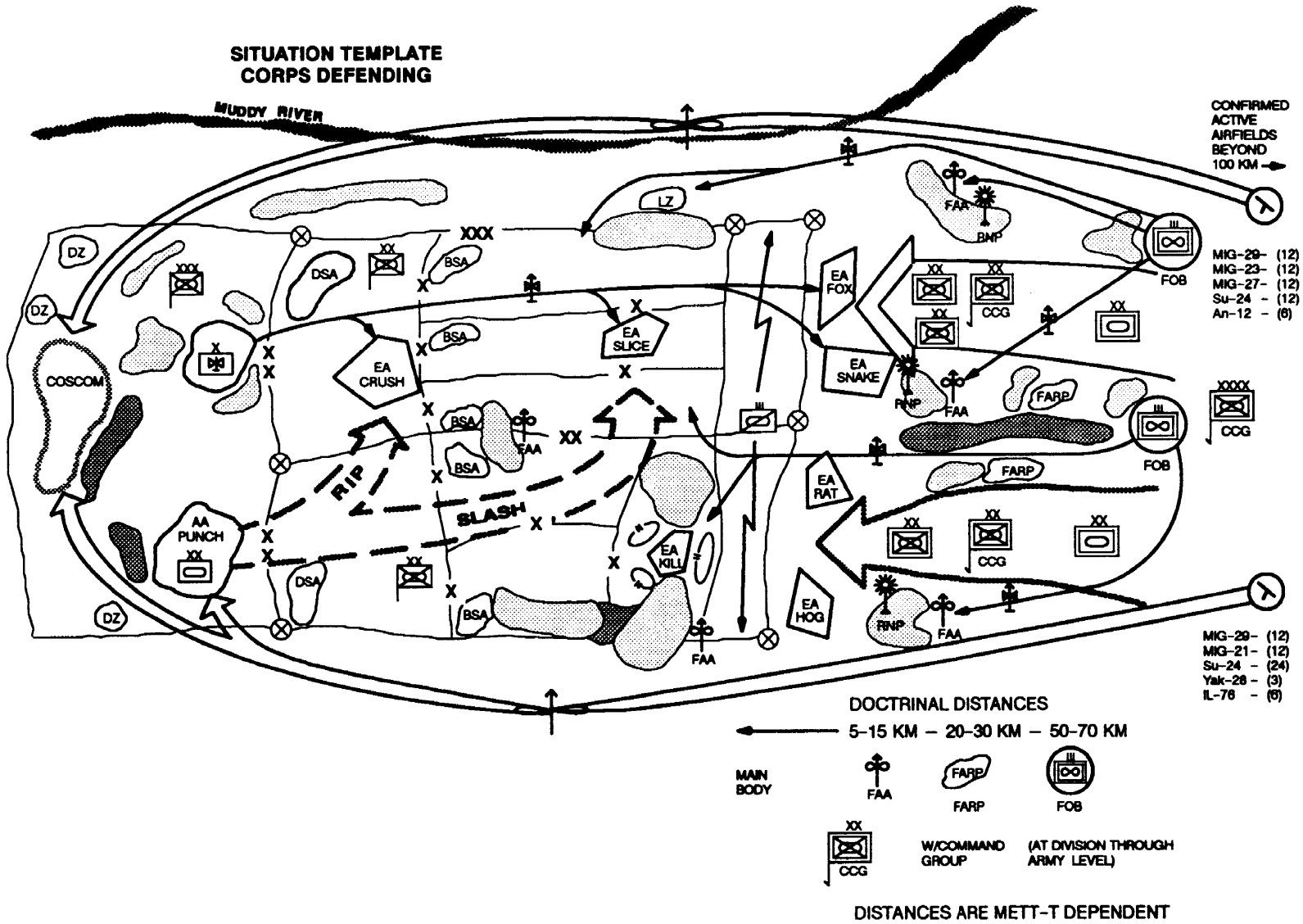
Once the DST has been prepared, the S2 will brief the XO or commander on his analysis. The S3 will identify decision points based on the NAIs that may require decisions. The decision may involve shifting primary target lines (PTLs), changing the EMCON status, targeting enemy aviation C2 facilities, adjusting CSS, or even relocating fire units.

The decision support matrix (DSM) is appended to the DST, as shown on page H-10. The DSM is the planning tool used by the commander to integrate all the battlefield operating systems (BOSS) to counter a potential threat's course of action. These detailed plans must be devised during the planning and training periods. During a battle exercise or actual conflict, the situation becomes too dynamic for detailed planning.

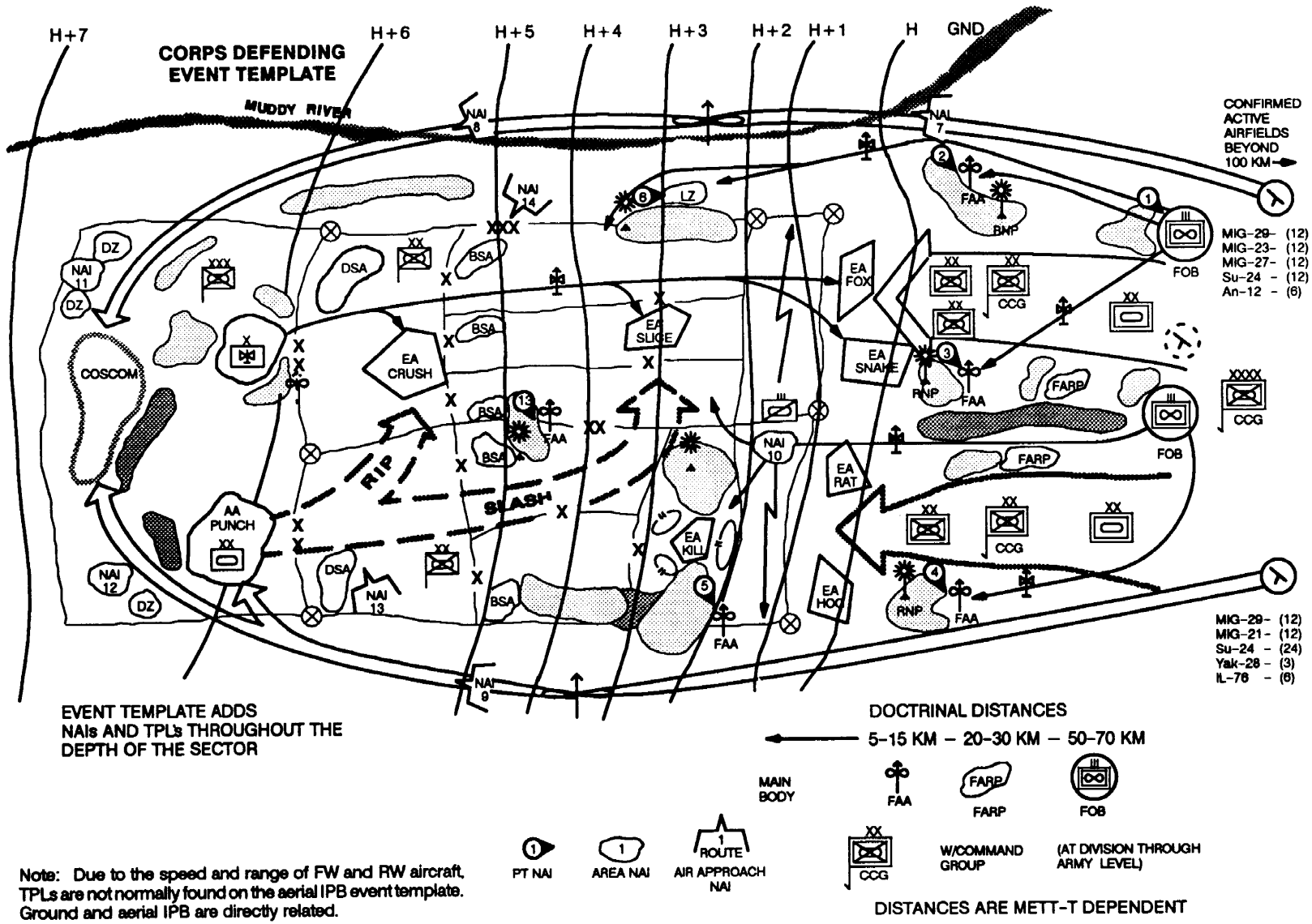
ADA brigades and FAAD battalions and batteries prepare DSMs. HIMAD batteries and FAAD platoons will prepare an execution matrix based on the DSM. For the subordinate units to accurately prepare their execution matrix, both the DST and DSM must be available to them.

The DSM illustration displays potential threat actions and the ADA commander's intent to counter them. The specific ADA units are listed under the DP column. Critical actions such as reorienting on a different NAI or TAI, or executing a particular "tactical play" are designated to occur at a later time or place. The decision point is the point were the commander must make the decision to execute and inform subordinate units, not the actual time the the action must take place.

