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HAWK BATTALION OPERATIONS

Preface

This field manual provides a readily available source of information on the organization and functioning of a Hawk air defense artillery battalion. It presents doctrinal material on the employment of the Hawk air defense system and on the design of air defenses. This manual is oriented primarily toward Hawk commanders, staff officers, tactical directors, and tactical control officers.

This field manual contains information explaining how the Hawk battalion fights the air-land battle. It explains how the Hawk battalion meets the threat and how it performs the mission of Army air defense artillery at very low to medium altitudes.

The provisions of this publication are the subject of international agreements:

STANAG	QSTAG/ ASCC	TITLE
2047	183	Emergency Alarms of Hazard or Attack (NBC and Air Attack Only)
2103	187	Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas (ATP-45)
2112		Radiological Survey
3700	45/3A	NATO Tactical Air Doctrine (ATP-33(A))
3805	45/6	Doctrine and Procedures for Airspace Control in the Combat Zone (ATP-40)
3880	45/4	Counter Air Operations (ATP-42)

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Unless otherwise stated, the masculine gender applies to both men and women.

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CHAPTER 1

The Air Defense Mission and Roles

JCS Publication 1 defines air defense as "all defensive measures designed to destroy attacking enemy aircraft or missiles in the earth's envelope of atmosphere, or to nullify or reduce the effectiveness of such attack."

Any discussion of air defense must emphasize the distinction between air defense and air defense artillery. In this manual, the terms "air defense" and "AD" refer to the whole realm of air defense; "air defense artillery" and "ADA" refer to specialized, ground-based, surface-to-air weapon systems or the specific Army branch.

JCS Publication 8 states the objective of all air defense. That objective is "to limit the effectiveness of enemy offensive air efforts to a level permitting freedom of action to friendly forces of all types."

Freedom for the ground force commander to maneuver without interference from enemy air attack is the objective of US Army ADA. This chapter defines the mission, objective, and responsibilities of air defense; points out how a variety of complementary air defense weapons will counter enemy air threats; and identifies the role of Hawk.

THE MISSION AND ROLE OF AIR DEFENSE ARTILLERY

The main mission of the US Army is to deter war. Failing that, the objective of combat operations is to destroy the opposing force. ADA must support the primary Army function of conducting prompt and sustained land warfare. To do this, ADA must carry out its four-fold mission. The mission of ADA is shown below.

ADA MISSION

To ensure the combined arms team retains the freedom to maneuver, to protect C²I, to sustain the battle, and to kill enemy air targets the first time.

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The role of each ADA weapon system is to accomplish the ADA mission within the capabilities of that particular weapon system. For example, Patriot's role is to accomplish the ADA mission within the very low- to very high-altitude boundaries of the battlefield. The role of Vulcan is to accomplish the ADA mission within the very low- to low-altitude boundaries of the battlefield. The standard altitude bands are shown in the following illustration.

STANDARD ALTITUDE BANDS

ALTITUDE BAND	ALTITUDE IN METERS	ALTITUDE IN FEET
VERY LOW	0-150	0-500
LOW	150-600	500-2,000
MEDIUM	600-7,500	2,000-25,000
HIGH	7,500-15,000	25,000-50,000
VERY HIGH	15,000 +	50,000 +

THE AIR-LAND BATTLE

The Army's air-land battle doctrine describes the ways the Army will conduct campaigns and battles. Air-land battle doctrine is based on securing and retaining the initiative to defeat the enemy force. Air-land battlefield operations are designed to throw the enemy off balance with a powerful initial blow from an unexpected direction and to follow up with rapid exploitation to prevent his recovery.

TENETS OF AIR-LAND BATTLE DOCTRINE

Flexibility, combined arms cooperation, and integration of efforts are essential to battlefield success. ADA units support operations designed to preserve and exploit the initiative, attack the enemy in depth with firepower and maneuver, maintain the agility necessary to rapidly shift forces and fires to enemy weaknesses, and synchronize combat operations to attain the commander's goal. Success in the air-land battle depends on the ability to achieve four principles — initiative, depth, agility, and synchronization — in combat operations.

Initiative

ADA is a combat arm which fights the air battle just as armor and infantry fight the land battle. ADA operations cause the enemy air threat to react to what ADA does. The enemy's reaction leads to ineffective, uncoordinated, and piecemeal responses and eventually to his defeat. The ADA commander at each echelon develops a plan of action to mass combat power at the critical time and place to permit freedom of action to friendly forces. By destroying the enemy as far forward as possible, ADA preserves the independence of action necessary for the maneuver forces. To preserve the initiative against the enemy air threat, ADA commanders assign appropriate support relationships to allow as much flexibility as possible to their subordinates. Subordinate commanders move their units as far forward as possible and position them where the air threat does not expect to encounter ground-based air defense.

Depth

ADA fights the air-land battle in all areas of operations (rear, deep, and close) during all hours of day or night and during periods of reduced visibility. Corps ADA and echelons above corps ADA provide the depth of resources to preserve flexibility and to extend the force commander's area of influence throughout the battle area.

Agility

ADA commanders tailor their organizations to support the entire spectrum of missions and to allow for rapid shifting of ADA forces to anticipate and counter any air threat. The command, control, communications, and early warning networks available to ADA units help those units to achieve and maintain agility.

Synchronization

The ADA battle plan flows from the force commander's concept of the operation. This is true from theater commander to division commander. Each supporting ADA commander ensures that there is a unified effort on the part of all of his subordinate units. Each individual mission assigned to a subordinate ADA unit is a part of and contributes to the successful implementation of the force commander's concept of the operation. Commanders must make provisions for exploiting tactical success to ensure sustained ADA support.

PLANNING CONSIDERATIONS

Planners must perceive the air-land battle in terms of destruction of the enemy's ability to fight. This concept is not new. However, current and future capabilities require commanders to consider new methods for bringing that goal within reach.

The air-land battle is one battle which simultaneously encompasses —

- Deep operations.
- Close operations.
- Rear operations.

Successful operations require the unified employment of a wide range of systems and organizations. The air-land battlefield for corps and divisions is much deeper than the battlefield envisioned in previous doctrine. The primary considerations within air-land battle doctrine are deep attack, limited assets, modern and enhanced weapon systems, and a single unifying idea.

Deep Attack

Deep attack is an absolute necessity to winning the conflict. Without the deep attack the enemy's numerical superiority would allow him to keep a substantial amount of his force out of the initial battle. The threat forces not needed in the initial battle could then join the battle at will to overpower or bypass friendly forces. Numerical superiority gives the enemy a strong hold on the initiative, a hold that only a deep attack can break.

Limited Assets

The force commander has limited resources for both acquiring and striking the enemy in deep operations. This necessitates a high degree of coordination between the decisive close operations and the deep operations so that maximum combat power can be brought to bear on the enemy at the right time and place. The conduct of these two operations with the limited assets available must prevent the enemy's second and succeeding echelons from joining the battle in the close operation.

Modern and Enhanced Weapon Systems

Modern and enhanced weapon systems have enormous lethality and range. Automated command and control systems and sensors of substantial capability support the modern weapons employed in the air-land battle. These systems provide a means of generating combat power that was not possible in previous conflicts.

Single Unifying Idea

The commander's concept of the operation is the single unifying idea which provides the basis for operational planning. FM 44-1 provides a detailed discussion of ADA in the air-land battle.

AIR-LAND BATTLE IMPERATIVES

Success in battle — achieving superior combat power — depends on using tactics appropriate to METT-T. The effectiveness of maneuver, firepower, and protection depends on how the commander combines operational procedures, battle drills, and other measures to solve each particular problem. Doctrine establishes common approaches to fighting. The successful tactician depends on proven techniques and well-trained troops to employ them. As he plans and fights the battle, the tactician must understand the air-land battle imperatives.

Ensure Unity of Effort

The role of ADA is to support the force commander's concept of the operation. All actions must point toward that goal. Mission orders will be simple and allow subordinates the greatest possible freedom. Where possible, ADA units will operate as battalions in support of the force mission. The command and control system available to Hawk units facilitates battalion-level control, yet allows a higher level commander to follow up and ensure that his is the single concept driving the operation to completion. The capabilities of modern systems and the number of airspace users on the battlefield

make unity of effort very difficult to achieve. Without detailed planning and continual coordination, unity of effort will not exist.

Anticipate Events on the Battlefield

The ADA unit commander must anticipate the enemy's actions and reactions. The Hawk commander must develop the skills to anticipate events and foresee possibilities hours, days, or even weeks in advance. These skills are critical if the unit commander is to maintain initiative and operate inside the enemy's decision cycle.

Concentrate Combat Power Against Enemy Vulnerabilities

The enemy air threat is most vulnerable while it is en route to or at its ordnance launch position. To capitalize on this vulnerability, commanders must exercise the mobility of all ADA units to deny the enemy the use of very low- to low-altitude approaches and standoff firing positions. An appropriate mix of ADA weapons with complementary capabilities should preclude evasive or suppressive air tactics designed to exploit individual ADA system weaknesses.

Designate, Sustain, and Shift the Main Effort

Massed ADA units will support the force commander's concept of the operation. Massing in one area may make economy of force measures necessary in other areas. Certain relatively static facilities may have to rely on their own passive and active self-defense measures for air defense. If conditions change, the commander must shift his main effort to a new direction. Priorities of support must change to assure success of the new main effort.

Press the Fight

Commanders must press the fight tenaciously and aggressively. To sustain momentum, leaders must deploy forces in adequate depth and arrange for timely and continuous combat and CSS at the outset of operations. They must accept risks and must relentlessly press soldiers and systems to limits of endurance for as long as necessary.

Move Fast, Strike Hard, and Finish Rapidly

Hawk units are highly mobile. Their weapons are accurate and lethal. Hawk units have the ability to mass at the proper place and time, and the flexibility to tailor forces to exploit tactical successes. All these characteristics contribute to the achievement of this combat imperative.

Use Terrain, Weather, Deception, and OPSEC

Hawk units must make maximum use of natural terrain features. Units should use covered and concealed routes whenever possible. Hawk units will occupy positions offering long-range observation and fields of fire to see and attack deep along enemy air attack avenues. Hawk units also enhance combat power by using deception and tight OPSEC.

Conserve Strength for Decisive Action

The force commander must take all steps necessary to preserve the fighting strength of his unit. Air attack must not surprise the unit. Early warning against air attack is provided to Hawk units and other ADA units who in turn alert the force. Hawk defense designers must locate fire units to counter the air threat directed against those resources crucial to the force commander's concept of the operation. Commanders must minimize the diversion of resources to nonessential tasks. Covered and concealed positions, good OPSEC, protection of troops and equipment from adverse weather, protection of troops from disease, and good supply and maintenance discipline are all measures which conserve a force's strength.

Combine Arms to Complement and Reinforce

The commander must use units and weapon systems which complement each other. Air defenders follow the principles of mixing weapon systems. A mix of weapons allows one system's strengths to compensate for another's limitations. The same principles — complementing one system with another — apply to the employment of combined arms and joint forces. Arms and services reinforce and complement each other. This will be true only if thorough planning and coordination are accomplished.

Joint and combined operations demand extraordinary cooperation and coordination for success.

Understand the Effects of Battle on Soldiers and Units

Commanders must be alert to small indicators of fatigue, fear, indiscipline, and reduced morale and be ready to take measures to deal with these before they cumulatively drive the unit to the threshold of collapse. Prior to combat, senior leaders must emphasize junior leader development. During combat, commanders must monitor and sustain the effectiveness of leaders to the greatest extent possible.

DEEP OPERATIONS

Deep operations begin before the enemy closes with the friendly maneuver forces and continue throughout the covering force and main battle areas. Deep operations will likely continue after initial direct contact between the forces ends. Deep operations prevent or delay the closing of follow-on echelons and create windows of opportunity for decisive attacks on leading enemy echelons.

To conduct deep operations, the corps commander relies primarily on the following combat capabilities:

- Interdiction by air, artillery, and special operation forces.
- Offensive electronic warfare.
- Deception.
- Maneuver.

Of these capabilities, battlefield air interdiction is now the principal means of conducting deep operations. In both the defense and the offense, the corps and its divisions must carefully coordinate deep operation plans to ensure unity of effort and to prevent duplication.

The deep attack is vital to the success of our fighting force. ADA protection is integral and vital to this mission. The requirement to conduct deep attacks forces commanders at every level to consider protection of deep strike assets when developing air defense priorities. Because of the direct relationship between success in the deep attack and ultimate success in the air-land battle, commanders must give a high priority for air defense protection to assets required to conduct the deep attack. Protecting these assets from air attack preserves combat power for interdiction of the enemy second echelon forces. The commander's deep-attack assets will include, but are not limited to, long-range delivery systems (aircraft, artillery, and missiles), maneuver units, and command and control facilities at various levels.

At theater level, a mix of Air Force and Army resources usually provides air defense protection of the theater commander's priority assets. The theater commander must conduct a careful analysis to identify those assets most critical to the conduct of the air-land battle. He then provides air defense protection in priority based on that criticality. Patriot battalions normally provide point defense of deep-attack assets in the communications zone — assets such as air bases and missile systems. Patriot battalions also provide area defense overwatch protection (medium- to very high-altitude coverage) of the combat zone. Hawk and SHORAD units normally provide point defense of deep attack assets.

The corps ADA brigade supports the corps commander's concept of the operation. Since the corps commander normally has insufficient HIMAD battalions to defend all the facilities in the corps area, he must present his requirements for additional air defense to the theater commander. The theater commander normally allocates HIMAD battalions to provide all-altitude protection of deep-attack assets. Priority of coverage normally goes to facilities in the tactical operations area. The corps commander should locate deep strike assets, such as Lance, under the coverage provided by theater ADA in the tactical operations area. HIMAD units must move forward to support deep attack maneuvers. Theater ADA units can engage and destroy standoff jammers. Destroying these jammers would improve overall ADA system performance. It would likely also reduce communications jamming in the tactical operations area.

CLOSE OPERATIONS

Maneuver brigades which conduct close operations must have protection from threat attack helicopters and ground support fighters. This protection should include integrated SHORAD and HIMAD defenses. The air defense protection provided by the HIMAD units destroys the enemy's deep-strike aircraft. It also forces enemy aircraft into the lower altitude engagement zones of SHORAD systems by denying them the option of attacking from medium to very high altitudes. Coverage provided by HIMAD battalions normally extends over that portion of the corps rear area which is adjacent to the division area. This overlapping of coverage also provides the corps commander a degree of rear area protection. The HIMAD, corps ADA brigade, and divisional ADA battalion commanders must exchange operational information to integrate their ADA protection rather than optimizing an individual weapon system's contribution. Close coordination enhances air defense of critical assets for both the close operations and the deep operations.

REAR OPERATIONS

The enemy will attempt to disrupt and demoralize forces in rear areas by interrupting support activities, interdicting lines of communications, and diverting combat forces from the main battle area. The threat to the rear area includes air attack, special operation forces, saboteurs, terrorists, airborne forces, airmobile forces, and amphibious forces. The size of the rear area threat can range from single individuals to division-size elements and from single aircraft to multiple-plane attacks.

ADA support for rear operations includes air defense of such likely enemy targets as —

- Nuclear sites.
- Command and control centers.
- Airfields.
- Ports.
- Logistics installations.
- Intelligence facilities.
- Key civilian industry and utility installations.

Attacks against the type assets listed are an important component of the enemy's battle concept. ADA protection of these deep operations and sustaining base assets is an important element in the preservation of combat power and the ability to conduct and sustain air-land battle operations.

At theater level, ADA resources of the Army air defense command, including HIMAD battalions, defend vital assets. The corps ADA brigade provides area and point air defense to the corps in support of the corps commander's concept of the operation. In the corps areas, the Air Force and theater level ADA will defend assets designated as priorities by the theater commander. In the division area, theater HIMAD and corps Hawk resources normally provide planned ADA protection. Planned Patriot coverage also may extend into portions of the tactical operations area. Theater Hawk battalions normally are under the command of ADA brigades assigned to the Army air defense command. The Air Force control and reporting center in the local area exercises control. Hawk assigned to corps level falls under the procedural air battle control of the Air Force, but tactical control of unit locations and missions remains with the corps.

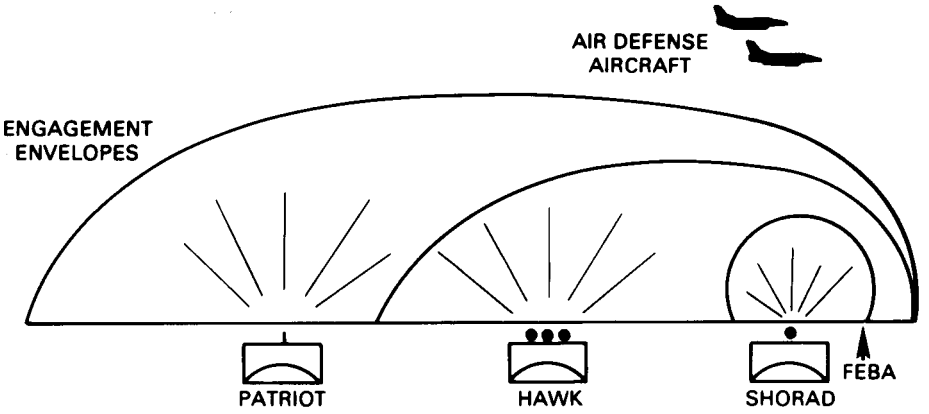
Hawk unit commanders must carefully evaluate the threat posed by airborne and air assault forces capable of penetrating division, corps, and theater rear areas along very low-altitude avenues of approach. Extensive terrain analyses to determine these avenues of approach and limitations in coverage caused by terrain masking are essential in ADA planning. Coverage should be weighted against these avenues of approach and at the same time should provide contiguous lateral coverage in the assigned sector.

Effective air defense protection is critical to the conduct of the air-land battle. One of the most important contributions that HIMAD battalions make to the main effort is the protection of deep-strike assets. HIMAD battalions also increase the survivability and sustainability of maneuver forces by providing coverage over combat, combat support, and CSS units operating in the division area.

HOW AIR DEFENSE COUNTERS THE AIR THREAT

No single air defense weapon system can do an effective job of protecting all assets of the force against the enemy's many attack techniques, aircraft and missiles. A family of complementary air defense weapon systems (see illustration) must be employed in sufficient numbers to be effective. All weapon systems must be integrated into a cohesive defense that is responsive to the needs of the maneuver commander and to the requirements of the area or region air defense commander in the overall air-land battle.

FAMILY OF COMPLEMENTARY WEAPON SYSTEMS



Generally, ADA weapon systems are divided into two categories — SHORAD and HIMAD. Counterair aircraft are also part of the total air defense force.

SHORAD GUN AND MISSILE SYSTEMS

SHORAD systems include Redeye, Stinger, Chaparral, Roland, Duster, and Vulcan. SHORAD systems are employed to defend maneuver forces and their critical assets against attack by enemy CAS aircraft and attack helicopters. They are also employed in rear areas to defend high priority assets such as airbases and logistics installations. Redeye or Stinger systems are authorized in the HIMAD force structure to defend HIMAD units from close-in air attack. See the SHORAD Characteristics illustration.

SHORAD CHARACTERISTICS

SYSTEM	TYPE	MOBILITY	ALL-WEATHER	DETECTION	RANGE (METERS)
REDEYE	**MISSILE**	**MAN-PORTABLE**	**NO**	**VISUAL**	**3,000**
STINGER	MISSILE	MAN-PORTABLE	NO	VISUAL	4,000
CHAPARRAL	**MISSILE**	**TRACKED (SP)**	***NO**	**VISUAL**	**5,000**
ROLAND	MISSILE	WHEELED (SP)	YES	RADAR, VISUAL	6,000
DUSTER	**GUN**	**TRACKED (SP)**	**NO**	**VISUAL**	**1,650**
VULCAN	GUN	TRACKED (SP)/ TOWED	NO	VISUAL	1,200

*CHAPARRAL WITH FLIR HAS ADVERSE WEATHER CAPABILITIES

HIMAD MISSILE SYSTEMS

HIMAD systems include Hawk and Patriot. HIMAD systems are assigned to the corps or the theater. They are employed throughout the corps or the theater to defend the commander's high priority assets and areas against hostile air attack. See the HIMAD Characteristics illustration.