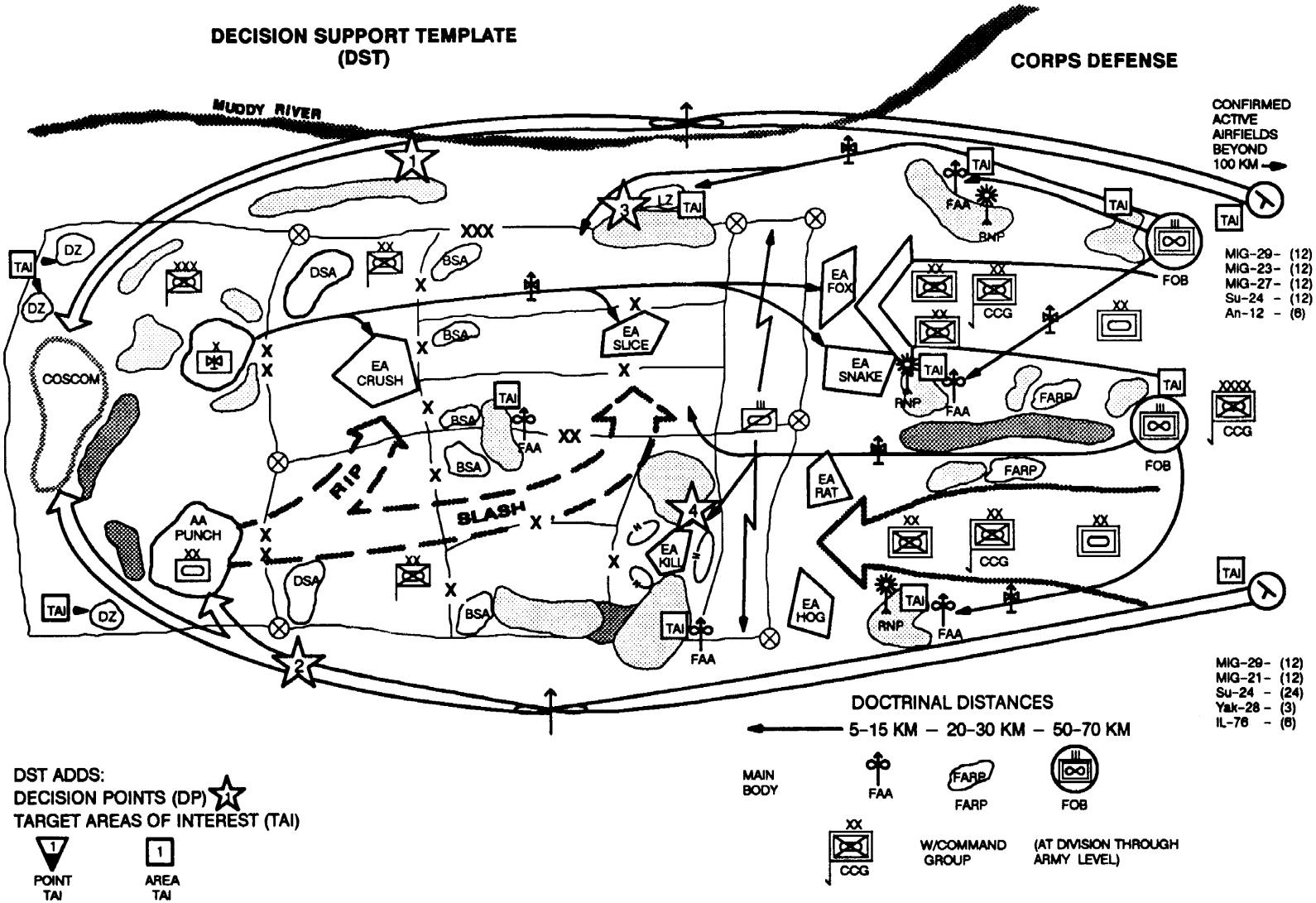
AERIAL IPB SITUATION TEMPLATE



GROUND IPB EVENT TEMPLATE



Note: Due to the speed and range of FW and RW aircraft, TPLs are not normally found on the aerial IPB event template. Ground and aerial IPB are directly related.


DECISION SUPPORT TEMPLATE
(DST)
CORPS DEFENSE
MUDDY RIVER
CONFIRMED
ACTIVE
AIRFIELDS
BEYOND
100 KM
MIG-29- (12)
MIG-23- (12)
MIG-27- (12)
Su-24 - (12)
An-12 - (6)
MIG-29- (12)
MIG-21- (12)
Su-24 - (24)
Yak-28 - (3)
IL-76 - (6)
COSCOM
DSA
BSA
EA CRUSH
EA SLICE
EA FOX
EA SNAKE
EA RAT
EA HOG
EA KILL
AA PUNCH
RIP
SLASH
FAA
RNP
FARP
FOB
CCG
TAI
DZ
LZ
DOCTRINAL DISTANCES
5-15 KM – 20-30 KM – 50-70 KM
MAIN BODY
W/COMMAND GROUP
(AT DIVISION THROUGH ARMY LEVEL)
DST ADDS:
DECISION POINTS (DP)
TARGET AREAS OF INTEREST (TAI)
POINT TAI
AREA TAI

DECISION SUPPORT MATRIX

DP	1	2	....
EVENT	• 1ST ECHELON (MAIN EFFORT) PENETRATING 1ST BDE SECTOR (TF 1-1) • LEAD ECM TK RGT MOVING WEST	• 2D ECHELON TK RGT ATK WEST • TK RGT ATK IN NORTHEAST SECTOR	
INTEL	• GUARDRAIL OR QUICKLOOK IDENTIFY TK RGT MOVEMENT WEST	• LRPs IDENTIFY TK RGT NORTHEAST	
MANEUVER	• TF 1-1 DELAY IN SECTOR DRAW TK RGT INTO SECTOR • 3D BDE PREPARE TO EXECUTE "KILLER" TO EA BLUE	• TF 2-1 DEFEND IN SECTOR • 3D BDE COA IN EA RED	
HHB	• ATTACH 3D PLT TO A BTRY	• ATTACH 3/HHB TO C BTRY	
A	• DS TO TF 2-1 • ACCEPT 3/HHB /ORIENT NAI 4	• DETACH 3/HHB	
B	• GS TO TF 1-1 (AA TK 1) /ORIENT NAI 5, 6, 7	• DS TO TF 1-1 /ORIENT NAI 2, 3, 4	
C	• GS TO 3D BDE /ORIENT NAI 8	• MOVE WITH 3D BDE • ESTABLISH AD COVER ALONG ROUTE • ACCEPT 3/HHB /ORIENT NAI 4	
C(AD)	• GS TO DIVISION (DSA) /ORIENT NAI 3, 4,	NO CHANGE	
HAWK	• GS CORPS • EXECUTE "TRAP" VIC LV5572 /ORIENT TAI 5, NAI 3, 4, 6	• EXECUTE "LINEBACKER" VIC MV1420 /ORIENT NAI 2, 3, 4	
PATRIOT	• GS CORPS • TBM MODE /ORIENT TAI 2, NAI 5, 6, 7	/ORIENT TAI 1, NAI 2, 3, 7	
C^2	TOC MV1523 TAC MV2925	TOC MV1523 TAC MV3347	
EW	/ORIENT NAI 5, 6, 7, 8	/ORIENT NAI 3, 4, 5	
AAAD	/REQUEST BAI TAI 2, 3 /FIRE TAI 5	/REQUEST BAI TAI 1, 4 /FIRE TAI 4, 5	
A^2C^2	• CAB ATK EA RIM ALONG ROUTE COBRA AT D+1 HR	• JAAT ATK 2D ECH DIVISION TK RGT	
CSS	• FLD TRAINS LV4532 • CBT TRAINS MV0055	NO CHANGE	

APPENDIX I

Reconnaissance, Selection, and Occupation of Position

Hawk AFPs will displace frequently, whether deployed in forward or rear areas. AFPs can only perform their missions when in position and ready to fire. The time required to move a Hawk AFP is out–of–action time. AFPs must be able to march order, move, emplace, and continue the ADA mission quickly. The accomplishment of the tasks is outlined in the following paragraphs. SOPs for RSOP must be part of every AFP's tactical considerations. Understanding and practicing RSOP procedures is the only sure method of ensuring AFPs can move on command, emplace, and continue the ADA mission.

This appendix explains the basic actions required to move an AFP into a new position. These basic actions can be modified to fit the specific tactical situation, but none can be omitted. RSOP procedures are separated into three distinct phases.

PHASE A—HOW TO CONDUCT THE RECONNAISSANCE AND SELECT THE POSITION

The basic actions required to conduct the reconnaissance and select the position are contained in the following paragraphs.

RECEIVING THE MOVEMENT WARNING ORDER

The battalion commander briefed the battery commander on the latest AFP mission. The battery commander calls a meeting of key personnel and issues the MWO to the platoon leader. The MWO contains the following information:

- Time received MWO.
- Time recon party leaves.
- Time released for march order.
- Time to cross start point.
- Time to cross release point.
- Time to assume Battle Stations.

This time list will permit the platoon leader to use the reverse planning process.

ISSUING THE PLATOON WARNING ORDER

The platoon leader returns to his platoon's location and briefs the assistant platoon leader, platoon sergeant, and two section chiefs on the new mission. Once the information is dispersed, the platoon sergeant forms the recon party per the platoon SOP.

PLANNING

The battery commander and platoon leader complete their plans. They determine the recon route by conducting a map reconnaissance of the proposed area. They check the map for alternate AFP positions in case the primary position is unsuitable. The platoon leader briefs the battery commander on the composition of the recon party. The platoon leader must plan for recon security and ensure sufficient weapons accompany the RSOP team. Communications equipment must accompany the RSOP team to ensure contact between

CONTENTS

the team and the platoon is maintained. Planning the recon includes the following:

- Determine routes to be used and area to be examined.
- Determine the composition of the recon party.
- Determine what supplies and equipment are needed.

PREPARING FOR MOVEMENT

Once the BC has approved the platoon leader's plans, the platoon leader assembles key personnel and provides the following information:

- Briefing on mission.
- Briefing on plans.
- Briefing on requirements.
- Instruction on operation in the absence of the platoon leader.

RECONNING AND SELECTING THE POSITION

When the platoon leader has completed his briefings and issues his orders, he directs the RSOP team to recon and select the position. The RSOP team performs a route reconnaissance and observes and records the following types of information:

- The route meets equipment height, weight, width, and depth (fording) requirements.
- Built-up areas.
- Possible ambush locations.
- Possible fuel and rest stop locations.
- Possible road guard and marker locations.
- Final route selection.