HIMAD CHARACTERISTICS

SYSTEM	TYPE	MOBILITY	ALL-WEATHER	GUIDANCE	RANGE(KM)
HAWK	MISSILE	TOWED	YES	SEMIACTIVE HOMING	40
PATRIOT	MISSILE	TOWED	YES	COMMAND/TRACK-VIA-MISSILE	68

DEFENSIVE COUNTERAIR AIRCRAFT

US and allied air defense aircraft complement surface-to-air weapon systems. These aircraft seek out and engage enemy aircraft before they reach critical assets protected by ADA. Primary Air Force interceptors are the F-4 Phantom, F-15 Eagle, and F-16 Fighting Falcon but other services and allies use many different aircraft. Some Army rotary-wing aircraft have a limited counterair capability. (See the Counterair Aircraft illustration.) In conjunction with ADA, manned interceptors have the mission of exacting maximum possible attrition and disrupting the enemy's air attacks before he reaches the defended area. Manned interceptors normally establish CAPS when they operate in the airspace above ADA.

COUNTERAIR AIRCRAFT

UNITED STATES

SYSTEM	SERVICE	DETECTION	ARMAMENT
F-4 PHANTOM	AIR FORCE, NAVY	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, 20-MM CANNON
F-14 TOMCAT	MARINE CORPS, NAVY	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, AIM-54 PHOENIX
F-15 EAGLE	AIR FORCE	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, AMRAAM, 20-MM CANNON
F-16 FIGHTING FALCON	AIR FORCE	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, AMRAAM, SKYFLASH
F/A-18 HORNET	NAVY, MARINE CORPS	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, 20-MM CANNON

ALLIED

SYSTEM	COUNTRY	DETECTION	ARMAMENT
F-4 PHANTOM	WEST GERMANY, SOUTH KOREA, UNITED KINGDOM, ISRAEL, SPAIN, TURKEY, JAPAN	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, 20-MM CANNON, SKYFLASH
F-5 FREEDOM FIGHTER	CANADA, EGYPT, GREECE, SAUDI ARABIA, SOUTH KOREA, SPAIN, TURKEY	VISUAL	AIM-9 SIDEWINDER, 20-MM CANNON

COUNTERAIR AIRCRAFT (continued)

SYSTEM	COUNTRY	DETECTION	ARMAMENT
F-15 EAGLE	ISRAEL, JAPAN, SAUDI ARABIA	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, AMRAAM, 20-MM CANNON
F-16 FIGHTING FALCON	BELGIUM, DENMARK, EGYPT, ISRAEL, NETHERLANDS, NORWAY	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, AMRAAM, SKYFLASH
F/A-18 HORNET	CANADA, AUSTRALIA	RADAR/VISUAL	AIM-7 SPARROW, AIM-9 SIDEWINDER, 20-MM CANNON
F-104 STARFIGHTER	BELGIUM, CANADA, DENMARK, GREECE, ITALY, JAPAN, NETHERLANDS, NORWAY, WEST GERMANY	VISUAL	AIM-9 SIDEWINDER, 20-MM CANNON
J-35 DRAKEN	DENMARK, FINLAND, SWEDEN	RADAR/VISUAL	AIMs, 30-MM CANNON
KFIR C-2	ISRAEL	RADAR/VISUAL	PYTHON 3, SHAFRIR AIM, 30-MM CANNON
LIGHTNING	SAUDI ARABIA, UNITED KINGDOM	RADAR/VISUAL	RED TOPS AIM, 30-MM CANNON
MIRAGE III	AUSTRALIA, BELGIUM, EGYPT, FRANCE, ISRAEL, SPAIN	RADAR/VISUAL	MAGIC, R.530 AIMs, 30-MM CANNON
MIRAGE 2000	FRANCE	RADAR/VISUAL	MATRA SUPER 530, 550 MAGIC, AIMs, 30-MM CANNON
MIRAGE F-1C	FRANCE, GREECE	RADAR/VISUAL	MATRA SUPER 530, 550 MAGIC, AIM-9 SIDEWINDER, 30-MM CANNON
TORNADO, F.MK2	UNITED KINGDOM	RADAR/VISUAL	SKYFLASH, AIM-9 SIDEWINDER, AIM-20, AMRAAM, ASRAAM
VIGGEN AJ-37	SWEDEN	RADAR/VISUAL	AIM-9 SIDEWINDER, SKYFLASH, 30-MM CANNON
GRIPEN JAS-39	SWEDEN	RADAR/VISUAL	AIM-9 SIDEWINDER, SKYFLASH, 30-MM CANNON

THE TOTAL AIR DEFENSE FORCE

Ground-based ADA weapons add depth to the defense by providing concentrated surface-to-air fires for the defense of critical assets within the operational area. In any given operation, the total air defense force should represent a mix of the speed, range, and flexibility of manned aircraft with the concentrated accuracy and firepower of ADA systems.

Units supplement the air defense family of weapons by using nonair defense weapons in an air defense role. When a unit comes under attack, many of its organic ground warfare weapons, such as individual and crew-served weapons, can be used to counter or deter attacking aircraft. Although these weapons may not completely destroy the threat, they can significantly degrade its effectiveness. Firing or merely attempting to fire at an attacking aircraft often causes the pilot to react. His reaction will result in evasive maneuvers which reduce the accuracy of his ordnance delivery.

THE ROLE OF HAWK

The Hawk system is a member of the air defense "family of weapons." Hawk's role on the air-land battlefield is to provide effective all-weather air defense of critical assets and

areas against aircraft operating at very low to medium altitudes. Its capabilities at very low to medium altitudes complement the fires of Patriot and the low-altitude, short-range capabilities of Chaparral, Roland, Redeye, and Stinger missiles and SHORAD gun systems.

The mission of Hawk units is to provide very low- to medium-altitude ADA protection to high value assets and ground combat forces. This protection supports the force commander's concept of the operation.

Hawk systems are employed in the firing batteries of Hawk battalions. The Hawk battalion is typically deployed as part of an air defense brigade assigned to a theater army or to a corps. The number of Hawk battalions and other ADA units in an air defense brigade varies. Brigades are task organized to create the best possible defense with a balance and mix of weapons to defend a particular asset or area. The best possible defense will depend on the size, shape, vulnerability, and criticality of the asset. The best possible defense will also depend on the existing threat and the defense forces available.

CHAPTER 2

The Threat

Soviet tactical aviation has been the focus of comprehensive modernization and reorganization programs emphasizing offensive capabilities. Changes over the last several years in the areas of equipment, training, tactics, and organization have not occurred spontaneously. They are the results of careful, long-range planning to increase tactical aviation capabilities against US and allied forces throughout the world. Since 1978, the Soviets have introduced five new fighters and three new versions of reconnaissance and ground attack aircraft. These aircraft have longer ranges, better avionics, and better altitude and all-weather capabilities than previous Soviet models.

Significant changes in tactics and training are less visible than equipment improvements but have a potentially far greater effect on tactical aviation effectiveness. Soviet doctrine places great emphasis on achieving air superiority from the outset. To implement this doctrine, the Soviets have recently made significant changes in their combat air tactics and training programs. Pilot independence and initiative are now stressed, a significant departure from previous procedures requiring positive ground control of air operations. Continued technological upgrading of equipment and increased proficiency in combat employment have greatly increased Soviet aviation's ability to strike an enemy's rear area.

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Improved tactics and training are aimed at maximizing performance of the new generation of Soviet aircraft with their improved penetration capabilities. Also, recent major reorganizations of the command and control structure for Soviet air and air defense forces have greatly improved Soviet air fighting capabilities. The new structure now provides the Soviets with a peacetime organization that closely approximates their anticipated wartime structure for the employment of air power. This allows a rapid transition to a wartime posture and enhances operational flexibility and coordination through centralized control of air assets at front and theater levels.

The Soviets and Warsaw Pact nations continue to have an aircraft quantity advantage over NATO and are rapidly closing the quality gap. The Soviets have, and must be expected to use, the capability of attacking our maneuver forces and supporting elements, as well as striking corps and theater targets to destroy NATO deep strike assets.

Although Hawk may be deployed worldwide, the focus of Section I of this chapter is on the most lethal part of the threat facing NATO: the low- to medium-altitude attack by fighter-bombers and bombers. This section also describes the roles and capabilities of threat aircraft and the tactics they employ. Section II discusses the threat to Hawk units by enemy suppressive measures. Hawk units are certain to be high priority targets for early destruction or neutralization. To accomplish their air defense mission, Hawk units must survive and counter enemy suppressive attacks.

All enemy order of battle data and doctrine presented here are unclassified. The material is useful for general planning by Hawk units. Additional unclassified threat information important to air defense units is contained in the FM 100-2 series. Hawk battalion S2s coordinate specific threat data bases for all tactical plans and operations. (S)FM 44-1A also contains extensive, classified threat data.

Section 1. The Air Threat

MISSION TYPES

Soviet forces recognize that part of their initial air effort is required to obtain local air superiority. Fighter units of the air army have the dual mission of providing air defense and close air support for their ground forces. Attack and bomber units engage targets beyond the

range of artillery and reinforce artillery fires on selected targets and targets of opportunity. Combined bombardments by bombers and ground attack aircraft are coordinated with artillery preparatory fires. After the ground attack begins, tactical air provides CAS for ground elements in contact. Priority tasks for enemy tactical air are the destruction or neutralization of opposing force nuclear delivery means and other targets beyond the range of conventional artillery.

GROUND ATTACK

Soviet forces consider air strikes an extension of field artillery. They place great emphasis on tactical air support of ground operations. Soviet forces attack preplanned targets to neutralize support and reserves within the tactical-operational area. In the past, Soviet air forces have preferred not to use high performance aircraft to attack targets which were within the range of field artillery weapons. Armed helicopters are the primary air threat along the forward line of troops. However, improving ground attack aircraft capabilities make it likely that the Soviets will employ such aircraft as the Fitter C, Flogger D, and Frogfoot to strike targets along the line of contact.

BOMBING MISSIONS

The primary responsibility of Soviet bombers is to maintain a strategic force capable of conducting strikes against military and industrial targets. Although ballistic missiles have taken on a significant role in destruction of deep targets, the Soviets will likely retain a sizeable bomber force for many years to come. Bombers have certain advantages over ballistic missiles. Although both bombers and missiles can be used for nonnuclear as well as nuclear warfare, bombers can seek out and strike small and mobile targets. Manned bombers can be recalled or retargeted after launch. Bombers can also conduct post-strike reconnaissance, and they have a restrike capability.

AERIAL RECONNAISSANCE

Tactical aerial reconnaissance is a method of gathering intelligence concerning an enemy. It employs airborne collection systems ranging from visual observation to the most advanced sensory devices. The Soviets use reconnaissance aircraft equipped with sensors capable of monitoring US operations in daylight, darkness, and inclement weather. Reconnaissance aircraft operate singly or in pairs.

ELECTRONIC COUNTERMEASURES

Soviet aviation has several organic support squadrons whose aircraft are capable of conducting ECM missions. These squadrons can conduct ECM missions against our radar and electronic guidance and communications systems. The most common airborne ECM activities are transmitting spot or barrage jamming signals and dispensing chaff. The Soviets direct the ECM against air defense early warning and fire control radars. The Soviets protect or camouflage their bombing operations by using aircraft equipped to conduct ECM missions in either a standoff or an escort role. The electronic jamming equipment installed in Soviet ECM aircraft has effective ranges of up to 300 kilometers and covers frequencies of US and allied air defense radars. These dedicated ECM aircraft can also eject chaff to achieve deception and camouflage. Other strike aircraft may carry self-screening jamming equipment and chaff dispensers for their own protection.

TACTICAL AIRLIFT

The Soviets consider tactical airlift operations critical both in the conventional and nuclear areas. Tactical airlift operations include logistics operations, airborne drops, and assault landings.

AIR SUPERIORITY

Fighter aircraft are normally given the mission of destroying opposing aircraft on approaches, on flanks, and beyond the maximum range of the ground-based air defense systems within a zone. To carry out this mission the fighters and SAM systems within a zone are integrated by geographical area, altitude layering, time separation, or by specific target allocation within a particular area. Defense planners must understand that not all hostile aircraft are priority threats to air defense. A fighter or an interceptor poses little or no threat to a defended asset when compared to a CAS aircraft.

HELIBORNE ASSAULTS

Soviet forces have placed increasing emphasis on air assault operations in recent years.

The mobility of helicopters allows Soviet commanders to —

•Assist attacking forces by rapidly surmounting obstacles and large areas of NBC contamination.

•Prevent opposing forces from closing gaps created by nuclear strikes.

•Seize important objectives in an enemy's rear operations area and hold them until the arrival of advancing troops.

•Conduct raids to destroy control points, radar posts, and signal centers.

•Assist maneuver units by providing a highly mobile antitank force.

Soviet doctrine stresses maintaining the momentum of the attack. Heavy use of air assault missions is one way the Soviets plan to do this. Soviet leadership believes that air assault missions are especially useful after a nuclear strike. Using this type of assault as soon as possible after a nuclear strike maximizes the gains made with the strike and minimizes the risk to air assault forces. Tactical air support, including assault helicopters, is often used to create a fly-through zone in opposition lines. Tactical air support generally continues until the air assault forces have landed and deployed.

In the past, Soviet forces have used helicopters to transport small numbers of specially trained airborne troops for air assault missions. Recently, however, they have emphasized the use of motorized rifle battalions for these missions. Soviet leadership believes that these motorized rifle battalions can be used effectively with a minimum of training. The threat presented by an enemy motorized rifle battalion being airlifted behind friendly lines should not be underestimated.

AIRBORNE ASSAULTS

Airborne assaults are conducted with aircraft from military air transport forces. The mission of airborne forces can be strategic, operational, or tactical.

Strategic missions are usually conducted in division strength. Their purpose is to establish a new battle front within a theater of operations. Operational missions support armies or fronts. Units conducting these operational missions are usually of regimental size or smaller and are dropped between 200 and 1,000 kilometers into the rear. Tactical missions are conducted up to 200 kilometers into the rear. Normal objectives are seizing bridgeheads and critical road or rail junctions, destroying airfields, and disrupting rear areas. In a nuclear environment, tactical missions are often used to exploit a nuclear strike.

Although airborne operations can be conducted at almost anytime, Soviet forces generally conduct them at night. Airborne drops are generally preceded by an increase in reconnaissance of the drop area. Reconnaissance can be conducted by air, clandestine agents, long-range patrols, or air-dropped reconnaissance teams.

Recently, Soviet emphasis on tactical airborne missions has decreased. Helicopter assaults are taking the place of the tactical airborne mission; however, airborne forces will still be used for operational and strategic missions.

SOVIET AIRCRAFT AND CAPABILITIES

Soviet forces have been particularly effective in integrating older aircraft and newer, more modern aircraft into a formidable fighting force. Combat aircraft can be classified by the role of the aircraft or by the type of aircraft. All data presented are representative of the operational use of these aircraft rather than maximum design capabilities. Additional information on Soviet aircraft can be found in Appendix D of FM 44-1 and in FM 44-30.

FIXED-WING AIRCRAFT

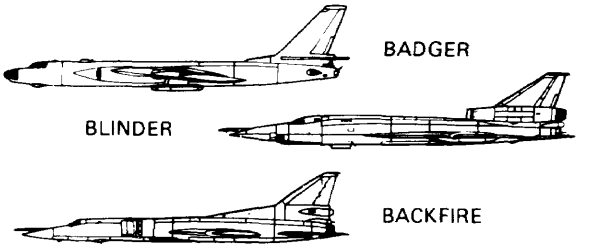
The primary air threat facing our forces and the threat the Hawk system was designed to counter is the fixed-wing threat. Fixed-wing aircraft operate in all areas over the battlefield and will generally outnumber other types of Soviet aircraft.

Bombers

During the first phase of the air battle, medium bombers strike targets critical to the theater in conducting and sustaining war efforts. Targets for these bombers include air bases, nuclear storage sites, and military-industrial complexes. Medium bombers likely to be encountered are the, Tu-16 Badger, Tu-22 Blinder, and the Tu-22M Backfire, as shown in

the illustration below. These aircraft pose a unique threat to US and allied units. Because of their extended range, they can be used in "end-around" tactics to attack rear areas from the flanks and rear.

THREAT MEDIUM BOMBERS



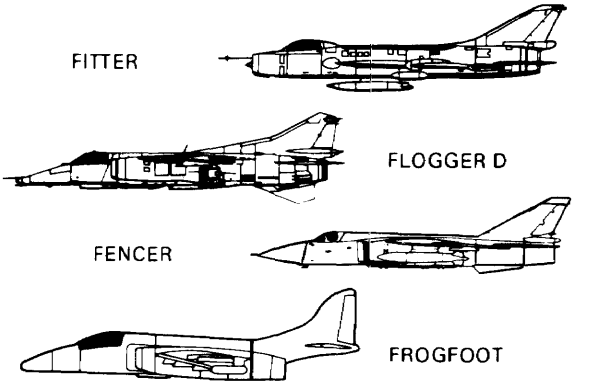
Fighter-Bombers

The early MiG-series aircraft (MiG-15, -17, -19, and -21) were designed primarily as interceptors for use in the counterair role. Early MiGs could carry two bombs or rocket pods on wing pylons which normally carried external fuel pods. This limited ordnance-carrying capability restricted their ability to attack ground targets. Newer models of these and comparable aircraft have been significantly improved in their ability to attack ground targets. The Su-17 Fitter C and D and the export variant Su-20 Fitter are typical of the improved, older generation aircraft. Three additional aircraft have greatly increased the ground attack capability of Soviet forces. The MiG-27 Flogger D is designed specifically for ground attack. It is able to carry most ordnance in use and currently under development. To supplement this ground attack capability, the Su-24 Fencer has been fielded. The Fencer is a deep penetration strike aircraft believed equivalent to our FB-111. Using an improved terrain avoidance radar, it may be able to fly under friendly radar defenses while conducting deep penetrations. A new ground support fighter, the Su-25 Frogfoot, is designed to fly high-performance sorties and is capable of carrying a wide variety of munitions. (See the Threat Fighter-Bomber illustration.)

Fighters

Despite the fact that fighters are defensive in nature, Hawk units will encounter fighters escorting strike aircraft penetrating our air defenses. The Soviets are also modernizing their force of fighters. The early MiG- and Su-series aircraft have been improved in their air-to-air role. A second generation fighter currently in service is the MiG-23 Flogger B, which has a secondary ground attack capability greater than the MiG-21 Fishbed or the Su-7 Fitter. Soviet third-generation fighter/interceptor aircraft, such as the MiG-29 Fulcrum and the Su-27 Flanker, are replacing some older Soviet interceptor aircraft. The MiG-31 Foxhound (an evolutionary development of the MiG-25 Foxbat) is now in operation in interceptor units in the Soviet Union.

THREAT FIGHTER-BOMBERS



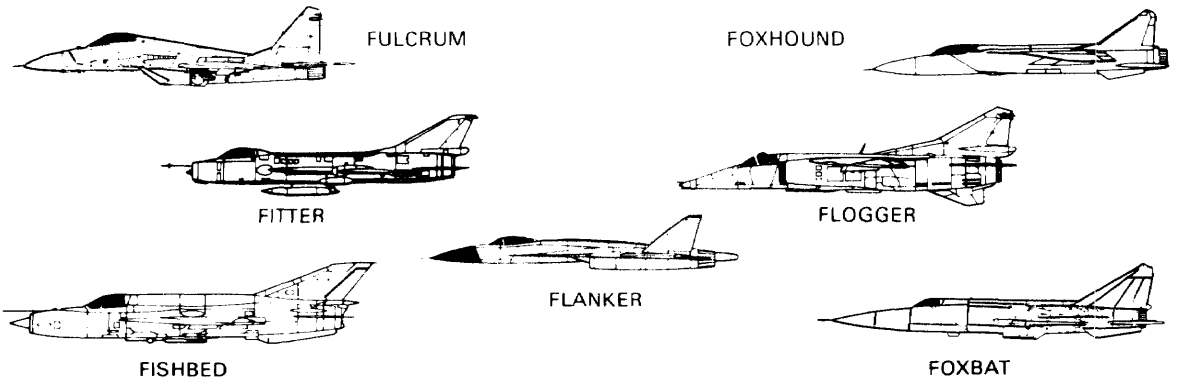
Reconnaissance Aircraft

Tactical aerial reconnaissance is one method of gathering enemy intelligence. The Soviets use reconnaissance aircraft equipped with photographic and electronic sensors. These sensors can detect, locate, and monitor US operations in daylight, darkness, and inclement weather. Reconnaissance aircraft can operate alone but probably will operate jointly with ground attack aircraft. Soviet reconnaissance aircraft used most often today are the Fitter, Fishbed, Flogger, and Foxbat as shown in the illustration on page 2-6.