After the route has been determined, the RSOP team performs a reconnaissance of the selected position. This recon ensures that—

- It provides immediate access.
- It provides concealment.
- It affords good radar coverage.
- It meets system emplacement requirements.
- It is secure and contamination free.

PLANNING AND PREPARING FOR THE OCCUPATION.

The decision to move has been made and the platoon leader is now ready to direct the occupation of the new site. At this time, he gives the order of march. This is the composition of vehicles, equipment, and personnel to be included in the serial for movement. It has the following types of information:

- Designated position in the serial.
- The type and number of vehicles in the serial.
- The vehicle load (on-board and towed).
- Driver and assistant driver assigned.
- End item position in serial to provide for quickest emplacement time.
- An alternate route, if primary is not usable.

PHASE A CHECKLIST

The checklist below is a quick reference for the personnel in the platoon. Steps maybe added as required to provide a fluid, usable reference.

CHECKLIST A

1. Receive the MWO:
   - Essential location and times.
   - Reverse planning sequence.

2. Issue the platoon warning order:
   - Initial actions according to SOF!
   - Special instructions as necessary.

3. Plan the reconnaissance:
   - Routes to be used and areas to be examined.
   - Composition of the recon party.
   - Extra equipment requirement.

4. Prepare for movement:
   - Brief personnel on the mission, plans, and requirements.
   - Instructions on operations in the absence of the leader.

5. Recon and select position:
   - Route reconnaissance.
   - Position reconnaissance.
   - Selection of sites for equipment, position, security, and support elements.

6. Plan and prepare for the occupation:
   - Order of march.
   - Briefing and positioning of guides.

PHASE B-HOW TO MOVE THE PLATOON BY ROAD

This phase describes the actions required to move the AFP by road. These actions will permit the successful deployment of the AFP to the position selected and reconned in Phase A.

EQUIPMENT MARCH ORDER AND LOADING

Equipment march ordering and loading began when the platoon was released from its ADA mission. Non-mission-related equipment was loaded upon receipt of the MWO at the platoon. These items were listed in the platoon's SOP. The SOP also lists other actions to be accomplished before the movement, such as vehicle preparation checks and refueling.

MARCH COLUMNS ASSEMBLY

At the designated assembly area, the order of march (serial) for the platoon's equipment is directed. This information is issued in the five-paragraph format and might contain—

- The movement is by SOP.
- Blackout drive (nighttime).
- Convoy speed.
- Distance between vehicles.
- Air ground instruction.
- Safety checks on vehicles and loads.

CROSSING THE STARTING POINT

When the platoon's serial is assembled, the platoon leader instructs the platoon to move out. The time is noted when the SP is crossed to ensure the plan is being executed on time.

ROAD MOVEMENT

The travel to the new position must be as safe as possible with periodic checks being made to ensure no vehicles are left behind. Vehicles that experience breakdowns must be serviced as soon as possible. Vehicles that become disabled may be carrying mission-essential equipment, and the absence of these end items could prevent the AFP from becoming operational. Care must be taken to ensure mission-essential equipment arrives on time as needed. The following annex example below provides an outline of a motor movement annex to the AFP SOP.

MOTOR MOVEMENT ANNEX EXAMPLE

ANNEX—(MOTOR MOVEMENTS) to AFP FSOP

1. PURPOSE: This annex prescribes standard procedures for motor convoy operations or vehicle movements.

2. RESPONSIBILITIES: The senior person on a vehicle is the vehicle commander. He is responsible to ensure that all orders concerning the march are carried out. When two or more vehicles travel together, the senior person present will be the convoy commander. The convoy commander is responsible for the proper conduct and safety of all passengers and vehicles in the convoy. The convoy commander will brief all drivers prior to departure.

3. CONVOY OPERATION:

a. March Procedures.

(1) Rates: Unimproved roads—Day: 25 MPH.
Night: 10 MPH.
Catchup speed—5 MPH above specified convoy speed.

(2) Halts: As designated.

b. Organization.

(1) Platoon serial position will be designated by the battery commander. Vehicle positioning within the platoon serial will be designated by the platoon leader.

(2) Normal time interval between serials will be 2 minutes.

c. Formation.

(1) Open column: 100 meters between vehicles; 12 vehicles per km.
(2) Closed column: 1 vehicle length between vehicles; 42 vehicles per km.
(3) Night column: 50 meters between vehicles; 24 vehicles per km.
(4) Infiltration: Maximum group of 10 vehicles; 200-meter intervals; 5 vehicles per km.

MOTOR MOVEMENT ANNEX EXAMPLE (Continued)

d. Routes and Guides.

(1) Routes will be as specified, based on recon and road clearance approval.

(2) Road guides or road markers will be posted along critical points of march between SP and RP. The convoy commander will ensure that road guides are–

(a) Briefed on their responsibilities.

(b) Posted when required.

(c) Posted in pairs at night, with one number providing local security.

(d) Instructed on what vehicle will pick them up.

(3) Convoy commanders must be familiar with the route of march so that interposing of enemy guides or substitution of road markers will be detected.

e. Vehicle Preparation.

(1) Vehicle and trailer markings will be covered.

(2) Windshields will be folded down and covered. Mirrors, windshields, and lights will be covered whenever the vehicle is not in use.

(3) Vehicle cargo canvas will be removed and stored with bows unless the load requires covering. Canvas on trailers will be kept installed. Canvas cab covers will be removed.

(4) Lights will be off during daylight moves. Blackout drive will be used during night moves.

(5) Following items will be checked prior to movements and at halts:

(a) All vehicle and trailer lights.

(b) Vehicle and trailer brakes.

(c) Vehicle and trailer connections.

(d) Vehicle horn, oil, fuel, and coolant.

(6) Vehicles will be topped off with fuel prior to and after every move.

f. Security.

(1) Vehicle drivers will, whenever possible, drive in the same tracks as the lead vehicle to reduce the possibility of detonating mines. Personnel will hold weapons at the ready to reduce reaction time in the event of ambush. If a vehicle drops out of the convoy, following vehicles will adjust their interval to conform to the established convoy distance.

(2) Each vehicle will have an airguard during movement. Airguards will continuously scan for enemy aircraft. If an enemy aircraft is spotted, the driver will be alerted and he will blow the vehicle horn (continuous blast). Upon hearing the warning, each driver will repeat it. Vehicles carrying MANPADS team personnel will stop and MANPADS teams will dismount and prepare to engage aircraft. The remainder of the convoy will continue the march, unless attacked. If attacked, each driver will move his vehicle off the road and into a concealed position (if possible). Vehicles will move off the road to alternate sides (herringbone). Personnel will dismount the vehicle and engage the aircraft with their assigned weapons. If machine guns are mounted on vehicles, they will remain mounted and manned.

(3) Personnel will dismount and assume defensive positions around vehicles during scheduled halts. Vehicle-mounted weapons will remain manned.

(4) Front and rear vehicles will be equipped with radios. The lead vehicle will maintain communications with the last vehicle to ensure convoy control.

(5) If ambushed, the convoy will not stop to fight as long as it can move forward. If stopped, personnel will dismount and assume defensive positions while returning fire.

(6) Vehicles and trailers will be camouflaged during lengthy halts and when movement is concluded.

g. Reports. Trail vehicle will report control point (SP, checkpoints, and RP) clearing time to lead vehicle.

h. Inspections. The platoon leader will ensure that all vehicles, trailers, and loads are inspected prior to movement. Defects will be repaired immediately by the operator or battery maintenance personnel.

4. LOADING PLANS: Each vehicle and trailer will have a loading plan. Loading plans will be kept in vehicle log books. Loading plans will specify those items of cargo that can be loaded prior to mission release time. A loading plan format is attached as an appendix.

CROSSING THE RELEASE POINT

Once the last vehicle in the platoon convoy has crossed the RP, the road movement is complete. The guides located at the new site location have now met the vehicles and equipment and quickly guide them into place.

PHASE B CHECKLIST

The checklist below is designed to be a quick reference. These steps outline actions required to complete Phase B.

PHASE C—HOW TO OCCUPY, ORGANIZE, AND IMPROVE THE POSITION

The AFP is now ready to begin the last phase of the displacement. The AFP begins the occupying, organizing, and improving of the position.

ESTABLISHING LOCAL SECURITY

Members of the recon party provided initial security at the new location. They selected perimeter defense positions, established sectors of fire and primary target lines, and prepared range cards. They built individual firing positions and bunkers and provided a secure location.

EMPLACING, ORIENTING, AND ALIGNING THE HAWK SYSTEM

An equipment guide met each vehicle as it entered the new location and guided it to a site marked by the recon team. After dropping their towed loads and unloading necessary cargo, the vehicles were dispersed inside the tree line. Crews immediately began to emplace the Hawk equipment. The HIPIR arriving early in the march sequence was the first to complete emplacement. The HIPIR crew then oriented the radar to the KDP selected by the RSOP team. As other items of equipment were emplaced, they were aligned to the HIPIR. Missiles were loaded onto launchers, power was applied, and local operational checks were made at each item of equipment. GEOREF was plotted on or entered into the PCP TDECC and plotting board.

ESTABLISHING COMMUNICATIONS WITH HIGHER HEADQUARTERS

Communications were maintained with higher headquarters throughout the movement. Appendix E describes platoon and battery communications links.

ASSUMING OPERATIONAL STATUS

When local checks were completed at each item of equipment, all items were integrated into the system. Integrated system checks were performed according to the procedures listed in appropriate technical manuals. When these checks were completed and the platoon was integrated into the battalion multichannel system, the AFP ran an integration check with the battalion's AN/TSQ-73 or the task force Patriot ICC. Once this is completed, crew drills are initiated and the AFP becomes operational at the assumption of Battle Stations.

IMPROVING THE AREA

The platoon leader and platoon sergeant begin to organize and supervise improvement of the platoon's ground defense. Personnel are directed to camouflage and revet equipment. Launchers are not revetted due to missile backblast. Equipment is dispersed tactically to the maximum extent possible. This includes supported areas that the platoon sergeant had selected within the tree line. Improvements to the area were planned to continue as long as the position is occupied.

CHECKLIST B

1. March order and load equipment:
   - Items not required for the AD mission, before mission release time.
   - Items required for the AD mission, after mission release time.
2. Assemble the march column (serial):
   - According to the march order.
   - Issue operation order and any special instructions.
3. Cross the SP on time.
4. Conduct the convoy movement according to the SOP and tactical situation.
5. Cross the RP:
   - At the correct time.
   - Vehicles met and led to their correct sites by equipment guides.

SELECTING SECONDARY AND OR ALTERNATE POSITIONS

During the planning phase, secondary and alternate positions were selected. The platoon leader and PSG now visit these locations and verify their use. The following descriptions of positions are important to note:

❑ Secondary positions are areas to which the AFP displaces after receiving a new mission. Secondary position RSOPs are conducted only after receipt of a new warning order.

❑ Alternate positions are areas generally close to the primary position from which the unit can perform the original mission if the primary position becomes untenable or unsuitable. Tentative alternate positions are selected during the map reconnaissance of the primary position. RSOPs for alternate positions are conducted as soon as the unit has become operational at the primary position.

PREPARING RADAR COVERAGE DIAGRAMS

The assistant platoon leader begins to prepare radar coverage diagrams for the new position. Radar coverage diagrams are graphic representations of radar target detecting and tracking capabilities (see Appendix G). They are used by defense planners to ensure that no gaps exist within the overall defense.

PHASE C CHECKLIST

The checklist below is a quick reference for the AFP personnel in the platoon. It can be modified as required to provide a usable reference.

CHECKLIST C

1. Improve local security:
   - Perimeter positions improved and increased as convoy arrives.
   - Vehicles dispersed and concealed.

2. Emplace, orient, and align the Hawk system:
   - Base piece (CWAR) oriented to KDP.
   - Remaining equipment aligned to CWAR.

3. Establish communications with higher headquarters:
   - Platoon multichannel equipment aligned to the AN/TRC-145, if possible, and to the battalion's multichannel equipment if not.

4. Assume operational status:
   - After completion of integrated system checks and battalion FDC integration.
   - Not later than specified mission assumption time.

5. Improve the area (camouflage and revet equipment):
   - Prepare individual frontal positions and crew-served weapon bunkers, revet equipment, and camouflage all equipment.
   - Disperse all equipment to the maximum extent possible.

6. Select secondary and or alternate position:
   - Always recon alternate positions.
   - Recon secondary positions after receipt of new warning order.

7. Prepare a radar coverage diagram (see Appendix G).

APPENDIX J

Air Defense Command and Control Procedures

This appendix implements STANAGS 3805 and 3880.

The AADC manages his integrated AD system through two means. The first is through his command and control structure, which specifies C2 relationships. The second is through AD C2 procedures that he establishes.

WARNING PROCEDURES AND ALERT STATUSES

These procedures alert or prepare a unit and increase unit readiness for combat. They include the following:

- DEFCONs.
- WADs or DEFREPs.
- ADWs or ARWs.
- SORs.
- SOEs.

DEFENSE CONDITIONS

DEFCONs describe progressive alert postures. DEFCONs are graduated to correspond to situations of varying military severity and are numbered 5,4,3,2, and 1 as appropriate. DEFCON 1 is the highest readiness condition.

Note: In NATO, a similar system of stages or states of alert is used in place of DEFCONs.

WEAPON ALERT DESIGNATORS OR DEFENSE READINESS POSTURE

Weapons alert designators describe a progressive system of alert postures based on the DEFCON. Note: DEFREP is a NATO term.

AIR DEFENSE WARNINGS AND AIR RAID WARNING

Air defense warnings represent the commander's evaluation of the probability of air attack within his area of operations. The three ADWs as defined in JCS Publication 1-02 are—

- ADW RED. Attack by hostile aircraft or missiles is imminent or is in progress.
- ADW YELLOW. Attack by hostile aircraft or missiles is probable.
- ADW WHITE. Attack by hostile aircraft or missiles is not probable.

Note: ARW is a NATO term.

STATE OF READINESS

SORs specify the time within which a Hawk unit must be able to fire a missile. The SORs also determine fire unit manning requirements. SORs are used during peacetime only. SORs prescribe the time allowed before a unit must be capable of full operation of all equipment necessary to conduct an engagement. Typical SORs for Hawk units are–

- Battle Stations.
- Twenty minutes to Battle Stations.
- Three hours to Battle Stations.
- Twelve hours to Battle Stations.
- Released (maintenance or training).

Note: Actual SORs may vary by theater of operation and are usually classified.

STATE OF EMISSION

SOEs replace SORs during combat operations. The SOE prescribes the number and type of emitters or transmitters in operation. All electronic emissions must be carefully controlled. EMCON begins with passive techniques to prevent detection by the enemy.

CONTENTS

AD personnel must be aware of the electronic emissions that their radar and radio equipment emit. EMCON procedures will help to minimize radio and radar emissions that are subject to intercept by the enemy. Platoon leaders must remember that Hawk was designed to fight and survive in the severest of EW environments. EMCON will result in immediate availability of Hawk AFPs when required without having them give off any radio or signature. The following states of emission are recommended:

• SOE l—these are no radios or radars emitting. Radio silence is broken only in an emergency, and radar and data links are only switched on if attacked. Radars should be passive.

• SOE 2—there is radio silence except for data links. Voice radio links are used only as necessary.

• SOE 3—they are operating with radio silence imposed and the Hawk radars are active. Radio silence on data links is only to be broken when targets are detected by the radars or to establish data links to FDC. Voice radio links are operated only if necessary for new weapons control orders or engagement reports.

• SOE 4--there are no restrictions on either radio or radar emissions.

RADAR FREQUENCY ALLOCATION

The Hawk platoon leader relays a radar frequency assignment to each HIPIR to minimize radar interference between FUs. Hawk radar operators must ensure proper frequency selections are input to the radar. Changes in radar frequency allocation maybe by design or necessity. Frequency allocation is necessary to prevent damage and interference and ensures clean radar pictures.

Note: Radar frequency allocation is done at brigade level.

FIRE CONTROL PROCEDURES

The joint forces commander establishes the rule of engagement for the theater. The AADC manages and directs the integrated air battle by implementing ROE and airspace control measures. The execution of these ROE and measures maybe through both positive and procedural means.

RULES OF ENGAGEMENT

ROE specify the circumstances and limitations under which forces will initiate or continue combat engagement with other encountered forces (JCS Publication 1-02). The six common components of rules of engagement are discussed in the following paragraphs.

The Right of Self-Defense

Self-defense is the right and the responsibility of commanders at all echelons. Commanders may take whatever action is required to protect their forces and equipment against air attack. Normally, such action will be governed by rules and procedures established by the AD commander. Emergency action deemed necessary, if contrary to the established rules, should be carefully weighed for its effect on the operations and on the safety of other friendly forces. If a unit must take self-defense action, it must report it to the appropriate commander at the earliest practicable time ([O]JCS Publication 3-01.3). For Hawk units, self-defense must be clearly defined in tactical SOPS and thereafter directives. Criteria for declaring an aircraft a self-defense threat will change depending upon the state of alert, the tactical situation, SOR, and, in some cases, the type of aircraft and its flight characteristics.

Level of Control

Level of control describes the AD echelon at which the air battle is being positively managed. The following are reasons for decentralization of control:

• Inability of higher echelons to detect the low-altitude threat.

• Tempo of the air battle (control is more time-consuming as echelons of control are added to the control chain).

• Degraded or lost communications.

For these three reasons, the Hawk battalion FDC is generally the highest AD echelon capable of effectively controlling Hawk fires in the air battle.

Modes of Control

Modes of control describe the control relationship between organizational levels. The two modes are centralized and decentralized control.

Centralized control is the mode whereby a higher echelon authorizes fire units to engage targets (JCS Publication 1-02). The fire unit must request permission from the controlling AD echelon to engage each track. Centralized control minimizes the likelihood of engaging friendly aircraft; it permits engagement of hostile aircraft only when specific orders are issued to

initiate the engagement. During most types of AD operation Hawk AFPs will be under the centralized control of the battalion FDC.

The normal wartime mode of control for AD is decentralized. In this mode, a higher echelon monitors unit actions, but makes direct target assignments to units only when necessary to ensure proper fire distribution. The monitoring echelon prevents engagement of friendly aircraft and prevents simultaneous engagements of hostile aircraft (JCS Publication 1-02). Decentralized control increases the likelihood that at least one AFP will engage each hostile aircraft in a high-density environment. The lack of positive controls associated with decentralized control is not acceptable during peacetime.