Electronic Countermeasures Support Aircraft

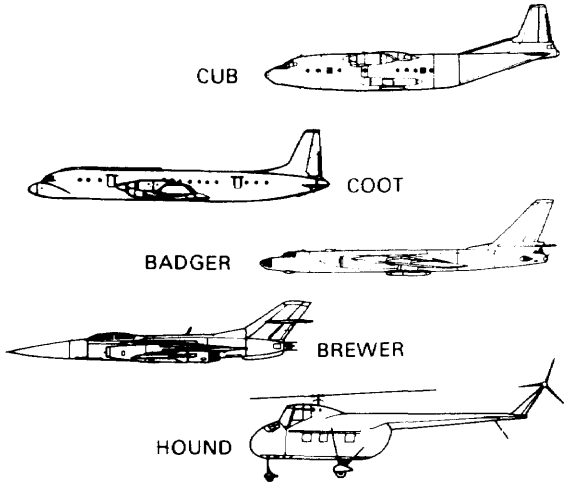
Generally, there are two roles for ECM support aircraft involved in offensive air operations. These two roles are SOJ and ESJ. ECM aircraft serve as airborne platforms for electronic jamming equipment. The Soviets direct ECM primarily against radar but may also direct it against communications.

THREAT FIGHTERS AND RECONNAISSANCE AIRCRAFT



The Soviets use modified transports, fighters, bombers, and helicopters (see the Threat ECM Support Aircraft illustration) to provide both standoff and escort jamming of enemy radars and communications equipment using electronic jammers and chaff dispensers. Cub, Coot, and Badger aircraft have been extensively modified to give these aircraft primary roles of standoff jamming while they remain outside the range of any enemy's HIMAD and defensive fighter aircraft. Badger, Backfire, Blinder, and Brewer bombers and Fishbed, Foxbat, Flogger B, and Flogger D fighters have had ECM equipment installed. The Soviets use this equipment to provide self-defense or escort jamming on missions across the FLOT. Yak-28 Brewer bombers and Mi-4 Hound helicopters have been modified to provide communications jamming in the forward area in support of their ground operations. Other ECM helicopters are discussed in the paragraph on rotary-wing aircraft.

THREAT ECM SUPPORT AIRCRAFT



Drone Aircraft

Drones are remotely piloted aircraft. Drones receive guidance from accompanying manned aircraft, from ground control stations, or from on-board, programmable navigation systems.

Drones are classified as either RRA or true drones. RRA are obsolescent, retired fighter or reconnaissance aircraft withdrawn from front-line duty, such as the Yak-25 Mandrake and the MiG-19 Farmer. The Soviets have been using both of these aircraft as target drones for surface-to-air missiles for years. True drones are designed and built as pilotless aircraft. One such true drone is the LA-17.

RRA maybe used in the initial stages of air operations and may continue to be used until stocks are depleted. Both RRA and true drones can deliver a wide variety of ordnance. Drones can also be used effectively as reconnaissance platforms.

The most significant advantage of drones is that they eliminate the risk of pilot loss. An especially effective use of this advantage is in reconnaissance of NBC contaminated areas. On the other hand, the lack of on-board human control limits the drone's maneuver capabilities. Drones can also be used to reconnoiter fire unit positions and force HIMAD missile expenditure.

ROTARY-WING AIRCRAFT

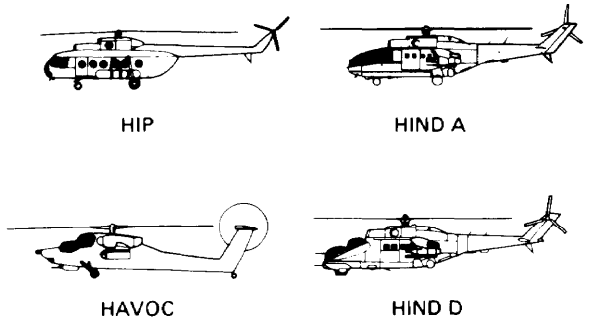
Helicopters have some distinct advantages over fixed-wing aircraft. Helicopters do not require large airfields or costly runways from which to operate. They can be employed in large numbers in forward areas. They are suitable for conducting reconnaissance of the enemy's forward forces. Rotary-wing aircraft can fly in weather that grounds fixed-wing aircraft. Helicopters can carry a wide variety of weapons — cannons, machine guns, ATGMs, free-flight rockets, and grenades. They can also be used as electronic warfare platforms. Helicopters can be used to transport small, light units for air assault operations.

Attack Helicopters

The Soviets have the most heavily armed helicopters in the world today. They employ them in the CFA, in the MBA, and in air assaults against rear area targets. The attack helicopter achieves maximum utility in a war of movement when employed in ambush or assault actions. Using speed, mobility, surprise, and an impressive array of weapons, it can harass, delay, and destroy advancing columns and armor thrusts. See the Threat Attack Helicopters illustration.

The Mi-24 Hind is the first Soviet helicopter specifically designed for attack missions. It is also capable of transporting a squad of fully equipped combat soldiers. There are currently four operational versions of the Hind. The first two, Hind A and C, differ basically only in the ordnance they carry. The third version, the Hind D, features a completely redesigned front fuselage. The Hind D's armament capabilities exceed those of the earlier versions. The Hind D has a four-barrel Gatling gum instead of the single-barrel machine gun of the Hind A. The Hind E is basically the same as the Hind D except that the E version carries Spiral ATGMs on launch racks under each of its wings.

THREAT ATTACK HELICOPTERS



The Hind is not the Soviet's only attack helicopter. One version of the Mi-8 Hip, called Hip E, has been described as being equipped with "the heaviest firepower seen on any helicopter in the world." Rocket and missile launching racks are now mounted on most Mi-8 Hip helicopters. In addition to Hind and Hip, the Soviets have fielded the Mi-28 Havoc, a new attack helicopter which is a dedicated gunship. The Havoc carries no contingent of troops, but it is a formidable antitank weapon system and is assessed to be capable of engaging other helicopters in air-to-air combat.

ECM Helicopters

These aircraft operate to reduce the effectiveness of enemy communications. The Mi-4 Hound C and the Mi-8 and Mi-17 Hip are designed as ECM emitter platforms containing noise jammers and chaff dispensers.

Utility Helicopters

The Mi-8 Hip is the main utility helicopter for Soviet forces. It is replacing the Mi-4 Hound as the standard troop carrier for air assault operations.

Other helicopters which may be targets for ADA systems are the Mi-2 Hoplite, which will act as a spotting aircraft for attack helicopters, and the Mi-6 Hook, a troop carrier. Helicopters may be targets for HIMAD systems when deep airmobile assaults are conducted or when helicopters conduct deep reconnaissance missions.

SOVIET MUNITIONS AND ATTACK TECHNIQUES

The Soviets have a full spectrum of air-deliverable munitions which are about as effective as those of the USAF. A new series of advanced munitions is in development and can be expected to be deployed in the near future.

THREAT MUNITIONS

Modern air forces use weapons systems and tactics designed to produce the greatest effect with the available resources. Weapons are selected to produce casualties or to destroy equipment and facilities. Delivery tactics are chosen to take advantage of weapon characteristics while providing delivery aircraft with the best possibility of survival.

Bombs

Freefall bombs have been in the Soviet inventory for years. Guided bombs, similar to those developed by the West, are new to the Soviet ordnance inventory. Equipped with these new munitions, a single aircraft can now destroy a target that formerly required attacks by large formations. Bombs may have HE, chemical, or nuclear warheads.

Cluster Bomb Units

A CBU is a single bomblike casing which holds many smaller submunitions or bomblets in one container. CBUs can be carried in large numbers on most aircraft. They are dropped at high speeds and low altitudes. When the CBU shell or casing separates, the bomblets spread out to cover a wide area, such as a Hawk or Patriot unit position.

Rockets

Rockets are loaded into pods or clusters which permit a high rate of fire. The rockets are ballistic and are normally used against soft targets.

Napalm

Napalm is a jellied fuel mixture which may be used against virtually all types of targets. The fuel mixture ignites on impact, burns the target, and forces personnel out of vehicles and shelters.

Cannon

In addition to employing specialized munitions, Soviet aircraft are equipped with cannons for use in strafing ground targets. Fighters also carry cannons for self-defense. Normally these cannons are 23- or 30-millimeter guns.

Air-to-Surface Missiles

TO improve capabilities against point targets, such as bridges and radar sites, the Soviets have developed new ASMs with improved guidance systems. These ASMs may be command-guided, passive-homing, or active-homing missiles. Command-guided ASMs are flown into the target by signals emanating from the launching aircraft or from an accompanying craft. The controller must see the target or have a remote TV pickup in the missile. Active homing is characterized by having an electromagnetic transmitter in the missile. The transmitter signal illuminates the target. The missile then homes on the reflected energy. The missile in a passive homing system homes on the target's own emissions or on energy reflected when the target is illuminated from a source other than the missile.

Some of the earlier versions of ASMs are nearly the size of small aircraft and can be launched only from medium and heavy bombers. Tactical ASMs are delivered by fighter-bomber aircraft and represent the greatest threat in the tactical operations area. To radars, an especially dangerous type of ASM is the ARM which passively homes in on the targeted radar's emissions. ARMs may be carried by bombers or fighter-bombers and some can be launched from well outside the lethal range of Hawk, reducing the danger to the launching aircraft. ASMs may carry HE, nuclear, or chemical warheads.

ATTACK TECHNIQUES

High-performance, fixed-wing aircraft rely on speed and ECM for surprise and survival. Fixed-wing aircraft can attack ground targets in a variety of ways. The actual attack technique depends on the type of target, aircraft, ordnance available, terrain, and weather. The common tactics or attack profiles include gravity dropbombing, divebombing, tossbombing, standoff, popup, and laydown. The Attack Variations illustration shows examples of attack techniques, ordnance, and targets.

Gravity Dropbombing

Aircraft using gravity dropbombing approach a predetermined drop point. At this drop point the ordnance is released from the aircraft and begins a free fall toward the target. The ordnance falls forward because of the movement of the aircraft. The distance the ordnance will fall forward can be determined for planning purposes based on the speed and altitude of the aircraft. Normally gravity dropbombing is

ATTACK VARIATIONS

ATTACK TECHNIQUE	ORDNANCE	WEAPON RELEASE HEIGHT (METERS)	AIRCRAFT SPEED (METERS PER SECOND)	ORDNANCE RELEASE DISTANCE (METERS)	TARGET
GRAVITY DROPBOMBING	BOMBS	2,000	300	3,000	LOGISTICS COMPLEXES
DIVEBOMBING	ROCKETS/ BOMBS	475	230	800	HEADQUARTERS VEHICLES
TOSSBOMBING	BOMBS	1,500	240	3,200	LOGISTICS COMPLEXES HEADQUARTERS
STANDOFF	ASM	100	250	10,000	HIMAD BATTERY
STANDOFF	ASM	5,000	200	70,000	HEADQUARTERS COMPLEXES
POP UP	BOMBS	810	230	1,110	ARMOR CONCENTRATIONS
POP UP	CANNONS	475	130	800	VEHICLES, PERSONNEL IN OPEN
LAYDOWN	CBU	500	230	1,200	VEHICLES, PERSONNEL IN OPEN
LAYDOWN	NAPALM	60	260	900	ALL EXCEPT HEAVY STRUCTURES

used by bombers at medium and high altitudes, but i t may also be used by fighter-bombers at lower altitudes. This technique can be used to deliver nuclear as well as conventional ordnance.

Divebombing

A divebombing aircraft starts its attack run at medium altitude and dives directly at the target. Ordnance release occurs at low to medium altitudes. After releasing the ordnance, the aircraft executes an evasive maneuver. As in gravity dropbombing, the ordnance falls forward, usually only a few hundred meters.

Tossbombing

An aircraft using tossbombing usually approaches the target at low to medium altitudes. At a predetermined point, the aircraft begins a steep climb. While climbing, the aircraft releases its ordnance and then turns to escape from the area. The ordnance can be thrown forward as far as 15 to 18 kilometers with this technique, but the accuracy of ordnance delivery is poor.

Standoff

Aircraft equipped with ASMs and precision guided munitions can, with a few types of specialized ordnance, stand off beyond the effective range of ADA systems and launch ordnance against the defended asset. The ordnance itself then becomes the threat. ASMs have ranges up to 500 kilometers. There is no fixed altitude required for ASM launch, but the range of most ASMs is dependent on the altitude at which they are launched.

Popup

Aircraft using the popup technique begin a low-level run-in about 10 to 20 kilometers from the target. Upon reaching a predetermined pullup point, usually from three to eight kilometers from the target, the aircraft climbs to its attack height. The attack height varies from 300 to 2,000 meters, depending on the terrain and type of ordnance used. Air speed will also vary, but will generally be between 200 and 250 meters per second. The pilot must begin to look for the target as soon as possible after pullup. He has only a few seconds to find the target if minimum exposure time is to be achieved. The aircraft will then dive at the target, release its ordnance 500 to 1,500 meters from the target, and escape the target area at high speed and low altitude.

Laydown

Aircraft using the laydown technique fly at altitudes below 200 meters and at speeds between 150 and 250 meters per second. High

speed and low altitude increase aircraft survival and mission success. The speed of ordnance fall is reduced by drogue chutes or retarding fins. The slowed fall allows the aircraft to escape the target area before the ordnance detonates. Runway cratering bombs are frequently delivered by this method.

SOVIET TACTICS

The study of recent conflicts and current threat analysis provides clear insights into the nature of the future air battle. The next air battle will be a game of large numbers played by both sides in terms of aircraft and ADA systems. The Soviets will bring together air attacks from multiple, dispersed air bases in an attempt to gain air superiority. At the same time, they will use air defense to protect their own forces.

Friendly forces can expect that enemy air will initially outnumber friendly air. In any event, it must not be assumed that US forces will have air superiority at the outset, except perhaps in limited areas and then only for short periods of time. This analysis leads to the concept of a two-phase air battle. These two phases represent separate methods but may be conducted simultaneously.

PHASE ONE OF THE AIR BATTLE

Phase one of the air battle will consist of high risk operations designed to gain air superiority and to neutralize theater nuclear forces. Soviet forces will dedicate all available assets to this effort including strategic, naval, and tactical aviation, and the strategic rocket forces. Soviet air forces will attempt to punch holes or lanes through the defended airspace by suppressing forward HIMAD units. Successive waves of aircraft will use these lanes to attack NATO air bases, command and control facilities, key logistics installations, and theater nuclear forces. If this initial air operation is successful, NATO's ability to retaliate will be greatly reduced and the ability to sustain ground forces will be greatly degraded.

In phase one of the air battle (see illustration), Soviet aircraft will be loaded with munitions selected to knock out NATO ADA units and to destroy aircraft on air bases and in the air. While the air superiority battle will continue as long as the conflict exists, it is the first attack which will be critical. As with other combat arms, ADA must win the first battle. ADA's success will determine —

- The size of initial and subsequent attacks on NATO ground forces.
- The amount of CAS available to NATO ground forces.
- NATO's freedom of maneuver despite enemy air actions.
- The survivability of the NATO logistics support systems.

THE AIR BATTLE, PHASE ONE

FIGHTER-BOMBERS

ATTACKING AT LOW ALTITUDES (150-600 METERS)

USING TERRAIN-FOLLOWING AND AVOIDANCE TECHNIQUES

USING ECM PODS

DELIVERING MIXED ORDNANCE
- — CBUs
- — ASMs (ARMs)
- — CHEMICALS
- — CANNONS
- — ROCKETS

BOMBERS

ATTACKING AT MEDIUM ALTITUDES (600-7,500 METERS)

USING SELF-SCREENING JAMMER PODS

DELIVERING HEAVY ORDNANCE
- — RUNWAY CRATERING BOMBS
- — ASMs
- — NUCLEAR, CHEMICAL, AND HE

FIGHTERS

ESCORTING FIGHTER-BOMBERS AND BOMBERS

CONFIGURED ONLY FOR AIR-TO-AIR COMBAT

THE AIR BATTLE, PHASE ONE (continued)

RECONNAISSANCE AIRCRAFT

- PRECEDING AND FOLLOWING ATTACK
- FLYING AT HIGH ALTITUDE
- LOCATING HIMAD UNITS
- ASSESSING COMBAT DAMAGE

ECM SUPPORT AIRCRAFT

- PRECEDING HIMAD ATTACK BY MINUTES
- DIRECTED AGAINST HIMAD ACQUISITION RADARS
- STANDING OFF OUTSIDE ENGAGEMENT RANGE
- MOST EFFECTIVE FOR LOW-ALTITUDE AIRCRAFT
- ESCORTING BOMBER FORMATIONS

PHASE TWO OF THE AIR BATTLE

After the initial waves of air superiority attacks, the Soviets will shift their emphasis to CAS of maneuver forces. Phase two of the air battle will be the attack of maneuver forces and their support elements. If the Soviets fail to achieve air superiority phase two may be delayed, and continued attacks could be directed against NATO ADA forces.

In phase two (see illustration) Soviet aircraft will attack forward maneuver elements as well as command and control, fire support, and logistics assets in brigade and division areas. Enemy flights will approach the forward edge of the MBA at low altitudes to avoid HIMAD weapons. Most attacks on ground targets will beat altitudes below 1,000 meters and at speeds of less than 250 meters per second. Flights will probably be composed of two to four aircraft. As they near their targets, these flights may divide into separate elements. Threat aircraft may execute popup maneuvers when approaching the target area. The first element will attack, deliver its ordnance, and then escape the target area. The second element will follow almost immediately. Elements may make a second attack on the target if they have unexpended ordnance.

THE AIR BATTLE, PHASE TWO

FIGHTER-BOMBERS

- ATTACKING AT LOW ALTITUDES (150-600 METERS)
- DELIVERING MIXED ORDNANCE
  - — CBUs
  - — NAPALM
  - — ROCKETS
  - — CHEMICALS
  - — CANNON

ATTACK HELICOPTERS

- FLYING NOE
- TARGETING ARMOR AND MECHANIZED UNITS
- DELIVERING MIXED ORDNANCE
  - — ATGMs
  - — ROCKETS
  - — CANNON
  - — BOMBS (CHEMICAL AND HE)

RECONNAISSANCE AIRCRAFT

- FLYING MEDIUM ALTITUDE
- DIRECTING ARTILLERY FIRE
- REPORTING TROOP CONCENTRATIONS AND MOVEMENT

ECM SUPPORT AIRCRAFT

- COMMUNICATIONS JAMMING EMPHASIZED
- JAMMING HIMAD

Section II. The Suppression Threat to Hawk

DETECTION OF AIR DEFENSE UNITS

Before an enemy can attempt to suppress a weapon system, he must first detect its presence, identify the weapon system, and determine its position. The enemy has many means available to do this, including human, signal, and imagery intelligence and radio direction finding.

HUMAN INTELLIGENCE

HUMINT is the use of people to gather information. The people used can be members of the local population or enemy ground and air observers. They can also be enemy intelligence agents disguised as friendly troops or civilians. Loose talk, information posted on maps and vehicle windshields, and improperly safeguarded operations plans and orders are examples of types of information that could easily be collected through HUMINT and pieced together to form essential intelligence.

SIGNAL INTELLIGENCE

SIGINT is the intelligence derived from the intercept and interpretation of signals from C-E systems. This includes the interception of radio and radar signals, VHF, UHF, and Hawk radar emissions can all be detected, intercepted, and analyzed. To intercept these emissions a direct line of sight must exist between the emitter or source and the electronic sensor or interceptor. This normally limits interception by ground-based sensors because of terrain masking. However, all Hawk C-E systems may be intercepted by airborne sensors.

IMAGERY INTELLIGENCE

IMINT is intelligence derived from the location, recognition, identification, and description of objects, activities, and terrain represented on imagery. IMINT is the most widely used method for detecting and locating units. It provides a permanent record of the exact details of an area. It also permits long-term comparisons to find changes in detail. IMINT is the most accurate means of pinpointing target locations. Hawk units not properly camouflaged to reduce visual and infrared signatures will be easily detected and located through IMINT measures.

RADIO DIRECTION FINDING

Radio direction finding sensors can intercept signals at several times the operational ranges of Hawk radios and radars, if a direct line of sight from the transmitter to the sensor exists. A single interception allows the enemy to find the approximate azimuth to his target — your position — even when he is beyond the engagement range of your weapons. If the enemy can obtain three radio direction finding bearings to your position, he can determine your position quite accurately. The enemy can locate positions with sufficient accuracy for indirect fire weapons in less than three minutes. After determining the azimuth and range to a potential target, he needs only a short time to coordinate a fire command. From the time of detection to the time he can place "steel on target" is less than 30 minutes. This response time will most certainly be significantly reduced by technological innovations now being developed. Acquisition radars are the C-E emitters in the ADA unit that are most susceptible to interception, identification, and location by radio direction finding equipment. ADA units will have to operate without active surveillance radars most of the time if they are to survive on the battlefield. Operations security measures to counter the enemy's attempt to collect information through ESM are contained in Chapters 4, 5, and 7.

SUPPRESSION OF AIR DEFENSE SYSTEMS

After the Soviets have identified and located a Hawk unit, they will attempt to destroy or neutralize the unit. They will try to do this through suppressive attacks or electronic warfare. Hawk units can be suppressed in four ways:

- Indirect fire.
- Air attack.
- Ground attack.
- Electronic warfare.

INDIRECT FIRE

The Soviets have a wide variety of indirect fire weapon systems — mortars, cannon artillery, MRLs, and TBMs. Mortar ranges are

typically less than six kilometers, cannon artillery ranges are less than 30 kilometers, and MRL ranges are less than 40 kilometers. Hawk units are normally deployed out of range of those systems. But, if Hawk is employed in support of offensive maneuvers, it may be necessary to position units in relatively exposed locations within cannon artillery range of the LD/LC. In any case, Hawk will be deployed within range of nearly all TBMs. The range of the Frog-7 is 70 kilometers, the SS-21 is 120 kilometers, the Scud-B is 280 kilometers, the SS-23 is approximately 500 kilometers, and the Scaleboard is 900 kilometers. Replacement of the Frog-7 by the SS-21, with its improved accuracy and range, will increase the likelihood of air defense units being targeted by ballistic missiles. The threat posed by this array of TBMs is by far the most severe indirect fire threat to Hawk units. Because of the priority the Soviets place on destroying HIMAD units early in the next battle, they will probably devote TBMs to destroying key Hawk units.

AIR ATTACK

Air attack will be used to suppress HIMAD units. Section I pointed out that fighter-bombers will be devoted to the mission of suppressing Hawk units. These fighter-bombers will attack at extremely low altitudes and at high speed. High-performance aircraft will likely attack in flights of two to four aircraft, and helicopters in flights of four to eight, attempting to saturate and overrun Hawk units. Aircraft will attempt to suppress Hawk units by employing ARMs, and they may deliver CBUs if they can penetrate to the Hawk unit position. They may also use chemical munitions.

GROUND ATTACK

Ground attack is the third method of direct physical suppression. This method includes the use of conventional forces as well as unconventional forces, such as guerillas, saboteurs, and commandos. Even a small force is capable of neutralizing a Hawk unit through the use of man-portable weapons such as the RPG-7.

ELECTRONIC WARFARE

Modern warfare views the electromagnetic environment as an extension of the battlefield where a unique type of combat occurs. This invisible but very real component of the air-land battle, known as EW, is a viable form of air defense suppression. The Soviets will use ECM extensively to screen aircraft, to deceive IFF systems, to degrade missile guidance, and to jam command, control, and communications systems. They may use ECM to intrude into radio nets using imitative and deceptive voice techniques, or otherwise interfering with or interrupting radio communications between control and firing elements. Soviet use of ECM against radar and missile guidance systems may degrade detection capability and missile accuracy and increase response time, thereby improving an aircraft's ability to penetrate the defense.

CHAPTER 3

The Hawk Battalion

This chapter describes the Hawk battalion. The chapter emphasizes key features of the system and organization which are fundamental to understanding the tactical employment of Hawk units. The Hawk TOEs provide detailed information on unit personnel and equipment authorizations. Detailed data on system characteristics are contained in Hawk technical manuals. Classified performance and planning data are in (S) FM 44-1A.

Section 1. Organization of the Hawk Battalion

BATTALION ORGANIZATION

Until recently all Hawk units were organized into either "square" or "triad" battalions. The square battalion contained four firing batteries, each with two firing platoons; the triad battalion had three firing batteries, each with three firing platoons. In each type battalion, the HHB included the elements needed to provide command and control, as well as administrative and logistical support, to the firing batteries. Each Hawk firing platoon has always been a complete fire unit. See the definition of a fire unit on the next page.

CONTENTS

DEFINITION OF A FIRE UNIT

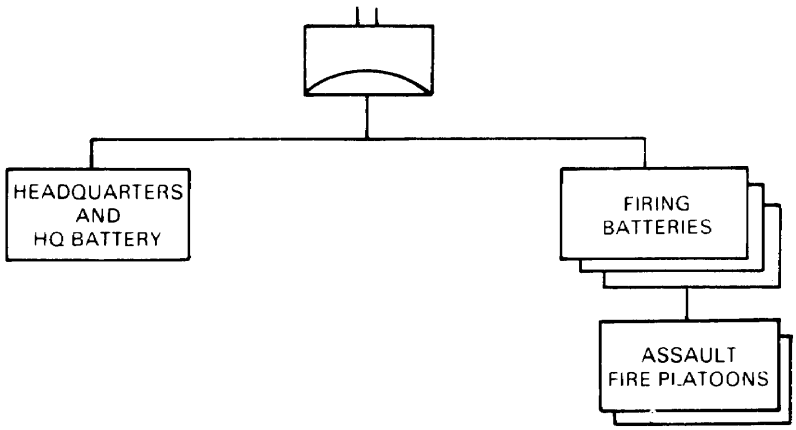
The Army Dictionary, AR 310-25, defines a fire unit as a "unit whose fire in battle is under the immediate and effective control of one leader." This definition has been modified in Air Defense Artillery to read "the smallest tactical unit that can successfully accomplish an engagement sequence against a hostile airborne target."

CORPS AND THEATER HAWK

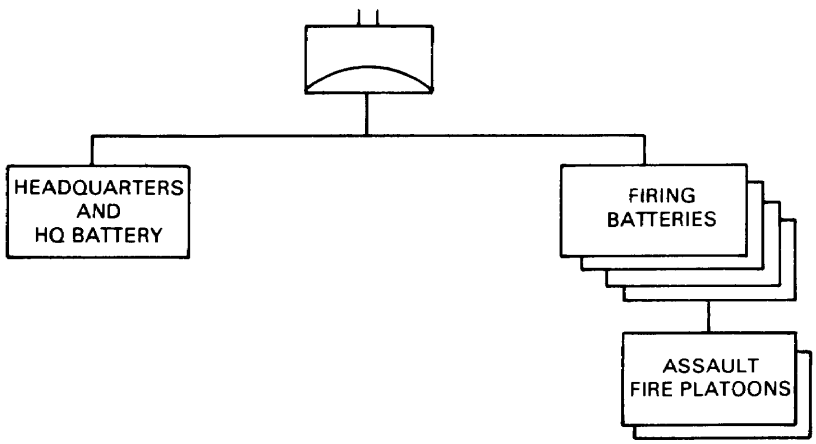
Hawk organizations in the current Army force structure still call for battalions of either three or four firing batteries. Every Hawk firing battery consists of two AFPs and a battery headquarters. The Hawk unit organic to the corps ADA brigade is a 3 x 2 battalion. It consists of an HHB and three firing batteries, each of which has two AFPs. The Hawk unit organic to the theater army is a 4 x 2 battalion; it consists of an HHB and four firing batteries, each of which has two AFPs.

The corps and theater configurations do not provide the firing batteries with organic medium- to high-altitude acquisition radars. The fire units must rely on outside sources (AN-TSQ-73 or AWACS) and the CWAR for target acquisition data. The organization of the units is shown in the illustrations below.

CORPS HAWK BATTALION



THEATER HAWK BATTALION



Hawk units assigned to CENTCOM/ WESTCOM rapid deployment forces would have limited access to outside sources of acquisition data, and so will retain one PAR per battery. The PAR will be deployed with one of the battery's AFPs and will provide acquisition data to the rest of the battery via the AN/TSQ-73. In addition, the battalion FDC will replace the AN/GSS-1 surveillance radar with a PAR. In US Army Europe Hawk units, only one PAR per battalion will be retained.

Corps ADA brigade hawk battalions have dedicated Stinger personnel in each firing battery. Each AFP includes personnel and equipment for two Stinger crews.

Theater Army Hawk battalions have dedicated Stinger personnel also. The theater Army Hawk battalion TOE allocates dedicated Stinger personnel to the HHB and to each AFP.

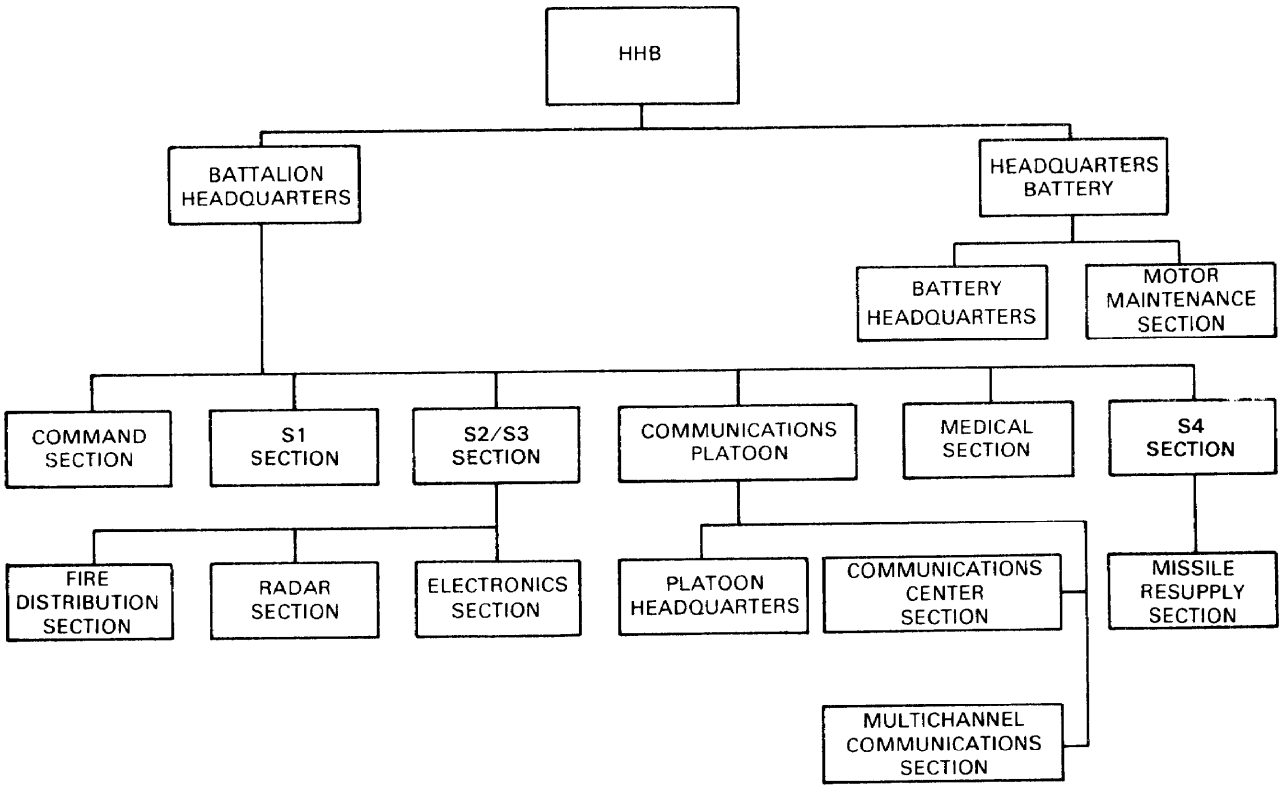
HEADQUARTERS AND HEADQUARTERS BATTERY

The HHB is organized as shown in the organizational illustration below. The following paragraphs describe the units in the HHB.

BATTALION HEADQUARTERS

The battalion headquarters provides command, operational controls, and administrative and logistical support for the battalion. While most functions performed in the Hawk battalion headquarters are similar to those performed in other type organizations, the sections and functions discussed on the following pages are Hawk peculiar.

HHB, ADA BATTALION, HAWK CORPS BRIGADE OR THEATER ARMY



Operations and Intelligence Section

This section, under direction of the S3, plans the battalion's tactical operations. It also performs the training and intelligence functions for the battalion. An AD fire coordination officer from this section represents the battalion at the headquarters of the supported unit, at the unit in whose area the Hawk battalion is located, or at the ADA brigade. The following illustrations show the duties of the AD fire coordination officer and guidelines on where this liaison is established. The FDC, which consists of the fire direction section and radar section, is supervised by the S3.

DUTIES OF AD FIRE COORDINATION OFFICER

KEEP THE ELEMENT WITH WHICH LIAISON IS ESTABLISHED INFORMED ON —	KEEP THE HAWK BATTALION INFORMED ON —
Enemy air activities and threat data received by the Hawk battalion from higher air defense echelons and from its own resources.	Status of the maneuver forces to include types of operations being conducted (e.g., offense, defense, airmobile) and location of the FEBA or the LD/LC.
Plans, activities, and status of the Hawk battalion.	Plans and activities of the unit with whom liaison is established.
Air defense rules and procedures received by the Hawk battalion higher air defense authority and having application to SHORAD.	Army and Air Force use of airspace.
Requests from the Hawk battalion for route clearance and information on occupied positions.	Guidance from the supported unit on Hawk battalion requests for route clearance and information on occupied positions.

LOCATION OF AD FIRE COORDINATION OFFICER

WHEN THE UNIT IS —	LIAISON IS ESTABLISHED AT —
Operating in corps rear area	Corps A²C² Element
Operating in division area	Div SHORAD Bn TOC
In airbase defense	Airbase operations
GS to corps, operating in multiple division areas	Corps A²C² Element
Employed in a narrative mission, area defense in multiple division areas	Corps A²C² Element

Fire Direction Section

The fire direction section provides direct control and supervision of engagements by AFPs. It is responsible for the operation of the FDC and provides an interface with the ADA brigade. See Chapter 4 for a complete discussion of this section.

Radar Section

The radar section is an element of the FIX. The radar section is responsible for the inspection and maintenance of the IFF equipment and the battalion's PAR.

Electronics Section

The electronics section provides the battalion electronic missile maintenance technicians who perform OREs and other inspections. They assist the battery maintenance technicians to maintain the readiness of the Hawk system. This section also operates and maintains the radar signal simulator station (AN/TPQ-29) for operator training. The S3 supervises the activities of this section.

Communications Platoon

The communications platoon is composed of the platoon headquarters, a communications

center section, and a multichannel communications section. The communications center section is responsible for battalion wire communications operations and operation and maintenance (less teletype) of the radio teletypewriter set and one VHF retransmission set (AN/VRC-49). This section is responsible for COMSEC materiel and organizational maintenance of HHB communications (less multichannel) and speech security equipment. The multichannel communications section operates radio repeater sets (AN/TRC-l 13) and radio terminal sets (AN/TRC-145). The radio repeater sets provide multichannel UHF (voice and data) communications to units not having line of sight with the FDC or units which are deployed at extended ranges from the FDC. Security for remotely located radio repeater sets is provided by personnel from the HHB.

Missile Resupply Section

The missile resupply section operates under the supervision and control of the battalion S4. The missile resupply section has the personnel and equipment necessary to receive and assemble missiles and to transport them to the battalion's fire units. The section includes eight enlisted personnel and has two 5-ton trucks, two loader-transporters, and two trailer-mounted missile pallets. The section personnel form two missile assembly crews.

HEADQUARTERS BATTERY

Headquarters battery provides food service and unit supply. It also provides refueling and organizational maintenance support for vehicles and power generators. The battery is organized with a battery headquarters and a motor maintenance section.

Battery Headquarters

The battery headquarters is composed of three elements. The elements perform command, unit supply, and unit food service functions.

Motor Maintenance Section

The motor maintenance section provides organizational maintenance for all HHB vehicles, power generation equipment, and air conditioners. The section has both refueling and vehicle recovery capabilities for the HHB equipment.

DIRECT SUPPORT

The Maintenance Company, Intermediate (DS) Hawk at the air defense support command or at the corps support command provides direct support maintenance to the Hawk battalion for Hawk-peculiar equipment. Chapter 9 shows the organization of the Hawk maintenance support company.

THE HAWK FIRING BATTERY

The Hawk battery has a headquarters section, two AFPs, a communications section, a motor maintenance section, and a system maintenance section. The illustration on page 3-5 shows the organization of a Hawk firing battery.

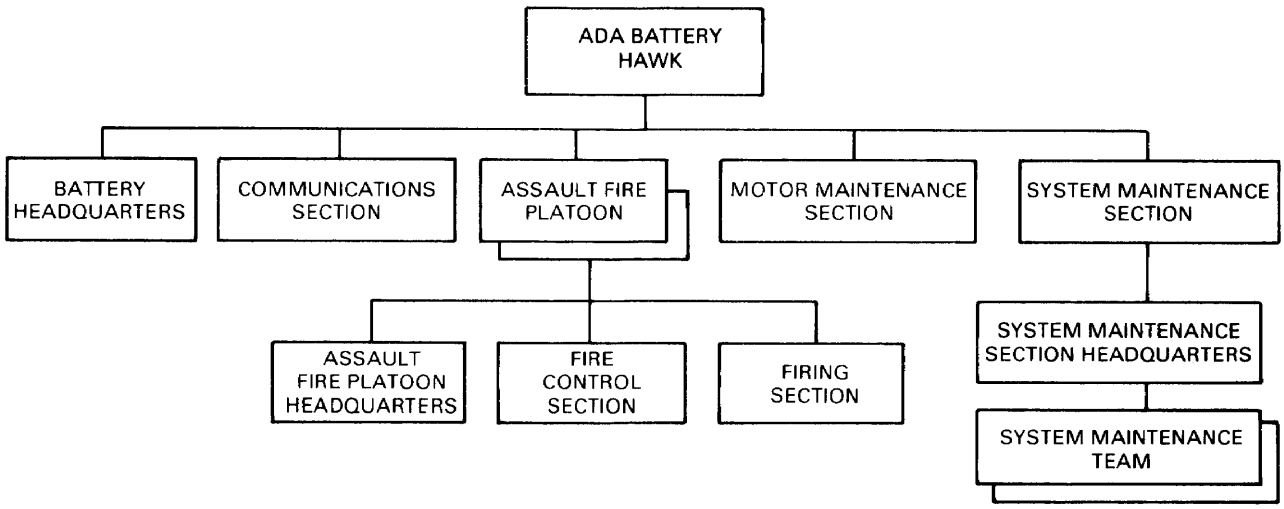
BATTERY HEADQUARTERS SECTION

The headquarters section has a command element, a supply element, and a food service element. This section normally collocates with one of the AFPs.