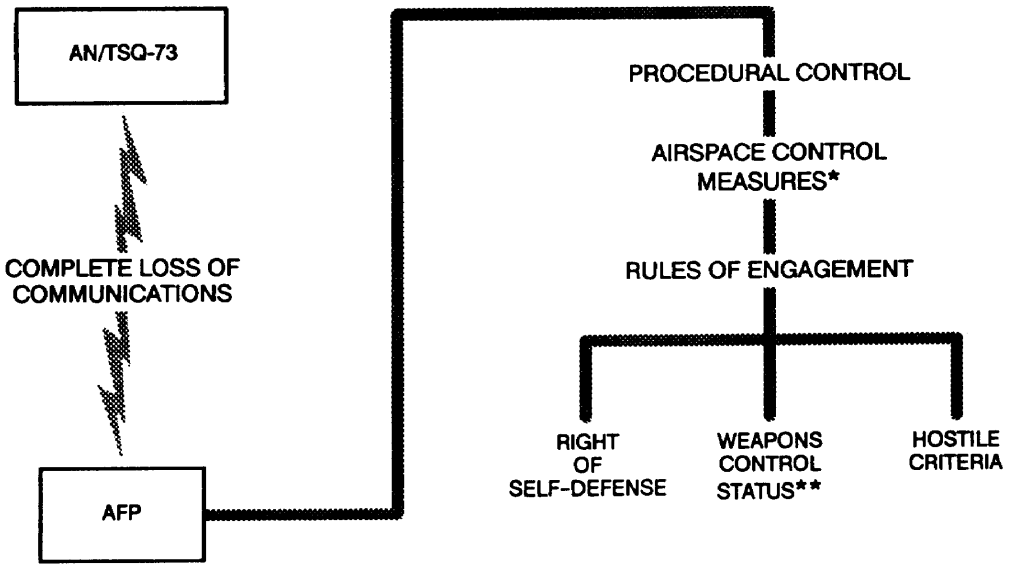
Autonomous Operations

Autonomous operations describe the activities of a unit after it has lost all communications with higher echelons. The unit commander must assume full responsibility for control of weapons and engagement of hostile targets. When an AFP loses all communications, higher control levels cannot monitor fire unit action; therefore, the TCO, who represents the commander, has full responsibility for aircraft engagements. Unit TSOPs should define specific actions and procedures for autonomous operations. Normally, the hostile criteria in effect when a unit loses communications remains in effect until the unit can reestablish communications. In autonomous operations, procedural management is available for control of the air battle (see the Autonomous Operations illustration below).

Hostile Criteria

Hostile criteria are basic rules issued by the commanders of unified or specified commands and by other appropriate commanders when so authorized to establish the status of aircraft. Hostile criteria are used by echelons having identification authority to determine whether a detected aircraft is friendly or hostile. Altitude and airspeed are normally used as hostile criteria when applied to procedural measures.

AUTONOMOUS OPERATIONS



Legend:
* Time sensitive and changed per OPORD, ACO, or TSOP.
** Normally changed to WEAPONS TIGHT after a predetermined time.

FIRE CONTROL ORDERS

Fire control orders are commands which control Hawk engagements on a near real-time, case-by-case basis (see the Use of Fire Control Orders illustration below). They may countermand or alter the prevailing WCS. Transmission of fire control orders maybe verbal or electronic. As long as digital communications are available, electronic transmission is preferred. Local directives and unit SOP may require verbal as well as electronic transmission for certain orders, such as Hold Fire. The Hawk battalion FDC most often uses these orders to control the engagements of its AFPs. TCOs and ROs also use fire control orders when engaging targets at the AFP. The following paragraphs describe the fire control orders used by Hawk units.

USE OF FIRE CONTROL ORDERS

FIRE CONTROL ORDERS	TCO ACTION	
	MISSILE FIRED	NOT FIRED
COVER. EXAMPLE– "A1, COVER AT ME3416."	NA	ACHIEVE LOCK ON THE TARGET. UPDATE TARGET TRACK REPORT.
ENGAGE. EXAMPLE– "A1, ENGAGE TRACK 68."	NA	ENGAGE THE TARGET.
CEASE ENGAGEMENT. EXAMPLE– "A2, CEASE ENGAGEMENT TRACK 68. ENGAGE TRACK 77."	ALLOW MISSILE IN FLIGHT TO CONTINUE TO INTERCEPT. DO NOT FIRE ADDITIONAL MISSILES. PREPARE TO ENGAGE THE NEW TARGET.	DO NOT FIRE AND CEASE TRACKING THAT TARGET. ENGAGE NEW TARGET.
CEASE FIRE. EXAMPLE– "B1, CEASE FIRE TRACK 77."	ALLOW MISSILE IN FLIGHT TO CONTINUE TO INTERCEPT. DO NOT FIRE ADDITIONAL MISSILES. CONTINUE TO TRACK THE TARGET.	DO NOT FIRE. CONTINUE TO TRACK.
HOLD FIRE. EXAMPLE– "B2, HOLD FIRE TRACK 77."	DESTROY MISSILES IN FLIGHT IMMEDIATELY. CEASE TRACKING.	DO NOT FIRE. CEASE TRACKING.
	(ACTION WILL DEPEND ON WHAT THE UNSAFE CONDITION IS.)	
STOP FIRE. EXAMPLE– "STOP FIRE ALPHA LAUNCHER SECTION."	ALLOW MISSILE IN FLIGHT TO CONTINUE TO INTERCEPT. DO NOT FIRE ADDITIONAL MISSILES. CONTINUE TO TRACK. ASCERTAIN AND CORRECT THE UNSAFE CONDITION. CONTINUE THE ENGAGEMENT.	DO NOT FIRE. CONTINUE TO TRACK. ASCERTAIN THE UNSAFE CONDITION. REQUEST PERMISSION TO DROP OUT OF THE AIR BATTLE, IF NECESSARY, TO CORRECT THE UNSAFE CONDITION. CONTINUE THE ENGAGEMENT.

Engage

This order is used to order an AFP to engage (fire on) a designated target. It cancels any previous fire control order which may have been given on that target. Based upon proximity and threat, the TCO will select one of the following methods to engage a target:

• Shoot-look-shoot. This is the firing of one missile against a target and assessing the success of the engagement before firing a subsequent missile at the target. This is the preferred method of fire because it provides the most effective use of available missiles.

• Ripple fire. This is the firing of two or more missiles against a single target with the least possible time delay between launches. When the target is a self-defense threat to the AFP and a very high kill probability is desired, the TCO will likely select ripple fire.

• LASHE. This is the firing of two or more missiles against multiple targets that threaten the platoon. This mode of fire is recommended by the ADP when LASHE criteria is met. This mode is initiated manually by the TCO (Phase III only).

Cease Engagement

This command orders the AFP to cease tracking a designated target. This order changes an ongoing engagement to another of higher priority. Missiles in flight are allowed to continue to intercept.

Hold Fire

This is an emergency fire control order which directs the AFP to discontinue an engagement or refrain from tracking or firing on a designated target. The AFP will destroy missiles already in flight to protect friendly aircraft.

Cease Fire

This command orders the AFP to refrain from firing on, but to continue to track a designated target. If the unit has already fired, missiles in flight are allowed to continue to intercept. The cease fire command is used to prevent simultaneous target engagement by manned fighters and ADA units.

Cover

This command orders an AFP to assume a posture that will allow engagement of a target, if directed. For Hawk, this means searching the designated area and achieving a HIPIR lock on the specified target. This command may be used for a target that is presently being engaged by another unit or for a target that has yet to become a significant threat. AFPs that receive the cover command report to higher echelons when they are tracking, locked on, and ready to fire. Cover is used to obtain more information on the target (same as investigate assign).

Stop Fire

This is an emergency fire control order which temporarily halts an engagement sequence to correct internally unsafe conditions. Stop fire is seldom transmitted outside the AFP. This command can be given by anyone in the AFP who detects an unsafe condition. The engagement continues after the AFP corrects the unsafe condition.

AIRSPACE CONTROL

Airspace control encompasses all efforts to ensure combat effectiveness by promoting safe, efficient, and flexible use of airspace. Airspace control instructions are issued periodically via the airspace control order, which may appear at lower echelons of the ADA command chain in the form of a separate order or as an airspace control annex to an operation order. The order will specify rules of engagement for a specific duration and hostile criteria to assist in discriminating between friendly and enemy aircraft. The following paragraphs describe airspace control techniques.

Weapons Control Statuses

Weapons control statuses describe the relative degree of control of the fires of ADA systems. A WCS may apply to weapon systems, volumes of airspace, or types of aircraft. The WCSs are—

• WEAPONS FREE. Weapons may fire at any aircraft not positively identified as friendly.

• WEAPONS TIGHT. Weapons may fire only at aircraft positively identified as hostile according to the prevailing hostile criteria. Positive identification can be established by a number of means to include use of the VTG and other designated hostile criteria supported by track correlation.

• WEAPONS HOLD. Weapons may fire only in self-defense or in response to a formal order. This is the most restrictive WCS.

• WEAPONS UNLIMITED (NATO only). Weapons may fire at any aircraft within a specified volume of airspace during a specific time period, regardless of any positive or procedural means of identification. When used, this is the least restrictive WCS.

Weapons Engagement Zones

Weapons engagement zones are volumes of defined airspace within which specific types of AD weapons are preferred for use in engagements, thus simplifying fire distribution (see the Weapons Engagement Zone Types illustration).

Establishment of a WEZ permits maximum use of weapons systems. A fighter engagement zone is normally established only in those areas where no effective surface-to-air capability is deployed. A missile engagement zone is normally established only for medium- and long-range SAMs. A MEZ limits the volume of airspace in which these weapons can conduct engagements. The MEZ is tailored to the capability and characteristics of the weapon system and to the specific tactical need.

Airspace Control Measures

Airspace control measures afford a variety of procedural methods of controlling airspace users and airspace. Airspace control measures are the rules and mechanisms declared by joint and allied doctrine, and defined by the theater airspace control plan. They are defined in general terms according to the normal usage associated with the control measure. The Airspace Control Means table below shows the control measures and their use.

Note: More specifics on airspace control measures are available in theater-specific documents or FM 100-103.