SYSTEM MAINTENANCE SECTION

This section is responsible for the organizational maintenance of the Hawk system. The missile system technicians, in addition to being the battery technical experts, are the battery commander's advisors on system maintenance activities and status. The section is divided into two maintenance teams which deploy with each AFP. This section is also responsible for the operation and maintenance of the Hawk-peculiar power generation equipment and the two-cubic-yard scoop loader issued to some Hawk units. The scoop loader cannot be moved by organic transportation; therefore, commanders who have scoop loaders must make the necessary coordination and plans to ensure that the scoop loader can be moved with the unit.

ADA BATTERY, HAWK
(CORPS BRIGADE X3) (THEATER ARMY X4)



ASSAULT FIRE PLATOON

The AFP has a platoon headquarters, a fire control section, and a firing section. It also includes a system maintenance team.

Platoon Headquarters

The platoon headquarters section is responsible for the supervision, management, and training of the platoon. The platoon leader directs and leads the platoon. Two TCOs provide positive control of Hawk engagements from the PCP. Target identification, external communications, and automatic data processing are available for this control.

Fire Control Section

The fire control section is responsible for the operation and maintenance of the PCP and the platoon's CWAR and HIPIR. A four-man fire control crew controls the Hawk system during engagements from consoles located in the PCP. This crew consists of the following personnel:

- TCO — MOS 14D, 2Lt or lLt.
- TCA – MOS 16E, E6.
- Tactical assistant — MOS 16E, grade unspecified.
- Radio communications operator — MOS 31M, E4.

Firing Section

The firing section operates the launchers. This section is responsible for the operation and maintenance of the launchers (three per section in corps Hawk batteries and four per section in theater Army Hawk batteries). The firing section also has one loader\transporter, one LSCB, 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 includes a maintenance officer (223B) and 24G, 24R, 31K, 31M, and 52D maintenance personnel.

COMMUNICATIONS SECTION

The communications section is responsible for the operation and organizational maintenance of the battery's communications equipment. This section is normally split into teams which accompany each AFP and battery headquarters.

MOTOR MAINTENANCE SECTION

The motor maintenance section is responsible for the organizational maintenance of all

automotive equipment including the automotive components of the loader/transporters, all wheeled vehicles, and small generators. This section is normally split into teams to support the battery headquarters and the AFPs.

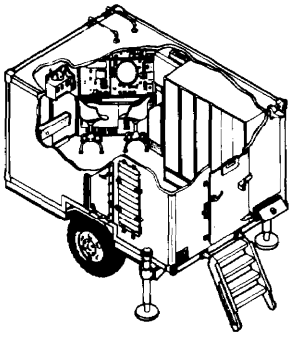
Section II. Hawk System Description

MAJOR ITEMS OF EQUIPMENT

The major items of Hawk equipment discussed below are described only to the extent necessary to understand the tactical function of the equipment. TMs listed in the reference section of this manual contain detailed information. The pieces of equipment needed to conduct an engagement are the PCP; either the CWAR, PAR, or an active data link with the battalion FDC; one HIPIR, one LSCB; one launcher; one missile; and one 60-kilowatt generator. When these items are operating, integrated, and under the control of the tactical control officer, the system is at its minimum engagement capability.

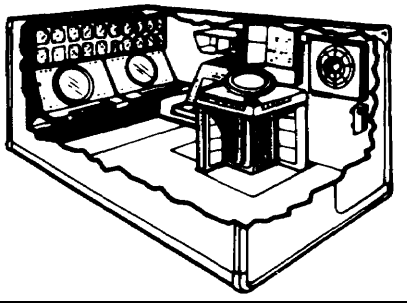
The following illustrations present a brief description of the major items of equipment and standard manning practices. Manning may be affected by unit SOPS and by the battlefield situation. Power for the Hawk system is provided by 60-kilowatt, 416-vac, 400-hertz generators.

PLATOON COMMAND POST



The PCP is used to control and direct AFP operations. It houses a TDECC, an IFF interrogator set, communications equipment, and an ADP. The PCP is normally operated by three crew members and a tactical control officer. During combat operations an additional crew member, called a tactical assistant, facilitates communications between the PCP and the unit command post.

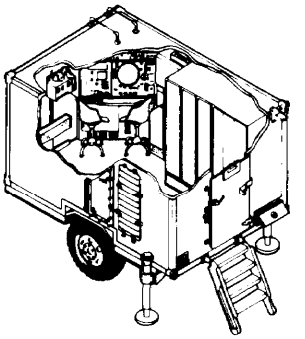
BATTERY CONTROL CENTRAL



The BCC is a control van that all RDF units will retain. Together with the ICC, it performs the same functions as the PCP. Though it has the capability to control two firing sections at the same time, it will normally be employed exactly as the PCP is employed, controlling only one firing section.

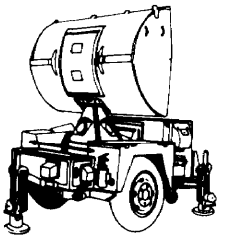
INFORMATION AND COORDINATION CENTRAL

The ICC is a piece of equipment used with the BCC. It houses an IFF interrogator set, communications equipment, and an ADP identical to that in the PCP. The ICC is normally operated by two crew members.



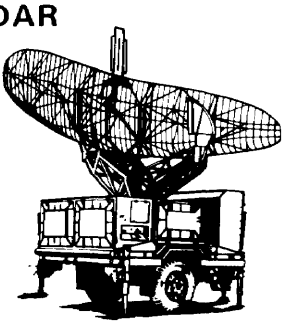
CONTINUOUS-WAVE ACQUISITION RADAR

The CWAR provides low-altitude target detection. It provides target azimuth, radial velocity, approach/recede status, and approximate range. This information is processed by the ADP and displayed in the PCP.



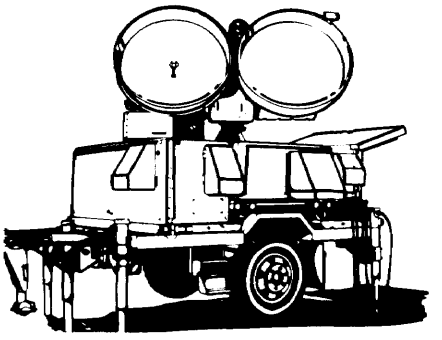
PULSE ACQUISITION RADAR

The PAR complements CWAR coverage by providing medium- to high-altitude target detection in RDF units. Target information provided by the PAR consists of azimuth and range. This information is processed by the ADP and displayed in the BCC. It may also be displayed in the PCP, but only as remote targets. The PCP cannot display live PAR targets. The PAR is also found at the FDC.



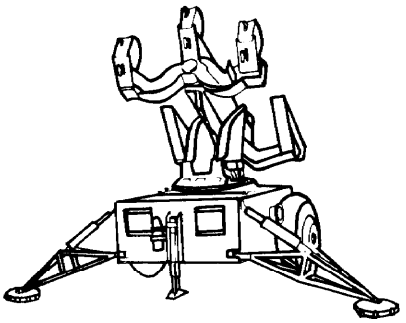
HIGH-POWERED ILLUMINATOR RADAR

The HIPIR is the fire unit'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 launch commands and a reference signal for the missile's proportional navigation system. It also has an electro-optical tracking capability known as VGTR. The HIPIR is connected by cable to the PCP and through an LSCB to the launchers in the firing section.



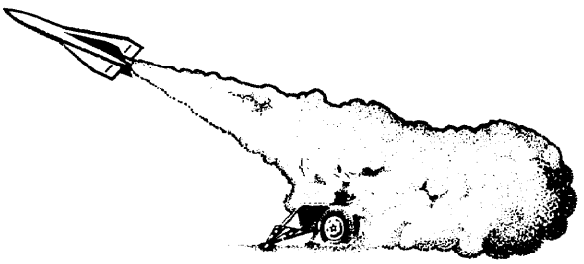
HAWK MISSILE LAUNCHER

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, which is slaved to and tracking with the HIPIR, accepts azimuth and elevation information 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.



HAWK MISSILE

The missile is propelled by a dual-phase, single-chamber, solid propellant rocket motor. It uses semi-active 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.



FUNCTIONS OF HAWK ASSAULT FIRE PLATOON

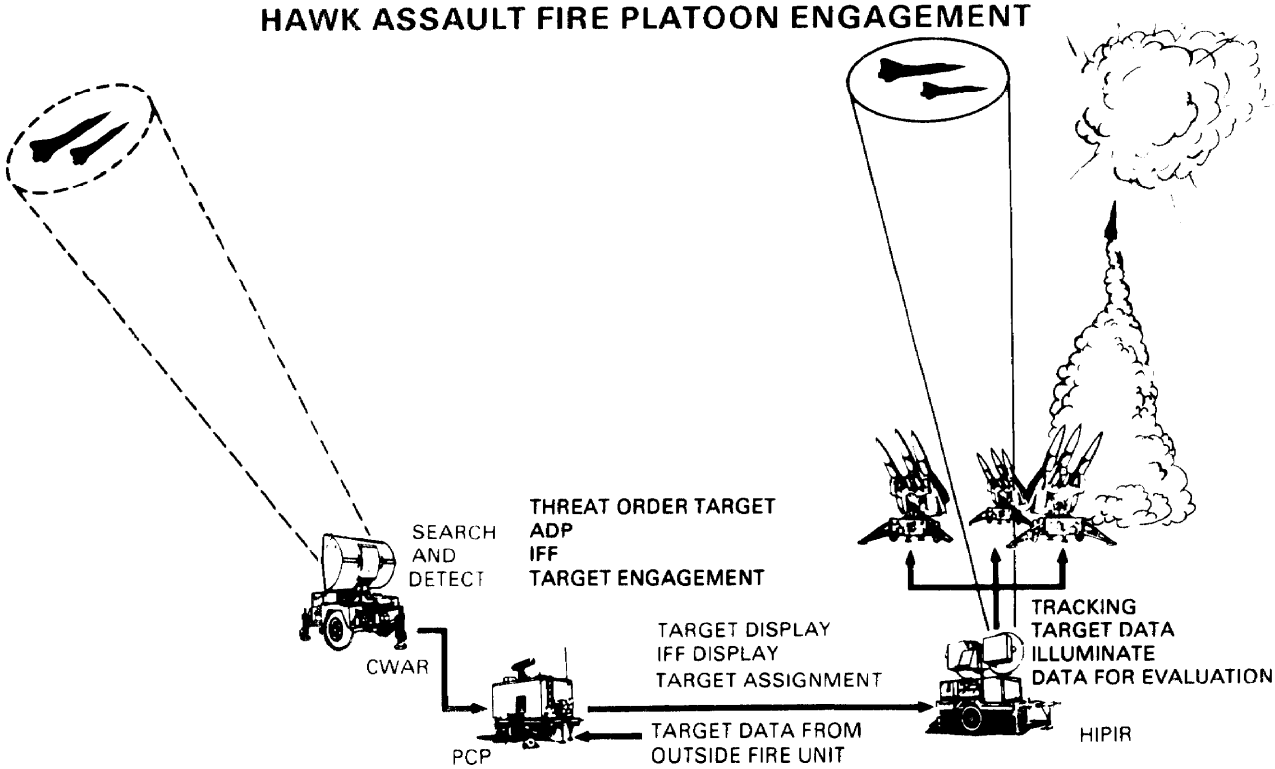
The top illustration on page 3-9 shows the functions of a Hawk AFP in an engagement. The system detects targets using the CWAR. Target data may also be provided from outside the system through a data link from the battalion fire direction center. Target data is fed to the PCP. The PCP provides a means of target display, IFF challenge and display, and target assignment. The TCO in the PCP selects the target for engagement and assigns the target to his fire control section. The HIPIR tracks the target and provides a reference signal to the missile. After launch, the missile homes 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.

BATTALION FIRE DIRECTION

The AN/TSQ-73 Missile Minder (see illustration) performs fire distribution, fire direction, and fire control functions for Hawk and Patriot units. Along with the Missile Minder, the Hawk battalion FDC is equipped with a medium- to high-altitude acquisition radar (the PAR) and an IFF system. The AN/TSQ-73 can communicate on two different data link nets: ATDL-1 and TADIL-B. ATDL-1 connects the Missile Minder with subordinate fire units and adjacent AN/TSQ-73s. TADIL-B connects the Missile Minder with other services. Chapter 4 contains more information on the communications system.

The AN/TSQ-73 is a highly mobile command and control system. The system integrates target and fire unit data from local and

HAWK ASSAULT FIRE PLATOON ENGAGEMENT



remote sources for console display and automatic data processing. Track data provide the operator with a PPI display of aircraft and missile targets identified by track symbols and alphanumerics. The AN/TRC-145 radio terminal set permits fire direction and fire distribution from the Missile Minder. The AN/TSQ-73 normally interfaces with tactical control systems and tactical data systems of the USAF and is capable of interoperability with the Marine Corps. It is housed in its own shelter. The complete shelter can be transported by rail, aircraft, ship, or 5-ton truck.

AN/TSQ-73 MISSILE MINDER

Section III. Limitations and Capabilities

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.

CABLE LENGTH

The Hawk system uses a large number of power and data cables. The assault fire platoon has seven power and nine data cables, including a spare for each type. This extensive cabling limits dispersion of items of equipment.

Power Cables

All standard power cables are 114.3 meters (375 feet) long. Each standard power cable can be extended with a 38.1-meter (125-foot) extension cable. This means that power cables for most major pieces of equipment can extend to 152.4 meters (500 feet). The power cables for the CWAR can be further extended by the addition of one more standard cable length to a maximum of 266.7 meters (875 feet). A launcher power cable can be made up of as many as three standard power cable lengths to provide a maximum length of 342.9 meters (1,125 feet). When power cables are extended, the generator output voltage must be adjusted to compensate for the added length of wire.

Data Cables

Standard data cables are also 114.3 meters (375 feet) long. All standard data cables except those for the HIPIR with VGTR can be extended with 38.1 meter (125-foot) data cable extensions to a maximum of 152.4 meters (500 feet).

Communications Cables

Communications antennas utilize cable **sections 76.2 meters (250 feet) long. An antenna cable may be extended up to 228.6 meters (750 feet) using three cable lengths. The height of the communications antenna must be considered** when determining length of communications cables.

LINE-OF-SIGHT REQUIREMENT

Line of sight is desired between radars, between the LSCB and launchers, and between the fire unit and C^2 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, visual, infrared, and electronic. See Chapter 5 for a discussion of how to minimize signatures.

Smoke

A Hawk missile creates a large backblast when fired. The backblast is highly visible, especially in dusty areas. This "cloud" of smoke and dust will show a threat pilot exactly where the Hawk launcher is located and will assist in accurately locating the rest of the fire unit. The 60-kilowatt generators produce a significant amount of diesel fuel smoke. This exhaust smoke may be detected by enemy air and ground forces. The Hawk unit can use a smoke haze to conceal its visual signature, including the backblast generated by missile firing.

Visual Signature

Because of the distinct visual pattern created by deployed Hawk equipment, Hawk units can often be identified from the ground or the air. Proper dispersion, camouflage techniques, and use of smoke screens should minimize this problem.

Infrared Signature

All Hawk equipment, particularly the 60-kilowatt generator, produces significant IR radiation. This radiation may make it possible to locate and identify the Hawk units.

Electronic Signature

The threat has a variety of modern, sophisticated radar detection devices. Because of the number and types of radars in the Hawk system, threat electronic emission locators can easily pinpoint and identify Hawk units.

MUTUAL MASKING AND INTERFERENCE

Mutual masking occurs when radars are sited too close together. If one radar unit obstructs another's transmissions into an area,

the radars will mask each other. Radar interference is the jamming of one radar by signals from another radar. Hawk radars must be separated by at least 31 meters to prevent mutual masking and interference. Additionally, HIPIRs must never radiate into each other's antennas.

CONTINUOUS-WAVE CLUTTER

CW clutter results from stray returns reflected by high-speed moving parts or equipment. The unit can reduce CW clutter by placing the fire unit away from the source (airports, factories, railways, and highways). To reduce internal CW clutter (from engine-driven generator and air conditioner fans) the unit should eliminate line of sight between CW radars and the sources.

TERRAIN

Terrain becomes an important consideration when employing any missile system. Terrain limits Hawk deployment in several ways.

Terrain Radar Masking

Terrain may cause radar masking. Topographic features, such as mountains and depressions, create areas in which aircraft can fly undetected. The closer a hill, mountain, or tree line is to the radar, the greater the masked area will be. Hawk fire units should be positioned to minimize radar masking and, at the same time, to limit detectable signatures as much as possible.

Terrain Slope and Firmness

The terrain at Hawk positions must be fairly level and firm with adequate drainage. It must be level (not more than a 10° slope) to facilitate equipment movement, positioning, and emplacement. The ground must also be firm enough to support the heavier pieces of Hawk equipment.

Access

A Hawk unit requires intensive support in the areas of maintenance, repair parts, fuel, and general supplies. Site access roads and internal roads are needed to facilitate support operations. A helipad must be constructed if roads are nonexistent, unsuitable for travel, or unavailable because of enemy operations.

Size of Area

A minimum of about 135 meters by 325 meters is required for a Hawk battery to emplace its equipment. Other areas are required for dispersing vehicles and for support elements and missile storage. The Hawk AFP requires a minimum of about 130 by 160 meters. See Chapter 6 for more information.

GROUND SECURITY

Deployed Hawk units must plan on providing their own ground security. Coordination must be made with division or corps RAOC by the Hawk liaison officer to obtain whatever assistance is available to improve or supplement unit ground security. See Chapter 5 for a discussion of physical security.

EQUIPMENT PREPARATION TIME

Hawk is a mobile system that normally relocates at least once daily for survivability, or more often as the tactical situation dictates. However, each time the unit moves the system is out of action. Out-of-action time is the actual road movement time (a function of speed and distance) and the time required to prepare for travel and emplace the system. The effect of moving on the overall defense can be reduced by moving the battery in platoon echelon. By 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. Mobility is discussed in further detail in Chapter 6.

LAUNCHER RELOAD TIME

Launcher reloading can be a time-consuming process depending upon crew proficiency, weather, terrain, and whether or not it is done during the hours of darkness. Using the Hawk loader/transporter, missiles are moved from an A&S area to an empty launcher. The launcher is prepared, the loader is indexed to the launcher, and the missiles are transferred. Complete procedures for missile transfer and loading are contined in TMs 9-1410-530-14, 9-1450-500-10, and 9-1440-531-12-1.

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.

Considering the overall US Army ADA mission to n unify or reduce the effectiveness of attack or surveillance by airborne hostile aircraft or missiles, the Hawk system can —

•Engage targets from near ground level to altitudes above 45,000 feet and ranges of more than 40 kilometers.

•Operate during all types of weather and in reduced visibility.

•Function effectively in a heavy ECM environment.

•Complicate the enemy's ability to locate friendly Hawk units through the use of EMCON.

•Interface with adjacent ADA units and C^2 facilities.

•Respond to targets detected by sensors outside the Hawk battalion through the use of the Army tactical data link.

•Move quickly about the battlefield using organic prime movers, tactical (helicopter) airlift, or rail transport.

•Deploy by strategic airlift or by ship.

HAWK PHASE III

Phase III is a continuation of the modifications begun with Phase II. Phase III is the most ambitious program yet to improve the firepower, survivability, and reliability of the Hawk system. It will be fielded in the near future. The objectives of Phase III are 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 is an optional mode of operations which significantly increases firepower capability. Current capabilities limit the system to engagement of one target at a time. In the Phase III LASHE mode, the HIPIR provides a wide angle, low-altitude illumination pattern. LASHE will allow multiple simultaneous engagements against saturation raids and against multiple pop-up targets as shown in the illustration on page 3-13. The LASHE model is recommended by the computer when enemy aircraft formations meet certain conditions. The computer recommendations may be accepted or modified for each engagement.

ACQUISITION RADAR

The Phase III CWAR is modified by replacement of 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.

TRACKING RADAR

In the Phase III HIPIR, the target intercept computer is replaced by a microcomputer. Phase III includes the following improvements:

•The system detects the presence of multiple targets in the tracking beam.

•Missiles in flight, in the LASHE mode, destroy the proper target.

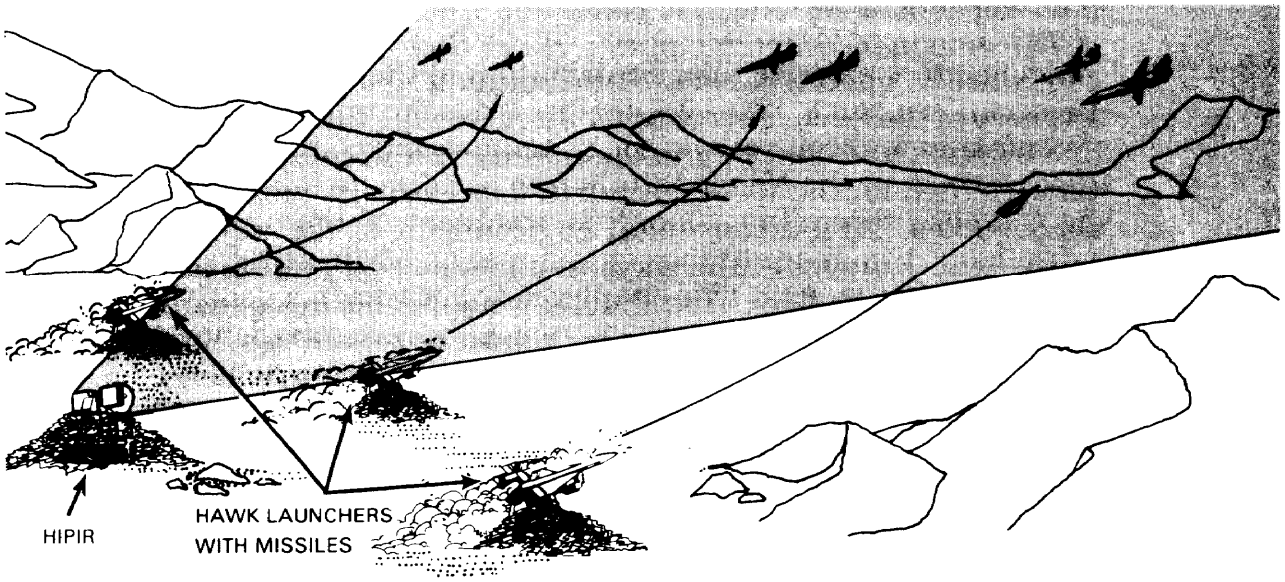
•Field wire replaces two data cables.

PCP

The Phase III PCP includes digital displays, electronic mapping, an IOT, and a new computer. The digital display presents electronic mapping of boundaries, safe passage corridors, weapons control volumes, the FLOT, the FSCL, and protected assets. The TDECC

display is simplified and the VGTR display is integrated with the HIPIR spectrum analyzer into one display. IOT provides realistic target simulation to train operators. It does not require operation of any major end item except the PCP. The trainer can fully simulate acquisition and tracking radars, IFF, and the launcher section. Target scenarios, which simulate multiple, maneuvering, jamming targets are contained in software memory. The target scenarios may be modified to correspond to the unit's level of training or to the expected tactical situation.

LASHE



CHAPTER 4

Command and Control

This chapter implements STANAG 3700, Edition 2, NATO Tactical Air Doctrine (ATP-33(A)) and STANAG 3805, Edition 2, Doctrine and Procedures for Airspace Control in the Combat Zone (ATP-40).

The ability of any unit to function effectively on the battlefield depends upon effective command and control. As with every component of combat power, Hawk fires are directed and controlled to maximize their contribution to the overall effectiveness of the force. This chapter discusses the fundamentals of command and control and the command and control structure required for the Hawk battalion to perform its mission in the complex, three-dimensional environment of the air-land battlefield. It includes the ways and means of directing and controlling Hawk fires. This chapter is applicable in a general sense to any theater of operations. It must be recognized, however, that air defense organization, control structure, policies, and procedures can vary widely from theater to theater, and even within a given theater. These features will depend on the nature of the air threat, size and composition of the AD force, mission of the supported force, nature of the transition from peace to war, and the command relationships established between US services and allied forces.

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. In the Hawk battalion, command and control personnel perform their functions through an arrangement of equipment, communications, facilities, and procedures. The

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commander employs his command and control resources to plan, direct, coordinate, and control his assets in the accomplishment of the mission. It is important to remember that command and control are two different processes.

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).

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). The control process is regulatory in nature; its premise is that the activities of units in battle must be supervised and altered when necessary.

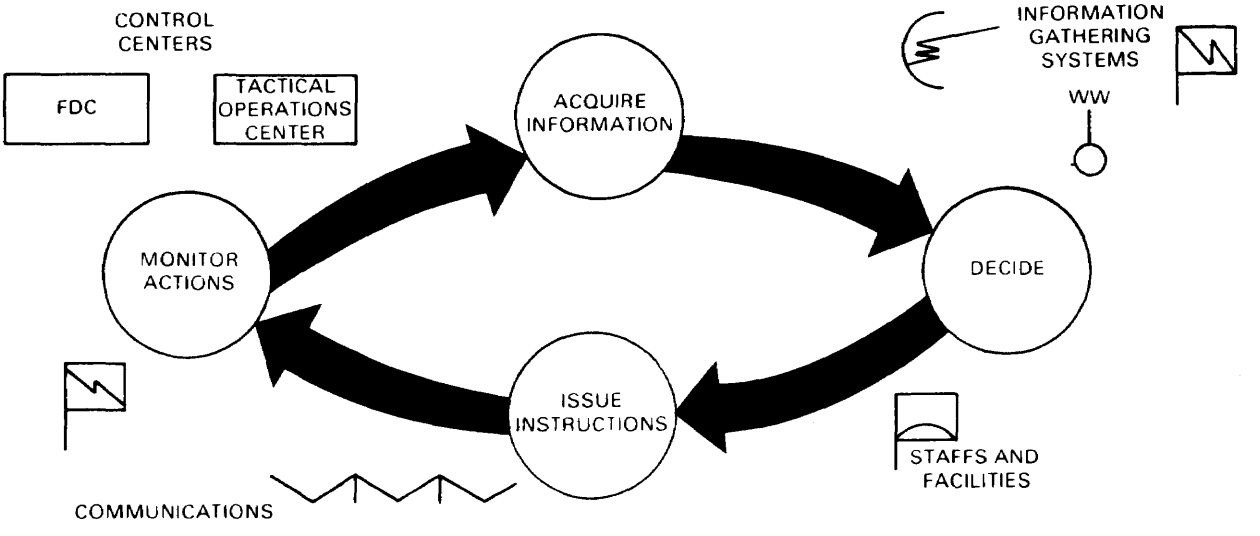
MODERN WARFARE

The characteristics of modern warfare on the air-land battlefield will place extreme stress on C^2 links at all levels. The tactical situation will probably be obscure. Time available for making decisions will be compressed. Massive personnel and materiel losses will result in psychological stress. Conventional operations will be integrated with nonconventional operations. Each of these characteristics serves as a consideration for designing and establishing effective command and control facilities and procedures.

INFORMATION CYCLE

The heart of command and control is the cycle shown in the illustration below. The cycle involves acquiring information, evaluating its content, making appropriate decisions, issuing instructions, and monitoring subordinates for compliance. The element which underlies all these tasks is ***time.*** The C^2 cycle must be well organized and efficient so that it is completed more quickly than the enemy's C^2 decision cycle. In this sense, speed is vital to effectiveness, and effective command and control is vital to successful, survivable Hawk units and other friendly airspace users.

THE COMMAND AND CONTROL CYCLE



HAWK COMMAND AND CONTROL FACILITIES

Three standard terms identify Hawk C^2 facilities. They are —

- CP.
- TOC.
- FDC.

COMMAND POST

A CP is a unit or subunit headquarters where the commander and the staff perform their activities. In combat, a commander may subdivide his headquarters. The element in which the commander is located or operates is called the CP. This is the principal facility for commanding and controlling combat operations. The AFP is the smallest Hawk element to maintain a CP. The purpose of the CP at all levels is to support the commander by providing a structure or framework from which to plan and direct operations. At platoon level the CP will also be the center for control of ground defense, Stinger operations, and information concerning procedural control of the air battle. Each Hawk AFP maintains a CP. The battery commander may establish his battery CP at either platoon CP. The illustration on page 4-3 shows the imperatives that the Hawk CP must meet to achieve its purpose. If the CP does not survive, it fails by definition. And clearly, it must operate in today's air battle and plan for tomorrows.

TACTICAL OPERATIONS CENTER

A TOC is a subelement of the CP for headquarters that have staff elements. It consists of a physical grouping of staff elements concerned with tactical operations, administrative support, and logistical support. Normally, at battalion level, the CP and the TOC will be collocated.

FIRE DIRECTION CENTER

The Hawk FDC is a subelement of the battalion CP from which the commander exercises fire direction, fire distribution, and fire control. The FDC receives target intelligence and fire control orders and translates them into appropriate fire directions. The AN/TSQ-73 Missile Minder is the Hawk battalion FDC. The AN/TSQ-73 system performs automated fire distribution functions for the Hawk battalion. Fire distribution functions include the following:

- Ensuring engagement of hostile targets in order of their importance.
- Preventing simultaneous engagement of the same target by two or more AFPs.
- Preventing engagement of friendly aircraft.
- Collecting, evaluating, and disseminating data.
- Monitoring and supervising engagements.
- Exchanging data with other services.
- Acting as center for liaison and coordination of ADA operations.

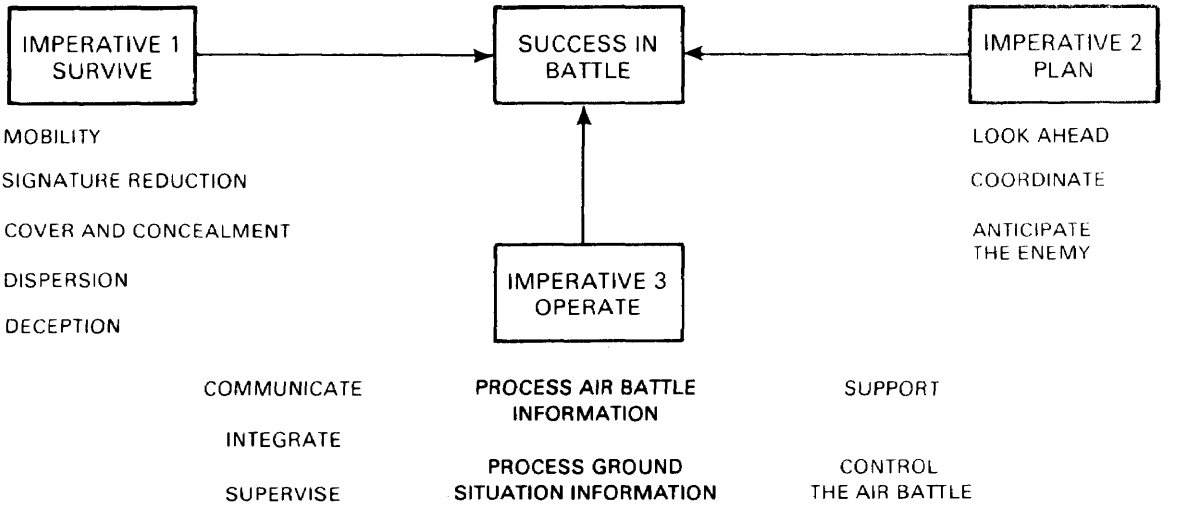
INTERACTION BETWEEN BATTALION AND BATTERY LEVEL COMMAND POSTS

One objective of the C^2 system is to facilitate the flow of information concerning the air battle among the commanders, staff elements, tactical direction officers, 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 to ensure effective flow, processing, and control of information.

FLOW

The flow of information that enters the battalion CP follows two paths. First, it must flow to all cells and locations where it is needed within the CP. Second, information must flow from the battalion CP down to the battery and platoon CPs, and up to the ADA brigade. The information leaving the CP is often on the more difficult of the two paths. Within the CP, the unit establishes a messenger system to move hardcopy information among cells and to the tactical direction officers in the AN/TSQ-73 and the TCOs in the PCPs. The standardization of most message formats and the use of multicopy forms facilitates dissemination.

HAWK COMMAND POST IMPERATIVES



REAL-TIME COMMUNICATIONS

Electronic means of communication may provide 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 would work for messages passing between the battery CP and the platoon CP.

PROCESSING INFORMATION

Battalion and battery SOPS should dictate the procedures units will follow to process information. Processing involves the full range of actions necessary to support decisions with available information. These actions include —

•Logging incoming information.

•Screening and analyzing incoming information.

•Establishing processing SOP with dissemination priorities.

•Circulating information to the personnel who need it.

•Fusing incoming data with other available information.

•Maintaining intelligence files.

•Displaying information so that the tommander may quickly assimilate what he requires.

CONTROL

Controlling a large amount of information within the CP is no simple matter. For each cell in the CP, a single designated individual should control information. This individual must be well trained to separate relevant from irrelevant information. He must then route all relevant information to the proper location. One individual may control information for more than one cell.

DISPLAYS

To be effective, information displays must highlight changes. Several methods to accomplish this include a current situation map and status boards and charts.

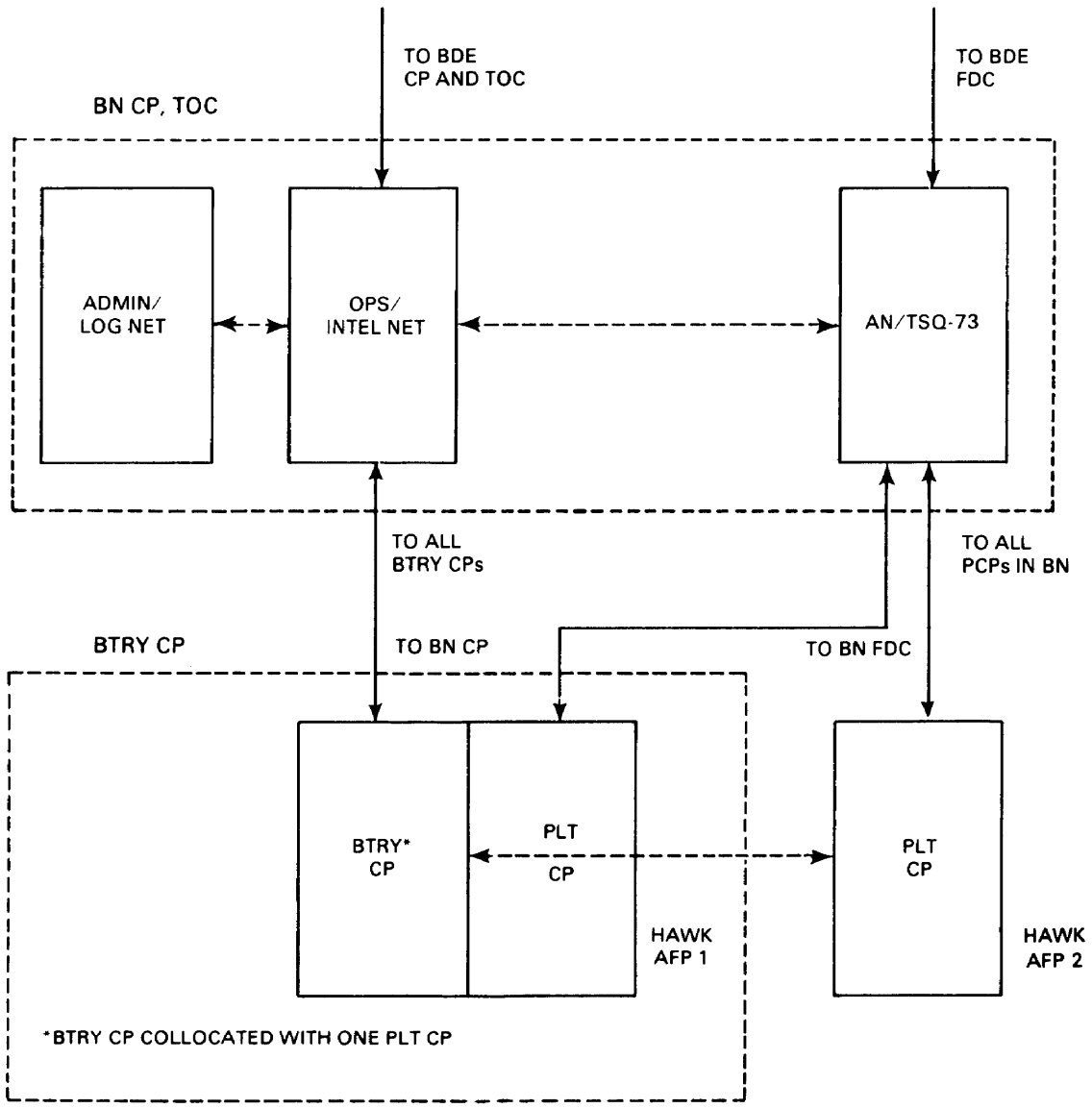
The preferred map scale for the battalion is 1:100,000 when such map coverage is available. The battery and the AFP should use 1:50,000 maps. When the unit requires coverage of a larger area, maps of 1:250,000 may supplement the smaller scale maps. Situation maps must be kept current. An outdated situation map can cause confusion at the very best and bad

decisions at the worst. In all cases, plotters should use standard military map symbols (see FM 101-5-1) to post information to the map. The use of these symbols enhances understanding and reduces training requirements.

Boards and charts present information that does not lend itself to display on a map. Alert status, air raid warning, WAD, system status, missile count, and kill count are examples of the kind of data units record on status boards and charts. Only essential information should be kept in this manner. Posting consumes precious manpower, and charts consume precious space.

The following illustration depicts information flow. It shows the Hawk battalion CP, the battery CP, and the platoon CP.