WEAPONS ENGAGEMENT ZONE TYPES

WEZ	DCA	FAAD	HAWK	PATRIOT
FAADEZ		X		
MEZ			X	X
FEZ	X			
JEZ	X	X	X	X

AIRSPACE CONTROL MEANS

MEASURE	USAGE
CORRIDORS AND ROUTES:	
• AIR ROUTE	NATO/ASCC
• LOW-LEVEL TRANSIT ROUTE (LLTR)	NATO/ASCC
• MINIMUM RISK ROUTE (MRR)	US
• STANDARD USE ARMY AVIATION FLIGHT ROUTE (SAAFR)	US
• SPECIAL CORRIDOR	NATO
• TRANSIT CORRIDOR	NATO
ZONES:	
• BASE DEFENSE ZONE (BDZ)	NATO
• HIGH-DENSITY AIRSPACE CONTROL ZONE (HIDACZ)	US/NATO/ASCC
• RESTRICTED OPERATIONS ZONE (ROZ)	US/NATO/ASCC
• WEAPONS FREE ZONE (WFZ)	NATO
FLIGHT LEVELS:	
• COORDINATING ALTITUDE (LEVEL)	US/NATO
• TRAVERSE LEVEL	US/NATO
OTHER AIRSPACE SUBDIVISIONS OR CONTROL MEASURES:	
• AIRSPACE COORDINATION AREA	US/NATO
• AMPHIBIOUS OBJECTIVE AREA	US/NATO
• TERMINAL CONTROL AREA (ZONE)	US/NATO
• WEAPONS ENGAGEMEMT ZONE	US/NATO
• CONTROL POINT	US/NATO
• WAY POINT	US/NATO
• TIME SLOT	NATO/ASCC

APPENDIX K

ADA Weapon Systems Planning Factors

This appendix provides ADA commanders with technical and tactical information necessary for deployment and employment of ADA systems. ADA commanders plan, coordinate, and execute the ADA mission based on the supported commander's intent, objectives, and orders. They perform this function by employing ADA principles and guidelines to ensure the required defense is provided.

ADA systems vary in capabilities and limitations. These variations impact substantially on ADA resource allocation and battlefield placement. This information is unclassified and is provided solely for planning purposes. See the illustration on page K–2.

ADA WEAPON SYSTEMS PLANNING FACTORS

	SYSTEMS CHARACTERISTICS/CAPABILITIES						MOVEMENT/DEPLOYMENT FACTORS				STANDARDS FOR TRAINING (per ARTEP drills)			
	Personnel Crew/Sect/ Plt/Btry	Armament Ammo Basic Load	Acquisition Range* (approx)	Engagement Range* (approx)	Engagement Altitude* (approx)	Mutual Support Distance	Highest Single Mil Wt Clas	Tallest Load (ft/m)	Slope Capability %	Time to Fire/Drill	March Order Time	Emplacement Time	Reload Time	Emergency Disarm Time
STINGER	2 men/tm 5 tms/sect 2 sect/plt**	6 msls/tm 4 wpn rds 2 msl rds	visual	4 km +	3 km +	2 km	3	7.9 ft/2.4 m	34% fwd 24% side	foot march: 10 sec mounted: 10 sec	team: 10 sec	team: 10 sec	4 min	wait 3 hrs @ 1,200 ft to standard no time limit
STINGER FIGHTING VEHICLE (SFV)	5 men/sqd 1 sqd/SFV 4 sqds/plt	6 Stinger msls 5 tow msls 25 mm: 300 ready 600 stowed	visual/ IR scope	Stinger: 4 km + tow: 3.7 km 25 mm: 2.7 km coaxial: 7.62–900 m	3 km +	2 km	24	10 ft/3.4 m	60% fwd 40% side	Stinger: 10 sec from exit of SFV tow: 30 sec 25 mm: 20–40 sec	6 min	hasty: 10 sec regular: 6 min	Stinger: 4 min 25 mm: 10 min	wait 3 hrs @ 1,200 ft to standard no time limit
CHAPARRAL	4 men/sqd 1 sqd/Chaparral 4 Chaparral/plt 3 plt/btry	12 msls: 4 ready 8 stowed	visual/FLIR (9–10 km)	5 km	3 km +	2 km	15	9.5 ft/2.8 m	60% fwd 30% side	target engagement: 12 sec	8 min	20 min	8 min	wait 15 min to standard no time limit
VULCAN (T)	4 men/crew 1 crew/Vulcan 3 Vulcan/plt 3 plt/btry	20–mm rds: 500 ready 1,000 stowed	visual	1.2 km air 2 km ground	1.8 km	1 km	10	9.6 ft/2.92 m	34% fwd 24% side	target engagement: 3–10 sec	8 min	13 min	7 min	wait 45 min
VULCAN (SP)	3 men/crew 1 crew/Vulcan 3 Vulcan/plt 3 plt/btry	20–mm rds: 1,100 ready 1,031 stowed	visual	1.2 km air 2 km ground	1.8 km	1 km	13	9.6 ft/2.92 m	60% fwd/side to operate: 11.1%	target engagement: 3–10 sec	6 min	4 min	8 min	wait 45 min
AVENGER	2 men/Avenger 6 Avenger/plt 6 plt/btry	8 msls	visual/ FLIR: 9–10 km	4 km +	3 km +	3 km	4	8.8 ft/2.2 m	60% fwd 30% side	target engagement: 8 sec	6 min 30 sec (with RCU deployed)	5 min 30 sec (with RCU deployed)	7 min	wait 60 min to standard no time limit
HAWK	47 per AFP 124 per btry 2 AFPs/btry	30 msls/plt 60 msls/btry	80 km	40 km	18 km	20 km	14	17.5 ft/5.33 m	to operate: 10^0	20 min	60 min from release time	90 min: 45–emplace 45–ready to fire	10 min max	misfire: wait 30 min hangfire: wait 2 hrs no time limit to standard
PATRIOT	92 per btry: lchr plt: 27 fire control: 22 maint plt: 31 HQ: 12	32 msls/btry	69 km	N/A	N/A	15 km lat 20–30 depth	33	13.10 ft/3.99 m	to operate: 10^0	60 min	60 min from release time	as per TSOP or OPORD	60 min	wait 1 hr to standard no time limit

* See (S) FM 44–100A (U) (TBP) for exact classified range data.
** Heavy division: 2 SFV platoons and 1 Stinger platoon per battery.

Glossary

AA	air–to–air (missile)
AAAD	all arms for air defense
ABT	air–breathing threat
A2C2	Army airspace command and control
AC	alternating current
AADC	area air defense commander
AADCP	Army air defense command post
A/C	aircraft
ACL	allowable cargo load
ACP	airspace control procedures
AD	air defense
ADA	air defense artillery
ADC	air defense control
ADFCO	air defense fire control officer
ADL	automatic data link
ADMIN/LOG	administrative/logistics
ADW	air defense warning
AFP	assault fire platoon
AGL	altitude above ground level
AH	attack helicopter
AI	area of interest
A/L	administrative/logistics
alt	alternate altitude
AM	amplitude modulated
AMCO	air movement control officer
AMNCO	air movement noncommissioned officer
ant	antenna
AO	area of operations
APOD	aerial port of debarkation
AR	Army regulation
ARM	antiradiation missile
ARO	auxiliary readout
ARP	all range processing
ARTEP	Army Training and Evaluation Program
ARW	air raid warning
ASCC	air standardization coordinating committee
ASIT	air–to–surface interface terminal
ASM	air–to–surface missile
asst	assistance assistant
atk	attack
attn	attention
ATDL	Army tactical data link
ATP	Allied Tactical Publication
auto	automatic
AWACS	Airborne Warning and Control System
az	azimuth
BAI	battlefield air interdiction
BC	battery commander
BCP	battery command post
BCU	battery coolant unit
bde	brigade
BDZ	base defense zone
BFDC	battalion fire direction control
BMNT	before morning nautical twilight
bn	battalion
BOC	battalion operations center
BOS	battlefield operating system
BRU	battery replaceable unit
BSA	brigade support area
btry	battery
(C)	confidential
C2	command and control
C3	command, control, and communications
C3I	command, control, communications, and intelligence
canc	cancelled
CANTCO	cannot comply
CAS	close air support
cbt	combat
CCG	command control group
CEP	circular error of probability
chal	challenge
clas	classification
cmd	command
COA	course of action
comm	communications
COMSEC	communications security
CONEX	container express
corr	corridor
COSCOM	corps support command
CP	command post
CPE	collective protection equipment
CRC	control and reporting center
CRG	communications relay group
CRT	cathode ray tube
CSS	combat service support
CWAR	continuous wave acquisition radar
DA	Department of the Army