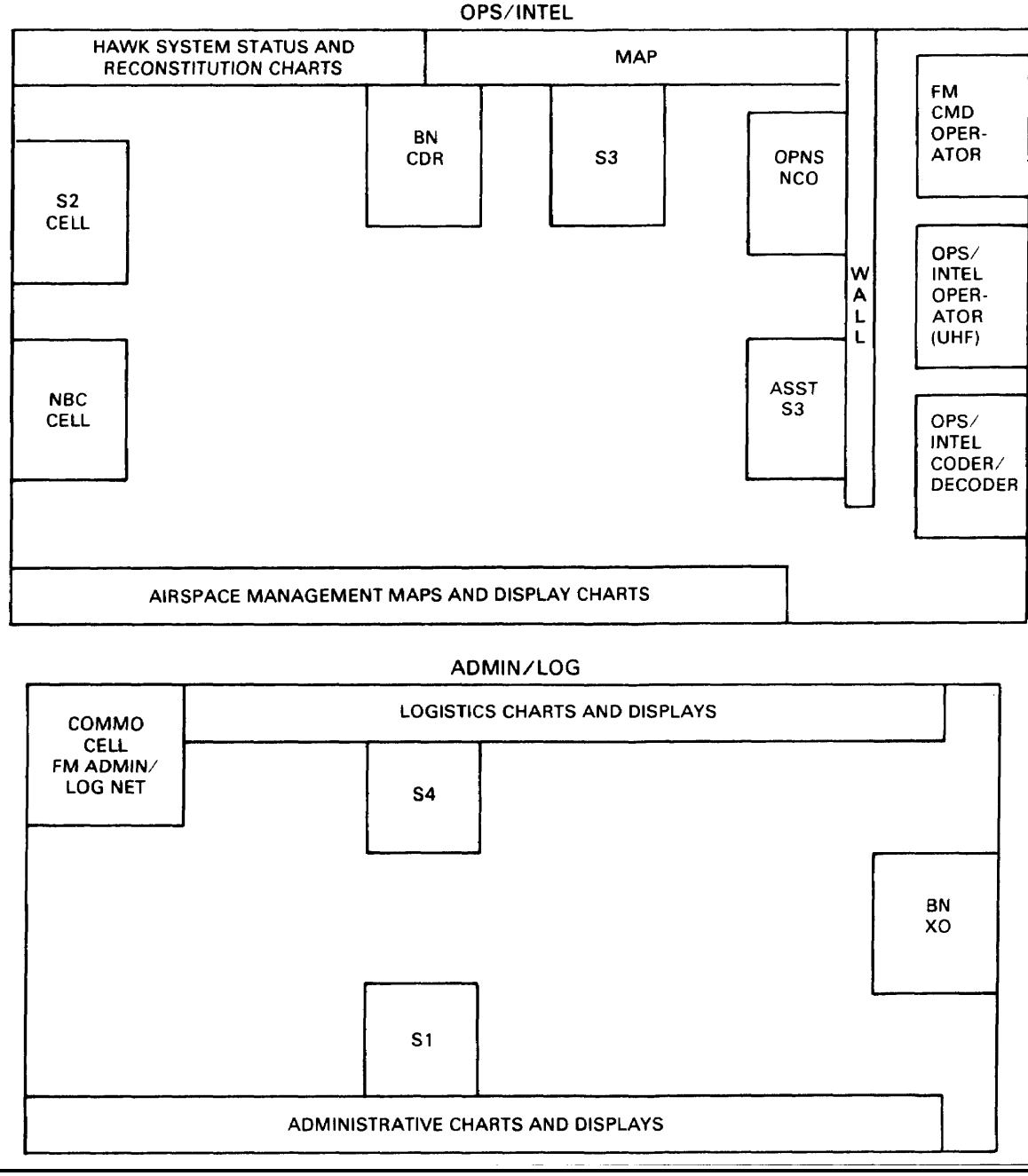
TACTICAL INFORMATION FLOW



PHYSICAL LAYOUT

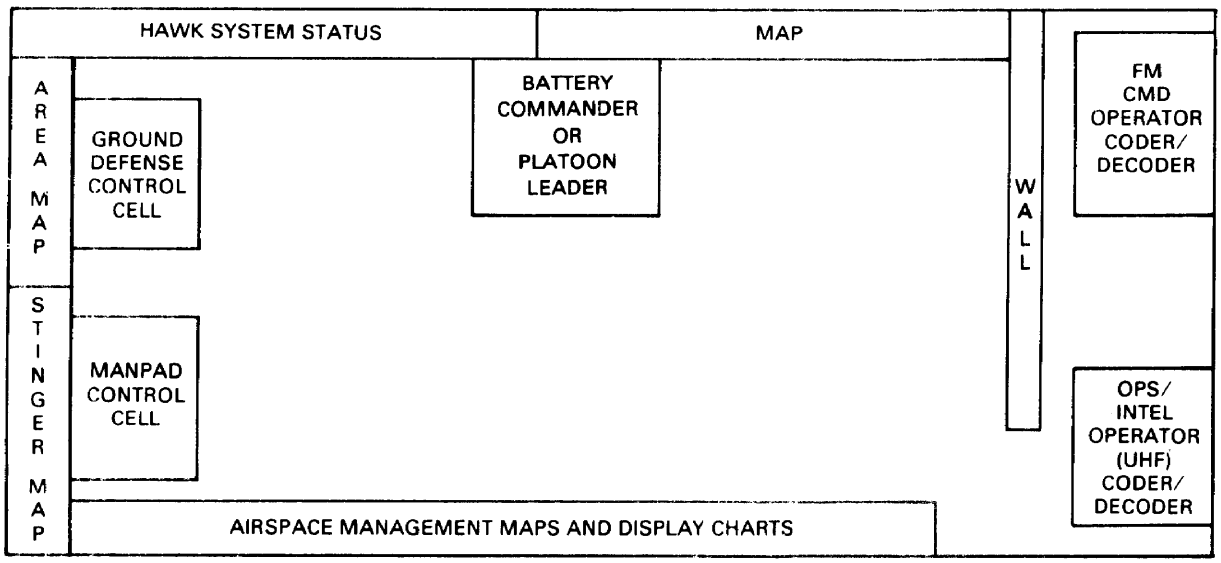
The illustration below depicts a typical layout for the battalion CP/TOC. Note that operations/intelligence functions are physitally separated from administrative/logistics functions. The commander and the S3 are physically located so that all information in the CP/TOC is easily visible to them.

HAWK BATTALION COMMAND POST/TACTICAL OPERATIONS CENTER



Actual physical design of the CP/TOC will depend upon mission and resources, as well as the types of shelters involved. Some Hawk battalions will have tents; some the five-ton, expandable vans; and some will construct their own shelters from available vehicles and materials. These variables matter less than the principles involved. The illustration below depicts a typical Hawk battery/platoon CP.

HAWK BATTERY COMMAND POST



COMMAND AND CONTROL FUNDAMENTALS

The operations of ADA units are based on a number of principles. The foundation of ADA C^2 rests on three cornerstones and depends on separate command and control chains.

C^2 CORNERSTONES

Three cornerstones that form the basis for AD command and control and relate the management of AD systems to the conduct of the overall air battle are —

- Centralized management with maximum decentralized authority to engage.
- Air battle management.
- Management by exception.

Centralized Management with Maximum Decentralized Authority to Engage

Organizations established for AD operations are an integral part of the overall force structure. Of necessity, AD organizations comprise different command levels and areas of responsibility. Centralized management must therefore be exercised to ensure the coordination, integration, and maximum operational effectiveness and economy of the entire AD organization. However, the diverse nature of air defense operations prevents a single commander from directing the many actions required to protect a large number of assets. To ensure rapid and flexible response to the threat, decentralized execution of AD tasks is essential. Decentralization is accomplished by delegating authority for mission execution. This management technique is called centralized management with maximum decentralized authority to engage.

Air Battle Management

Air battle management is the control and coordination of both tactical air-to-air and ground-based air defense resources. Air battle management includes airspace command and control and air defense command and control. Close coordination among the diverse elements of an air defense is important because of the

short reaction times available to engage threat aircraft and because of the need to integrate air defense operations with all other air and ground operations. This coordination becomes even more critical in the integration of air defense operations with offensive air operations. Precise centralized coordination is necessary to prevent mutual interference between ADA weapons and offensive air forces. Two basic methods have been established to exercise air battle management.

Positive management. Positive management relies upon real-time data from radar, IFF, computer, digital data link, and communications equipment to provide air defense command and control and airspace command and control. Positive management facilities are vulnerable to attack, sabotage, and electronic interference. Line-of-sight requirements and limited communications can also restrict the availability and usefulness of these facilities.

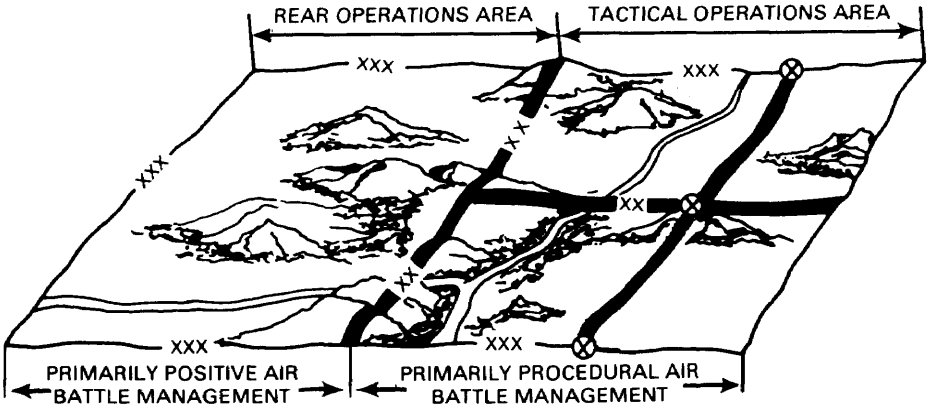
Procedural management. Procedural management relies upon techniques such as segmenting airspace by volume and time and the use of weapons control statuses to manage the air battle. Procedural management techniques are usually more restrictive than positive management, but they are less vulnerable to 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 management in the air battle, procedural management must be available to provide an immediate backup system should degradation occur. Procedural management provides the only management means for air defense systems that do not have real-time data transmission capabilities (ATP 33).

Combination of positive and procedural management. In most cases, a combination of positive and procedural management will be used to manage the overall air battle. The specific mix is determined by the —

- Nature and magnitude of the enemy operations and threat.
- Availability, capability, reliability, and vulnerability of the air battle management facilities. This includes consideration of airborne and surface air defense facilities, as well as peacetime air traffic control and terminal control facilities.
- Number, deployment, and characteristics of friendly airborne weapon systems.
- Type of terrain and weather conditions (current and projected) in the combat area.
- Capability of friendly forces to identify aircraft by electronic means.

The methods used for managing 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 illustration below. The distinction between these areas is based 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.

REAR AND TACTICAL OPERATIONS AREAS



In the rear operations area, air traffic will usually move along an axis perpendicular to the FSCL between forward and rear areas. Movement in this area is usually definitive and, therefore, is suited for electronic control. Aircraft will be controlled by radar to the maximum extent possible, and ADA units within the area will be managed primarily through positive management means. Procedural techniques will provide backup management capabilities.

In the tactical operations area, air traffic will generally move along routes both perpendicular and parallel to the FSCL. Aircraft in this area provide rapid, flexible responses to the requirements of both the air and ground commanders. This mandates freedom of movement for friendly aircraft operating throughout the area and makes individual control of aircraft extremely difficult. ADA units operating in the tactical operations area will therefore be primarily managed through procedural management techniques.

Management by Exception

This cornerstone of air defense command and control reinforces the theme that no single commander can direct the overall air battle on a real-time basis. Therefore, the area or region AD commander must publish, in advance, positive management processes and procedural management methods to provide unified direction to the battle. Positive and procedural techniques must be thoroughly practiced during peacetime. However, due to the unpredictable nature of combat, tactical situations may arise 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.

COMMAND AND CONTROL CHAINS

Hawk battalions normally rely on separate chains for command and control. This dual nature exists for the following reasons:

•ADA operations are, by their very nature, joint operations. Control of the vertical dimension of the battlefield is the responsibility of the AADC who is normally an Air Force commander but may be a Navy or Marine Corps officer.

•Hawk battalions deploy over relatively large areas when compared to other units. For example, an armor battalion operates within its designated sector or zone of the brigade area. The Hawk battalion, by contrast, may be required to protect an entire corps.

•Hawk battalions fight in a combat support role. The setting of priorities for protection, while it may require ADA input, normally occurs outside the ADA command chain.

Command Chain

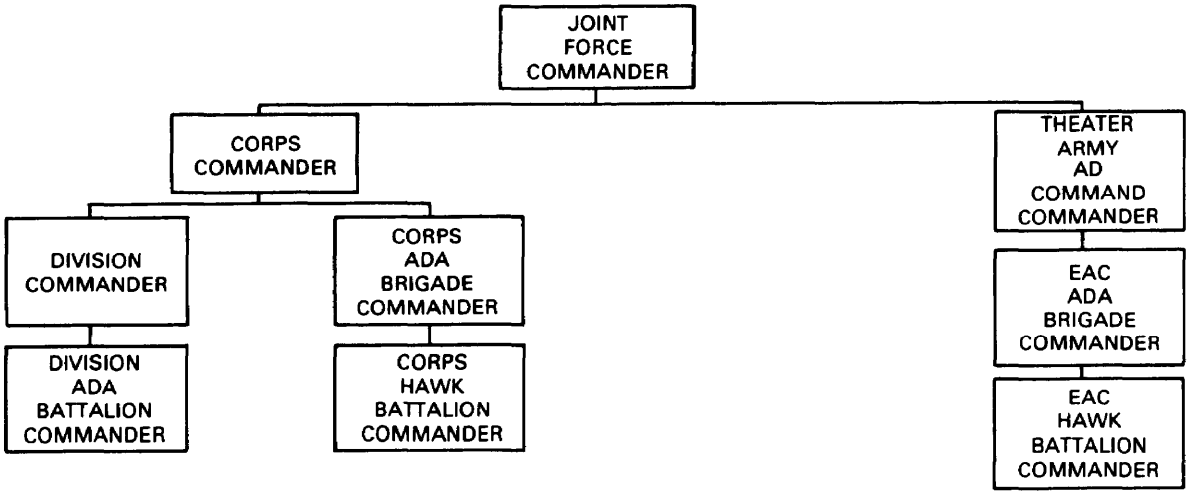
The command chain for Hawk units follows standard military organizational lines. The illustration on page 4-9 depicts these lines.

Control Chain

The Hawk control chain is a more complex structure. The theater commander assigns responsibility for the overall air defense to a single commander, the AADC. This officer is normally the Air Force component commander who is usually designated as both the AADC and the area airspace control authority. The AADC coordinates and integrates the entire air defense effort within the command. He may create air defense regions and appoint an RADC for each. The AADC may appoint the RADC from any service. The RADC is normally located at the next subordinate C^2 facility below the TACC. The RADC usually operates at a CRC. The CRC supervises the surveillance and control activities of subordinate radar elements, provides means for air traffic identification, and directs region air defense. In the Army chain, the CRC controls subordinate ADA FDCs at brigade and battalion and may control firing batteries or individual Hawk AFPs.

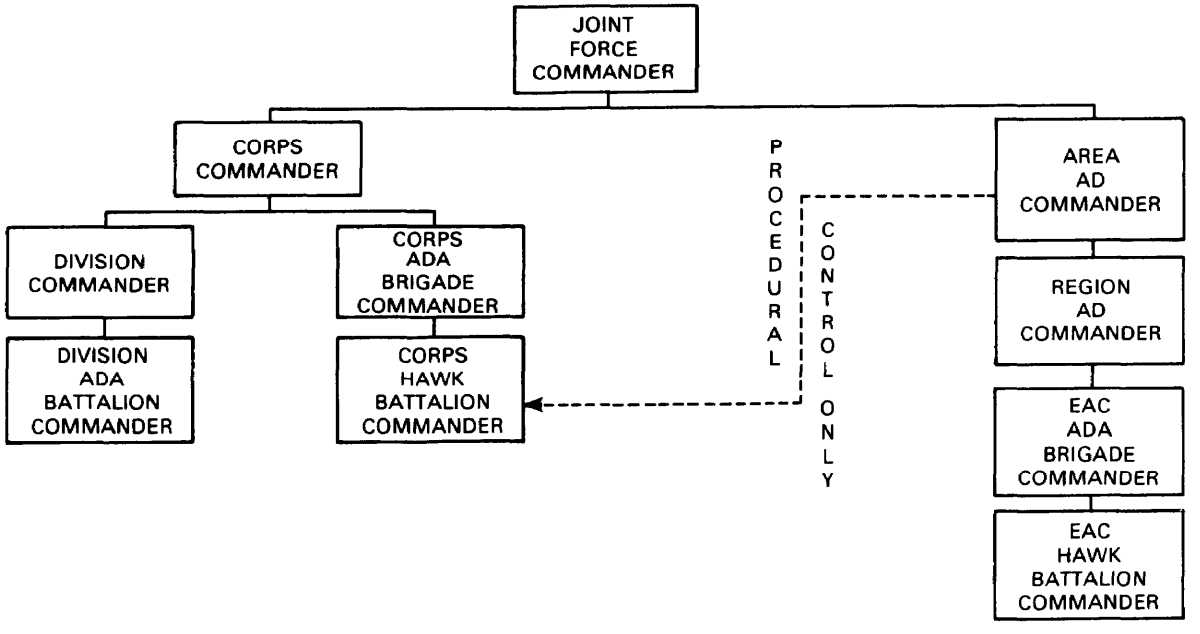
Sector operations center. In NATO, an SOC is interposed between the RADC and the CRC. The sector commander then exercises fire control over all subordinate elements and ADA brigades. The ADA brigade provides an ADOLT to the corps for coordination between the integrated air defense system and the corps.

AIR DEFENSE COMMAND CHAIN



Area air defense commander. The AADC or his representative exercises positive control over Hawk units assigned or attached to the theater Army. The corps controls its organic Hawk units except with regard to the procedural methods of fire control discussed later in this chapter. This means that the AADC has operational control of all aspects of the employment of theater Hawk units, but controls only the fires of corps Hawk, and then only through procedural methods, not by positive means. However, this does not mean that corps Hawk should not establish communications with theater air defense for early warning, alerting and cueing, and current air battle information. The illustration below depicts the control chain.

AIR DEFENSE CONTROL CHAIN



HAWK COMMAND AND CONTROL PROCEDURES

To employ Hawk systems effectively, the corps or theater commander often places Hawk elements under the command or control of the AADC, the RADC, or the ground force commander. Command and support relationships define responsibilities for Hawk units and the units they support.

COMMAND AND SUPPORT RELATIONSHIPS

To deal with the separation of command and control 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 battalions. 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 C^2.

Attachment. Attachment is the temporary placement of a unit within another organization. The commander of the organization receiving an attached Hawk element will exercise 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 commander retains the responsibility for the transfer and promotion of personnel. Because of the responsibilities assumed by the receiving commander, it is advisable to attach ADA units to like ADA units. This tends to relieve some of the logistical burden of attachment. However, it is occasionally appropriate to attach an ADA unit to an unlike unit, such as a maneuver force unit. In this situation the receiving unit must ensure that a fair share of support accompanies the attached element or that a realistic support plan exists. ***Normally, a Hawk element smaller than battalion size will not be attached, unless it is attached to another Hawk unit.***

Operational control. OPCON is exercised 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, and unit training. Placing one unit under operational control of another is sometimes unavoidable, but the increased span of control of the receiving unit must be considered. When OPCON is the appropriate command relationship, it should be maintained only for brief periods of time, and it should never be assigned when the parent unit has the capability to control the unit. ***As with attachment, OPCON is normally not exercised with Hawk elements smaller than battalion size.*** Either attachment or OPCON may be ordered for ADA units subordinate to the commander assigning the relationship. The commander issuing the order may dissolve the command relationship by simply recalling the affected unit(s) to parent unit control. However, when a commander places a Hawk battalion in an attached or OPCON status to a unit not under his command, recall of the attached or OPCON element must be requested through the receiving command and must be executed so that the force's best interest is taken into account.

Support Relationships

Specific responsibilities and relationships between supported units and supporting Hawk battalions can be defined by the assignment of the proper support relationship. The authority to assign support relationships rests with the commander and follows the normal command chain. The term "support relationship" replaces the term "standard tactical mission."

The four support relationships that apply to Hawk units are GS, GSR, R, and DS. Four basic rules amplify the application of the support relationship:

- There is no implicit logistical support associated with assignment of a support relationship. Although logistical support may be coordinated through the supported unit, it is not an automatic function of the support relationship.

- In all cases, the ADA commanders operating within a support relationship may task organize to support the given priorities and may further subassign support relationships to subordinate elements.
- The Hawk AFP is the smallest Hawk element which may be assigned a support relationship. (Support relationships are, however, *not normally* suballocated below the battalion level for Hawk units.)
- A commander cannot simultaneously order a command relationship and a support relationship for the same subordinate element.

Support relationships are further defined and discussed in Chapter 5.

WARNING PROCEDURES AND ALERT STATUS

These procedures alert or prepare a unit and increase unit readiness for combat. They include the following:

- DEFCONs.
- WADs.
- ADWs.
- SORs or SOEs.

Defense Readiness Conditions

DEFCONs describe progressive alert postures primarily for use between the Joint Chiefs of Staff and the commanders of unified and specified commands. 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. In NATO, a similar system of stages or states of alert is used in place of DEFCON.

Weapons Alert Designators

WADs describe a progressive system of alert postures based on the DEFCON. WADs are used by the area or region AD commander to specify minimum percentages of ADA fire units within parent organizations which are required to be at certain states of readiness. In NATO, WAD is termed DEFREP.

States of Readiness

SORs specify the time within which a Hawk unit must be able to fire a missile. If a battalion in WAD A has two AFPs at a 20-minute SOR, each of these AFPs must be able to fire a missile within 20 minutes. The battalion commander determines each unit's SOR according to the current WAD. The SOR also determines fire unit manning requirements. SOR is used during peacetime only.

Based on the requirements of the ADA brigade (see illustration below), a subordinate Hawk battalion commander would designate the AFPs within his battalion to be at specific SORs. See the Hawk Battalion Readiness Requirements illustration on page 4-12.