DCA	defensive counterair
DEFCON	defense readiness condition
DEFREP	defense readiness posture
dep	deploy
dev	development
div	division
DLRP	data link reference point
DOD	Department of Defense
DP	decision point
DS	direct support
DSA	division support area
DSM	decision support matrix
DSMC	direct support maintenance company
DSSU	direct support supply unit
DST	decision support template
DSU	direct support unit
DZ	drop zone
EA	engagement area
EAC	echelons above corps
ECM	electronic countermeasures
ECCM	electronic counter-countermeasures
ech	echelon
ECS	engagement control station
EDRE	emergency deployment readiness exercises
EEI	essential elements of information
EENT	early evening nautical twilight
el	elevation
elev	elevation
ELSEC	electronic security
EMCON	emission control
emp	employ
EOD	explosive ordnance disposal
ESM	electronic warfare support measures
est	estimate
EW	electronic warfare
ext	external
FAA	Federal Aviation Administration
FAAD	forward area air defense
FAADEZ	forward area air defense engagement zone
FAC	forward air controller
FARP	forward area rearming and refueling point
FDC	fire direction center
Feb	February
FEBA	forward edge of the battle area
FEZ	fighter engagement zone
FIDOC	firing doctrine
fld	field
FLIR	forward looking infrared
FLOT	forward line of own troops
FM	field manual frequency modulated
FOB	forward operating base
FORSCOM	United States Army Forces Command
FRAGO	fragmentary order
FRG	Federal Republic of Germany
FROG	free rocket over ground
FSCL	fire support coordination line
FSO	fire support officer
FU	fire unit
FW	fixed wing
fwd	forward
G2	Assistant Chief of Staff (Intelligence)
GEHOC	German HIMAD Operations Center
gen	generator
GEOREF	World Geographic Reference System
gnd	ground
GPS	global positioning system
GS	general support
GSR	general support reinforcing
H	Hawk
hel	helicopter
HHB	headquarters and headquarters battery
HIDACZ	high-density airspace control zone
HIMAD	high- to medium-altitude air defense
HIPIR	high-powered illuminating radar
HPI	high-powered illuminator
HPIO	high-powered illuminator operator
HPT	high-payoff target
HQ	headquarters
hr	hour
HTF	how to fight
HVT	high-value target
Hz	hertz
IADS	integrated air defense system
ICC	information and control central
ICOM	integrated communications
id	identification
IFF	identification, friend or foe
IJMS	interim JTIDS message specification
int	internal
intel	intelligence
I/O	input/output
IOS	input-output storage
IOT	integrated operator trainer

IPB	intelligence preparation of the battlefield
IRR	intelligence and radar reporting
ISC	integrated system check
JAAT	joint air attack team
JCS	Joint Chiefs of Staff
JEZ	joint engagement zone
JFACC	joint force air component commander
JTF	joint task force
JTADS	joint tactical automated distribution system
JTIDS	joint tactical information distribution system
KDP	known distance point
kft	kilofeet
kg	kilogram
km	kilometer
KRP	known reference point
LASHE	low-altitude simultaneous Hawk engagement
lat	latitude
LBE	load-bearing equipment
lbs	pounds
lchr	launcher
LIC	low-intensity conflict
LLTR	low-level transit route
LNIP	launch now intercept point
LOAP	list of applicable publications
long	longitude
LOS	line of sight
LRP	long-range patrol
ltn	location
LZ	landing zone
m	meter
maint	maintenance
MANPADS	man-portable air defense system
max	maximum
med	medium
METT-T	mission, enemy, terrain, troops, and time available
MEZ	missile engagement zone
MIC	medium-intensity conflict
MICC	master information and control central
MIF	missile in flight
min	minimum minute
mm	millimeter
MMC	materiel management center
MPH	miles per hour
MOPP	mission-oriented protection posture
MOS	military occupational specialty
MPC	message processing center
MPS	miles per second
MRBM	medium-range ballistic missile
MRE	meals, ready-to-eat
MSE	mobile subscriber equipment
msl	missile
MSL	meters above sea level
MSV	maximum safe velocity
MTOE	modification table of organization and equipment
MTP	mission training plan
mts	mountains
MWO	movement warning order
NA	not available
N/A	not applicable
NAI	named areas of interest
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, chemical
NCOIC	noncommissioned officer in charge
NMI	nautical mile indicator
no.	number
NOE	nap of the earth
NPFC	Naval Publications and Forms Center
(O)	for official use only
obj	objective
OCOKA	observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach
OF	optional form
OIC	officer in charge
OPCON	operational control
OPORD	operation order
OPSEC	operations security
OPS/INTEL	operations and intelligence
ORF	operational readiness float
OVM	organizational vehicle maintenance
P	Patriot
PADIL	Patriot data link
PADS	Patriot azimuth determining system
PAR	pulse acquisition radar
pax	passengers
PCP	platoon command post
PDB-3	post deployment build-3
pri	primary
PIR	priority intelligence requirements
PLL	prescribed load list
plt	platoon
PMCS	preventive maintenance checks and services
POL	petroleum, oils, and lubricants
PPI	planned position indicator

PRC	People's Republic of China
proh	prohibit
PSG	platoon sergeant
PSOI	primary sector of interest
PTL	primary target line
PV	prohibited volume
PW	prisoner of war
pwr	power
PZ	pickup zone
QSTAG	Quadripartite Standardization Agreement
R	reinforcing
rad	radar
RATELO	radiotelephone operator
RCU	remote control unit
rd	round
RF	radio frequency
rgt	regiment
RH	radar homing
RNP	radio navigation point
RO	radio operator
ROE	rules of engagement
ROR	range only radar
ROZ	restricted operations zone
RP	release point
RPV	remotely piloted vehicle
RSOP	reconnaissance, selection, and occupation of position
RTO	radiotelephone operator
RW	rotary wing
RV	restricted volume
RX	repairable exchange
(S)	secret
S1	Adjutant
S2	Intelligence Officer
S3	Operations and Training Officer
S4	Supply Officer
SA	spectrum analyzer
S&A	safety and arming
SAAFR	standard-use Army aircraft flight routes
S&S	supply and services
SACLOS	semiautomatic command to line of sight
SAM	surface-to-air missile
SASP	special ammunition supply point
sec	second
sect	section
SFV	Stinger fighting vehicle
SICC	subordinate information and control central
SOE	state of emission
SOFA	Status of Forces Agreement
SOI	signal operating instructions
SOJ	standoff jammer
SOP	standing operating procedure
SOR	state of readiness
SP	self-propelled starting point
SPOD	seaport of debarkation
sqd	squad
SRBM	short-range ballistic missile
SSJ	self-screening jammer
SSM	surface-to-surface missile
STANAG	Standardization Agreement
STP	soldier training publication
T	towed
tac	tactical
TACAIR	tactical air
TACC	tactical air control center
TAC OPS	tactical operations
TADIL A	tactical data link A
TADIL B	tactical data link B
TAI	target area of interest
TAOC	tactical air operations center
TAMMS	The Army Maintenance Management System
TAS	tracking adjunct system
TB	technical bulletin
TBEQ	to be engaged queue
TBM	tactical ballistic missile
TBP	to be published
TC	training circular
TCA	tactical control assistant
TCO	tactical control officer
TD	tactical director
TDA	tactical director assistant
TDECC	tactical display and engagement control console
tech	technical
temp	temperature
TF	task force
tk	tank
tm	team
TM	technical manual
TN	training
TO	tactical officer
TOC	tactical operations center
TOE	table(s) of organization and equipment
TOJ	track on jam

TPL	time-phased lines
TPU	tank and pump units
trk	truck
trl	trailer
trl/wt	trailer weight
TSOP	tactical standing operating procedure
TTLL	time to last launch
TW	thumbwheel
TVA	target value analysis
(U)	unclassified
UAV	unmanned aerial vehicle
UHF	ultrahigh frequency
UNAAF	Unified Action Armed Forces
US	United States
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
UTM	universal transverse mercator
veh/wt	vehicle weight
vel	velocity
VHF	very high frequency
vic	vicinity
vol	volume
VTDP	vector targeting designation point
VTG	video tracking group
w	with
WAD	weapons alert designator
WCS	weapons control status
WCV	weapons control volume
WEZ	weapons engagement zone
WFZ	weapons free zone
WOC	weapons operations center
wpn	weapon
wt	weight
XO	executive officer

References

SOURCES USED

These are the sources quoted or paraphrased in this publication.

AR 380-5. Department of the Army Information Security Program. 25 February 1988.

(C) AR 530-4. Control of Compromising Emanations (U). 1 March 1984.

AR 710-2. Supply Policy Below the Wholesale Level. 13 January 1988 (Change 1, September 1989).

ARTEP 44-495-MTP. Mission Training Plan for an ADA Battalion, Hawk. 3 September 1991.

ARTEP 44-497-30-MTP. Mission Training Plan for the Hawk ADA Battery. 15 November 1991.

ARTEP 44-497-10-Drill. Drills for a Hawk ADA Missile System Phase H. 5 September 1991.

ARTEP 44-497-13-Drill Drills for a Hawk ADA Missile System Phase XII. 30 September 1991.

FM 3-3. NBC Contamination Avoidance. 30 September 1986 (Change 1, May 1987),

FM 3-5. NBC Decontamination. 24 June 1985.

FM 3-9. Military chemistry and Chemical Compounds. 30 October 1975.

FM 5-20. Camouflage. 20 May 1968.

FM 5-36. Route Reconnaissance and classification. 10 May 1986.

FM 5-100. Engineer Combat Operations. 22 November 1988.

FM 6-2. Field Artillery Survey. 30 November 1986.

FM 9-6. Munition Support in the Theater of Operations. 1 September 1989.

FM 9-59. Unit Operations for Support of Missile and Air Defense Gun Systems. 16 September 1985.

FM 10-63. Handling of Deceased Personnel in the Theaters of Operations. 28 February 1986.

FM 11–44. Air Defense Artillery Signal Operations Battalion and Signal Operations Company. 27 September 1988.

FM 11-92(HTF). Combat Communications Within the Corps (How to Fight). 1 November 1978.

FM 21-26. Map Reading and Land Navigation. 30 September 1987.

FM 24-1. Signal Support in the AirLand Battle. 15 October 1990.

FM 24-18. Tactical Single-Channel Radio Communications Techniques. 30 September 1987.

FM 24-33. Communications Techniques: Electronic Counter-Countermeasures. 17 July 1960.

FM 26-2. Management of Stress in Army Operations. 29 August 1986.

FM 34-60. Counterintelligence. 5 February 1990.

FM 34-64. Electronic Security (ELSEC) Techniques. 9 May 1986.

FM 34-130. Intelligence Preparation of the Battlefield. 23 May 1989.

FM 44-1. Army Air Defense Artillery Employment. 9 May 1983.

FM 44-1-2. Air Defense Artillery Reference Handbook. 15 June 1984.

FM 44-8. Small Unit Self-Defense Against Air Attack. 30 December 1981 (1 August 1984).

FM 44-18. Air Defense Artillery Employment, Stinger (How to Fight). 30 September 1981(1 May 1985).

FM 44-18-1. Stinger Team Operations. 31 December 1984.

FM 44-30. Visual Aircraft Recognition. 28 October 1986.

(C) FM 44-70. Air Defense Artillery Command and Control System, AN/TSQ-73 Missile Minder (U). 16 July 1982.

FM 55-12. Movement of Units in Air Force Aircraft. 10 November 1989.

FM 55-450-1. Army Helicopter External Load Operations. 3 October 1988.

FM 63-1. Combat Service Support Operations, Separate Brigade. 30 September 1983.

FM 63-2. Combat Service Support Operations--Division (How to Support). 21 November 1983.

FM 63-4. Combat Service Support Operations--Theater Army Area Command. 24 September 1983,

FM 90-2. Battlefield Deception. 3 October 1988.

FM 90-14. Rear Battle. 10 June 1985.

FM 100-10. Combat Service Support. 18 February 1988,

FM 100-27. US Army/US Air Force Doctrine for Joint Airborne and Tactical Airlift Operations. 31 January 1985 (Change 1,1 March 1985).

FM 100-28. Doctrine and procedures for Airspace Control in the Combat Zone. 1 December 1975.

FM 100-103. Army Airspace Command and Control in a Combat Zone. 7 October 1987.

FM 101-5. Staff Organization and Operations. 25 May 1984.

FM 101-5-1. Operational Terms and Symbols. 21 October 1985.

FM 101-10-1/1. Staff Officers Field Manual--Organizational, Technical, and Logistical Data (volume 1). 7 October 1987.

FM 101-10-1/2. Staff Officers Field Manual--Organizational, Technical, and Logistical Data Planning Factors (Volume 2). 7 October 1987 (Change 1 July 1990).

JCS Publication 0-2. Unified Action Armed Forces (UNAAF). 1 December 1986.

JCS Publication 1-02. DOD Dictionary of Military and* ciated Terms. 1 June 1987.

JCS Publication 3-56. Tactical Command and Control Planning Guidance and Procedures for Joint Operations (Information Exchange Planning Guidance). 1 April 1973.

STP 21-1 -SMCT. Soldier's Manual of Common Tasks (Skill Level 1). 1 October 1990.

(0) TB 9-380-101-11. Security Classification Guide for: Hawk Guided Missile Systems. 1 August 1988.

TB 43-0118. Field Instructions for Painting and Preserving Communications-Electronics Equipment. 15 June 1986.

TB 43-0209. Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment. 29 October 1976.

TB 55-46-1. Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Other Outsize/ Overweight Equipment. 1 January 1990.

(S) TB 380-6-8. Electronic Security (ELSEC) for Air Defense Artillery Battlefield Survivability (U). 15 September 1982.

TC 5-200. Camouflage Pattern Painting. 28 August 1975.

TC 11-4. Handbook for AN/VRC-12 Series of Radio Sets. 8 April 1977.

TC 11-6. Grounding Techniques. 3 March 1989.

TM 5-200. Camouflage Materials. 19 April 1968.

TM 9-1290-262-10. Operator's Manual for Aiming Circle M2 W/E and M2A2 W/E. 15 April 1981.

TM 9-1410-530-14. Operator, Organizational, Direct Support and General Support Maintenance Manual Intercept-Aerial, Guided Missile, MIM-23B, MIM-23C, MIM-23D, MIM-23E, MIM-23F, MTM-23B, and M18E2. (Hawk Air Defense Guided Missile System). 11 September 1972 (Change 20, September 1988).

TM 9-1425-525-L. List of Applicable Publications (LOAP) for Hawk Air Defense Guided Missile System. 11 May 1990.

(C) TM 9-1425-1525-12-3. Operator's and Organizational Maintenance Manual for Electronic Countermeasures and Counter-Countermeasures (Improved Hawk Air Defense Guided Missile System) (U). 30 June 1979 (Change 10, January 1990).

TM 9-1430-1528-12-1. Operator's and Organizational Maintenance Manual for Radar Set AN/MPQ-55 (XO-l) (Hawk Air Defense Guided Missile System). 30 June 1979 (Change 17, May 1990).

TM 9-1430-1533-12-1. Operator and Organizational Maintenance Manual for High-Powered Illuminator Radar Set, AN/MPQ-57 (Hawk Air Defense Guided Missile System). 28 June 1983 (Change 11, April 1990).

TM 9-1430-1535-12-1. Operator's and Organizational Maintenance Manual for Information and Coordination Central Guided Missile System, AN/MSQ-110 and Platoon Command Post, Guided Missile AN/MSW-19 (Hawk Air Defense Guided Missile System). 25 July 1979 (Change 18, July 1990).

TM 9-1430-2535-10. Operator Manual for Platoon Command Post, Guided Missile AN/MSW-2O and Battery Command Post, Guided Missile AN/MSW-21 (Hawk Air Defense Missile System). 30 November 1988, (Change 2, May 1991).

TM 9-1440-531-12-1. Operator's and Organizational Maintenance Manual for Guided Missile Zero Length Launcher, M192 Guided Missile Loading and Storage Pallet, M1E2 and Guided Missile Launching Section Control Box, AN/GSA-132A (Hawk Air Defense Guided Missile System). 1 September 1972 (Change 22, December 1989).

TM 9-1450-500-10. Operator's Manual for Loader-Transporter, Guided Missile: XM501E3 (Hawk Guided Missile System). 17 March 1988 (Change 2, June 1990).

TM 11-5855-213-10. Operator's Manual for Night Vision Sight, Individual Served Weapon, AN/PSV-4. 13 September 1985 (Change 1, June 1988).

TM 38-250. Packaging and Materials Handling Preparing of Hazardous Materials for Military Air Shipment. 15 January 1988,

TM 38-750-1. The Army Maintenance Management System (TAMMS) Field Command Procedures. 29 December 1978 (Change 2, February 1984).

TM 43-0002-24. Organizational Maintenance Manual: Destruction of Equipment to Prevent Enemy Use (Improved Hawk Air Defense Guided Missile System). 17 February 1983 (Change 1, July 1988).

These international agreements are available on request from the Naval Publications and Forms Center (NPFC), 5801 Tabor Avenue, Philadelphia, PA 19120. Use DD Form 1425 to requestion documents.

STANAG	QSTAG/ ASCC	TITLE	EDITION
2047	183	Emergency Alarms of Hazard or Attack (NBC and Air Attack Only)	6
2103	187	Reporting Nuclear Detonations, Biological and Chemical Attacks and Predicting and Warning of Associated Hazards and Hazard Areas--ATP-45	5
2112		Radiological Survey	3
3700	45/3A	NATO Tactical Air Doctrine (ATP-33 [B])	3
3805	45/6	Doctrine and Procedures for Airspace Control in the Combat Zone	2
3880	45/4	Counter Air Operations--ATP-42	1

DOCUMENTS NEEDED

These documents must be available to the intended users of this publication.

FM 1-103. Airspace Management and Army Air Air Traffic in a Combat Zone. 30 December 1981.

FM 3-4. NBC Protection, 21 October 1985.

FM 3-100. NBC Operations. 17 September 1985.

FM 21-10. Field Hygiene and Sanitation. 22 November 1988,

(S) FM 34-40. Electronic Warfare Operations (U). 9 October 1987.

(S) FM 44-1A. Air Defense Artillery Operational Planning Data (U). 21 September 1984 (Change 1, May 1986).

FM 44-100. US Army Air Defense Operations. 22 November 1988.

FM 100-5. Operations. 5 May 1986.

FM 100-16. Support Operations: Echelons Above Corps. 16 April 1985.

JCS Publication 3-01.1. Joint Doctrine for Defense of the United States Against Air Attack. 11 February 1982.

(0) JCS Publication 3-01.3 (ICl). Joint Doctrine for Air Defense. 23 May 1964 (Change 1, 9 June 1984).

READINGS RECOMMENDED

These readings contain relevant supplemental information.

AR 40-5, Preventive Medicine. 1 June 1985 (Change 1, Sep tember 1986).

DA Form 2404. Equipment Inspection and Maintenance Worksheet. April 1979.

DA Form 1425. Specifications and Standards Requisition. March 1986.

DA Form 2028. Recommended Changes to Publications and Blank Forms. February 1974.

OF Form 346. US Government Motor Vehicle Operator's Identification Card. November 1985.

FM 22-9. Soldier Performance in Continuous Operations. 8 December 1983.

(S) FM 44-72A. Hawk IIA, IIIA (U) (TBP)

FM 44-85. Patriot Battalion/Battery Operations EAC (TBP)

(S) FM 44-100A. ADA Operations Planning (U) (TBP)

FM 55-15. Transportation Reference Data. 9 June 1986.

FM 55-65. Strategic Deployment by Surface Transportation. 10 May 1989.

FM 100-103. Army Airspace Command and Control in a Combat Zone. 7 October 1987.

FM 710-27. Logistics Inventory Management. 29 December 1989.

Index

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
02953

DISTRIBUTION:

Active Army, USAR, and ARNG: To be distributed in accordance with DA Form 12-11E. Requirements for FM 44-73, Tactics, Techniques, and Procedures for Hawk Platoon Operations (Qty rqr block number 4610).

☆ U.S. GOVERNMENT PRINTING OFFICE : 1995 O - 388-421 (02559)