ADA BRIGADE READINESS REQUIREMENTS

PERCENT OF FIRE UNITS AT EACH STATE OF READINESS

WAD CODE	BATTLE STATIONS	20 MIN SOR	1 HR SOR	12 HR SOR
A		25%	25%	50%
B	25%	25%	25%	25%
C	50%	25%	25%	
D	50%	50%		
E	75%	25%		
F	100%			

HAWK BATTALION READINESS REQUIREMENTS

NUMBER OF AFPs AT EACH STATE OF READINESS

WAD CODE	BATTLE STATIONS		20 MIN SOR		1 HR SOR		12 HR SOR	
	THEATER	CORPS	THEATER	CORPS	THEATER	CORPS	THEATER	CORPS
A			2	1	2	2	4	3
B	2	1	2	2	2	2	2	1
C	4	3	2	2	2	1		
D	4	3	4	3				
E	6	4	2	2				
F	8	6						

States of Emission Control

SOEs replace SORs during combat operations. The SOE prescribes the number and type of emitters or transmitters in operation and the time allowed before a unit must be capable of full operation of all equipment necessary to conduct an engagement. Typical SOEs for Hawk units are —

- Battle stations.
- CW radars only in operation.
- Pulse radars only in operation.
- Tracking radars only in operation.
- VGTR system only in operation.

In combat operations the Hawk battalion would require each of its AFPs to be at an SOE consistent with the battalion's mission and the WAD or DEFREP. Actual SOEs may vary by theater of operation and are usually classified.

Air Defense Warnings

ADWs represent the commander's evaluation of the probability of air attack within his area of operations. ADWs are routinely issued by region or area AD commanders. ADWs can be issued by any commander for his command. In no case, however, can the local ADW be lower than the overall ADW issued by the region or area AD commander. The issuance of an ADW is not tied to any other warning procedure or alert status. Therefore, a commander may issue an ADW for his command irrespective of DEFCON or WAD. Similarly, ADW can be used by a commander to dictate the readiness posture of the ADA units under his command. As an example, a situation might occur in which an air attack had not been expected for a division (low DEFCON, WAD, or ADW); nevertheless, a forward element of that unit is subjected to air attack. The division commander could declare ADW RED, forcing the ADA units in his sector to assume the highest readiness posture regardless of the declared DEFCON. ADWs replace the term ARWs. The three ADWs as defined in JCS Publication 1 are:

- ADW RED -– Attack by hostile aircraft or missiles is imminent or is in progress. This means that hostile aircraft or missiles are within a respective area of operations or are in the immediate vicinity of a respective area of operations with high probability of entry thereto.
- ADW YELLOW — Attack by hostile aircraft and or missiles is probable. This means that hostile aircraft and or missiles are en route toward an air defense division or sector, or unknown aircraft and or missiles suspected to be hostile are en route toward or are within an air defense division or sector.
- ADW WHITE — Attack by hostile aircraft and or missiles is improbable. ADW WHITE can be declared either before or after ADW YELLOW or ADW RED.

HAWK FIRE CONTROL PROCEDURES

The AADC manages and directs the integrated air battle by imposing ROE and airspace control measures. These rules and measures may be executed through both positive and procedural means.

Rules of Engagement

Hawk ROE are the positive and procedural management directives issued by the AADC which specify the circumstances and limits tions under which forces will initiate or continue combat engagement with other encountered forces (JCS Publication 1). The AADC establishes ROE to enable him to delegate the authority to engage aircraft and also to permit him to retain control of the air battle by prescribing the exact conditions under which engagements can be conducted. The six common components of rules of engagement are as follows:

- The right of self-defense.
- Level of control.
- Modes of control.
- Autonomous operations.
- Hostile criteria.
- Fire control orders.

The right of self-defense is the right and the responsibility of commanders at all echelons to 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 air defense commander. Emergency action deemed necessary, if contrary to the established rules, should be carefully weighed for its effect on the operations and 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 (JCS Publication 8). For Hawk units, self-defense must be clearly defined in tactical SOPs and theater directives. Criteria for declaring an aircraft a self-defense threat will change depending upon state of alert, the tactical situation, and, in some cases, the type of aircraft and its flight characteristics.

Level of control describes the AD echelon at which the air battle is being positively managed. It specifies which commander has the authority to order engagement of a specific target. Control of Hawk engagements can be exercised either by the area or region AD commander through the TACC or the CRC, by the brigade or battalion commander through the FDC, or by the tactical control officer at the AFP. The authority to order aircraft engagements is kept at the highest possible level consistent with the availability of timely and accurate threat information and the control capability of the selected level. The region AD commander can retain the responsibility or he may delegate this responsibility to a lower level of control, thus decentralizing the control of the air battle. Decentralization is done for a number of reasons, such as —

- Inability of higher echelons to detect the low-altitude threat.
- Tempo of the air battle.
- Degraded or lost communications.

For these three reasons, the Hawk battalion FDC is generally the highest AD echelon capable of controlling Hawk fires in the air battle.

Theater Hawk units, under Air Force control, are emplaced in corps or division areas of operation. Corps or division Army aviation operates in the airspace defended by theater Hawk. Coordination and communications between air defenders and Army aviation is absolutely necessary to prevent fratricide and to make efficient use of aviation assets.

Modes of control describe the control relationship between organizational levels. The two modes are centralized and decentralized control.

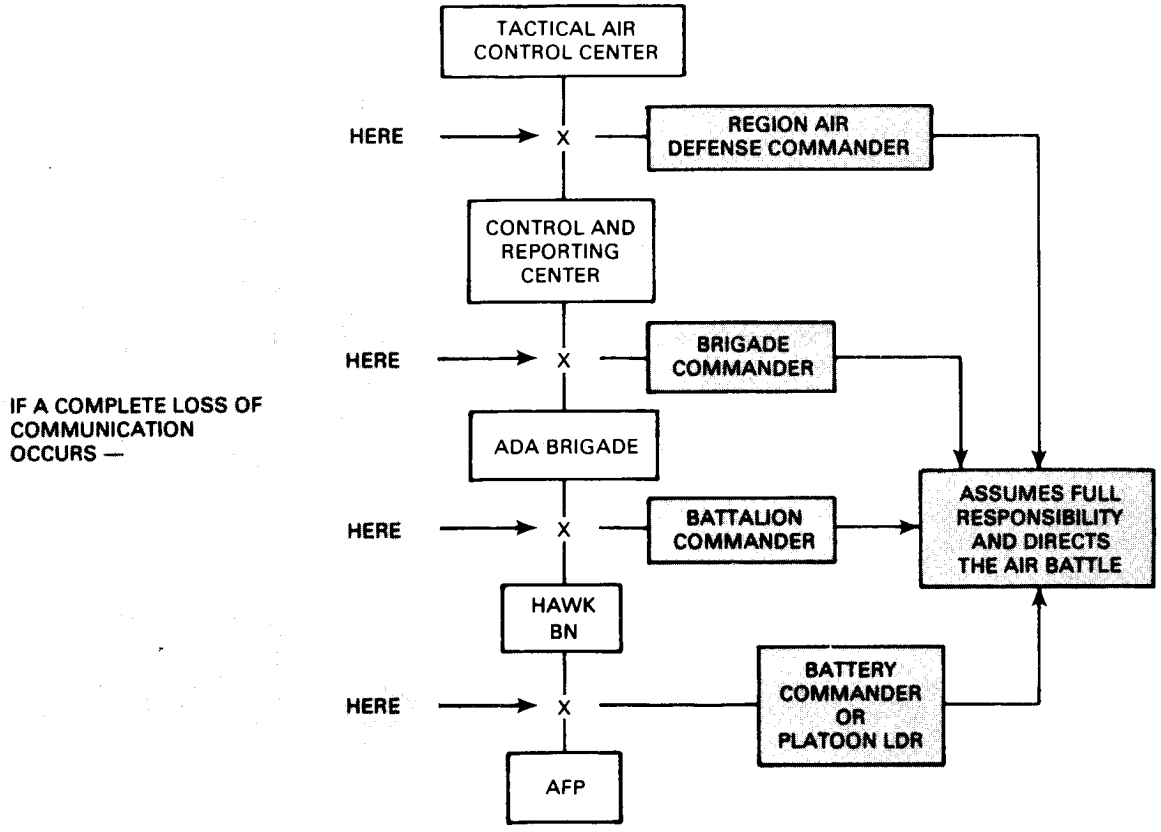
Centralized control is the control mode whereby a higher echelon authorizes fire units to engage targets (JCS Publication 1). The fire unit must request permission to engage each track from that higher AD echelon. Centralized control minimizes the likelihood of engaging friendly aircraft; it permits engagement of hostile aircraft only when specific orders are issued to initiate the engagement. During most types of air defense operations, Hawk AFPs will be under the centralized control of the battalion FDC.

Decentralized control is the normal wartime mode of control for air defense, whereby a higher echelon monitors unit actions, making 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). Decentralized control is used to increase 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.

The processes of raising and lowering the echelon at which the air battle is being managed are "centralizing control" and "decentralizing control," respectively. Air battle management is centralized when it is conducted at battalion level or higher, as long as that echelon has the capability of making direct target assignments to fire units, and higher echelons have the capability of monitoring fire unit actions. For instance, in a situation in which air battle management has been decentralized to the Hawk battalion FDC, the battalion commander exercises centralized control of his AFPs. At the same time, however, higher control echelons are continuously monitoring the actions of the battalion's AFPs. These higher echelons exercise decentralized control while the battalion commander exercises centralized control. Thus, centralized control and decentralized control are conducted simultaneously, although at different levels.

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 at the time communications are lost remain in effect until communications are reestablished. Procedural management is used for control of the air battle. The following illustration shows the changes in levels of control upon loss of communications at various points in the C^2 structure. See Chapter 7 for specific action the unit must take upon loss of communications.

AUTONOMOUS OPERATIONS — THEATER HAWK



Hostile criteria are basic rules issued by the commanders of unified or specified commands and by other appropriate commanders when so authorized. Hostile criteria are used by echelons having identification authority to determine whether a detected aircraft is friendly or hostile. Identification authority is normally retained at the AD sector (at the CRC) level for units with automated data link communications. Upon target detection, if the ADL is operational, the battalion FDC should perform target correlation (determine that an aircraft appearing on a radarscope, on a plotting board, or visually detected is the same aircraft as that on which information is being received from another source), make initial target identification, and report target characteristics to the sector AD commander.

The commander who establishes hostile criteria parameters may consider the following factors:

•Time slot — as it applies to procedural measures. For example, a restricted operations area will be established with activation and deactivation times.

•Altitude — as it applies to procedural measures. For example, aircraft operating below a certain altitude may be considered hostile.

•Airspeed — as it applies to procedural measures. For example, aircraft operating at high speed in certain areas may be considered hostile.

•Self-defense — the authority for engaging aircraft in self-defense is never denied. This criteria is always assumed and need not be specifically declared. However, theater and local tactical SOPs should define self-defense as it applies to Hawk units.

•Visual aircraft identification — for example, aircraft visually confirmed as hostile may be engaged subject to the WCS in effect. Hawk units may use the VGTR to identify aircraft when conditions and training permit. Leaders should recognize that this will require teaching visual aircraft recognition to TCAs.

•Hostile action — for example, aircraft discharging enemy paratroopers, conducting an air assault, emitting electronic or infrared jamming in friendly airspace, delivering ordnance, or performing any other hostile act may be grounds for engagement.

•Electronic interrogation — determining if the aircraft is friendly or unknown with IFF.

Fire control orders are commands that are used to control Hawk engagements on a real-time, case-by-case basis. They may be used to countermand or alter the prevailing WCS. Fire control orders may be transmitted verbally or electronically, but as long as digital communications are available, electronic transmission is preferred. Local directives and unit SOP may require certain orders, such as HOLD FIRE, to be passed verbally as well as electronically. For Hawk units, these orders are most often used by the battalion FDC to control the engagements of its AFPs. They are also used by TCOs and TCAs when engaging targets at the AFP. See the Use of Fire Control Orders illustration on pages 4-16 and 4-17. The fire control orders used by Hawk units are described in the following paragraphs.

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. Engagements may be conducted using one of three firing methods. Based upon proximity and threat, the TCO will select the proper firing method:

•Shoot-look-shoot is the firing of one missile against a target, assessing the success of the engagement, and firing a subsequent missile at the target, if necessary. This is the preferred method of fire because it provides the most effective use of available missiles.

•Ripple fire 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.

•Shoot-new target-shoot is the firing of one missile against a target. A new target is assigned for engagement immediately after warhead detonation occurs. The unit does not perform kill assessment.

Cease engagement. This command is used to order the AFP to cease tracking a designated target and is always followed by another fire control order. This order is used to change an ongoing engagement from one target 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 engagement or to refrain from tracking or firing on a designated target. Because the Hawk system has the capability to do so, ***it will destroy missiles already in flight in response to a hold fire order.*** This order is used 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 read y to fire. Cover is used to obtain more information on the target.

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 unsafe condition has been corrected.***

Airspace Control

Airspace control encompasses all those efforts to ensure detection, identification, engagement, and destruction of hostile targets that are not fire control functions. One commander is usually designated the ACA for an entire theater. He is usually also the AADC. When an ACA is appointed, Hawk units operating within the theater are subject to the rules and procedures he establishes. The ACA will control the airspace primarily through procedural means rather than through positive means.

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.

USE OF FIRE CONTROL ORDERS (continued)

FIRE CONTROL ORDERS	TCO ACTION	
	MISSILE FIRED	NOT FIRED
	(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.
		CONTINUE TO TRACK.
	DO NOT FIRE ADDITIONAL MISSILES.	ASCERTAIN THE UNSAFE CONDITION. REQUEST PERMISSION TO DROP OUT OF THE AIR BATTLE, IF NECESSARY, TO CORRECT THE UNSAFE CONDITION.
	CONTINUE TO TRACK.	
	ASCERTAIN AND CORRECT THE UNSAFE CONDITION.	CONTINUE THE ENGAGEMENT.
	CONTINUE THE ENGAGEMENT.	

This is because communications limitations make real-time control unfeasible. Airspace control instructions are issued periodically via the airspace tasking 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 operations 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 authority, responsibility, and involvement of the Army in the joint arena of airspace management is A^2C^2. The intent of A^2C^2 is to closely involve the joint air forces in the support of tactical and operational objectives of the ground force commander. ADA plays an important role in this effort as both an airspace user and an advisor to the ground commander.

Within the corps and division command post is an Army airspace command and control staff element. Representatives from all types of units operating within the respective corps or division and directly concerned with airspace control coordinate their operations through this element. Air defense artillery is an active participant in the A^2C^2 element. Other type units commonly found in the A^2C^2 element are Army aviation; Army air traffic control; Air Force, Marine, or Navy aviation; field artillery; and military intelligence. The corps or division G-3 air is responsible for overseeing operations of the respective A^2C^2 element to ensure unity of effort. The techniques available to coordinate the airspace control effort are described in the following paragraphs.

Weapons control statuses. WCSs describe the relative degree to which the fires of ADA systems are controlled. A WCS can be applied to weapon systems, volumes of airspace, or types of aircraft. Since Hawk battalions normally operate over large areas, it is likely that more than one WCS will be in effect within the battalion's coverage, and possibly within the coverage of one AFP. The degree or extent of control will vary depending upon the relative priorities of two needs: the need to protect friendly aircraft and the need to accommodate a specific tactical situation. The ACA establishes the WCS; however, force commanders (corps down to battalion) have the authority to impose a more restrictive WCS within their areas of operation if the local situation so demands. Similarly, these force commanders can request that the ACA impose a less restrictive WCS within their respective areas. Force commanders may also request authority from the ACA to establish a WCS exclusively for rotary wing aircraft operating within their respective areas. The three WCSs are —

• WEAPONS FREE. Weapons may fire at any aircraft not positively identified as friendly. This is the least restrictive WCS.

• 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 VGTR

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.

WCSs do not generally apply to Hawk units except as they affect organic Stinger crew operations. Unlike Patriot, the Hawk computer software cannot use WCS, and therefore cannot simulate engagement zones, or use WCS to help the TCO evaluate targets for engagement.

Weapons engagement zones. WEZs are volumes of defined airspace within which specific types of AD weapons are preferred for use in engagements, thus simplifying fire distribution. Use of a WEZ does not preclude engagement of high-priority targets by more than one type of weapon system if centralized control of each weapon system involved is available. The activation of a WEZ can be used to delegate identification authority but does not exempt units from requesting authority to engage from the echelon exercising control. Hawk commanders should note that the activation of a WEZ does ***not automatically*** constitute authority to engage. The level of control in effect continues to direct engagements of hostile targets.

A Hawk engagement within an activated WEZ may be conducted by the echelon controlling engagements without further permission from the establishing authority if the target meets specified hostile criteria. For example, if the level of control is battalion, the FDC may determine that a specific target is hostile and within an activated WEZ and assign it to an AFP for engagement without further permission. WCS and hostile criteria for targets outside the WEZ have no effect on this situation. Thus, an activated WEZ may be used to supplement hostile criteria and to aid the battalion FDC in making target assignment and engagement decisions. The illustration appearing on page 4-19 shows the horizontal and vertical boundaries of the typical WEZ. Remember, however, that the WEZ is just one of the tools the ACA uses to control airspace and may change radically as the tactical situation changes.

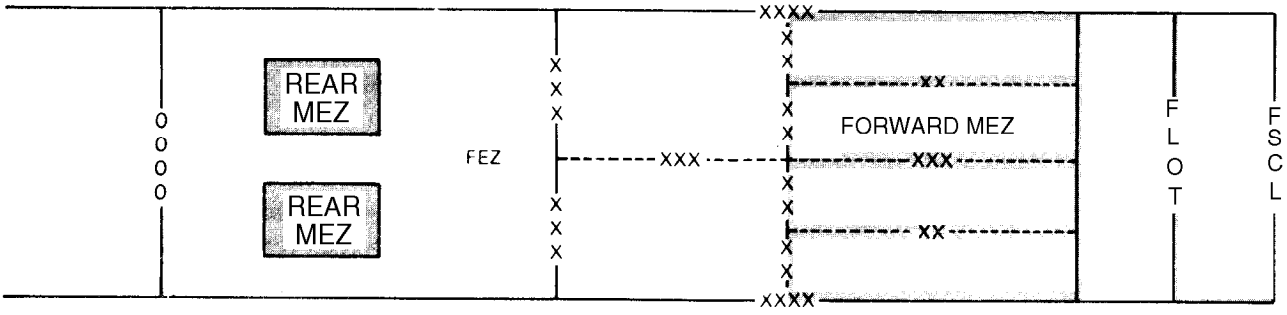
Establishment of a WEZ permits maximum use of weapons systems. A FEZ is normally established only in those areas where no effective surface-to-air capability is deployed. A MEZ is normally established only for medium- and long-range SAMs. A MEZ limits the volume of airspace in which these weapons can conduct engagements. The MEZ is tailored to the capability and characteristics of the weapon system and to the specific tactical need. It is usually subdivided between Patriot and Hawk systems. A forward MEZ is usually established from approximately the division rear boundary to the FSCL. For Hawk, this MEZ usually extends from 0 to 3,000 meters in altitude, but may be extended based upon the availability and reliability of digital targeting data from sources outside the battalion, such as Patriot and AWACS. The forward MEZ is established to permit freedom of action to Hawk AFPs protecting forward units. A rear MEZ may be established to prevent potential control difficulties between SAMs and air superiority fighters. Typically, the rear MEZ for Hawk is established between O and 3,000 meters altitude over critical deep-strike assets. Exact dimensions of either the forward or rear MEZ are determined by the AADC.

Airspace control zones. A HIDACZ is airspace of defined dimensions in which there is a concentrated employment of numerous and varied airspace users. These can include aircraft, artillery, mortars, naval guns, ADA weapons, and surface-to-surface missiles. The airspace control authority will establish a HIDACZ upon request of the ground commander when the level and intensity of airspace operations dictate the need for special airspace control measures. The number of such zones will vary depending on the combat situation and the complexities of airspace control in conjunction with fire support coordination. The establishment of a HIDACZ normally will increase temporary airspace restrictions (see below) within the volume of defended airspace. Additionally, establishment of a HIDACZ over a maneuver unit's area will normally give the commander of that maneuver unit authority to determine WCS within the activated HIDACZ.

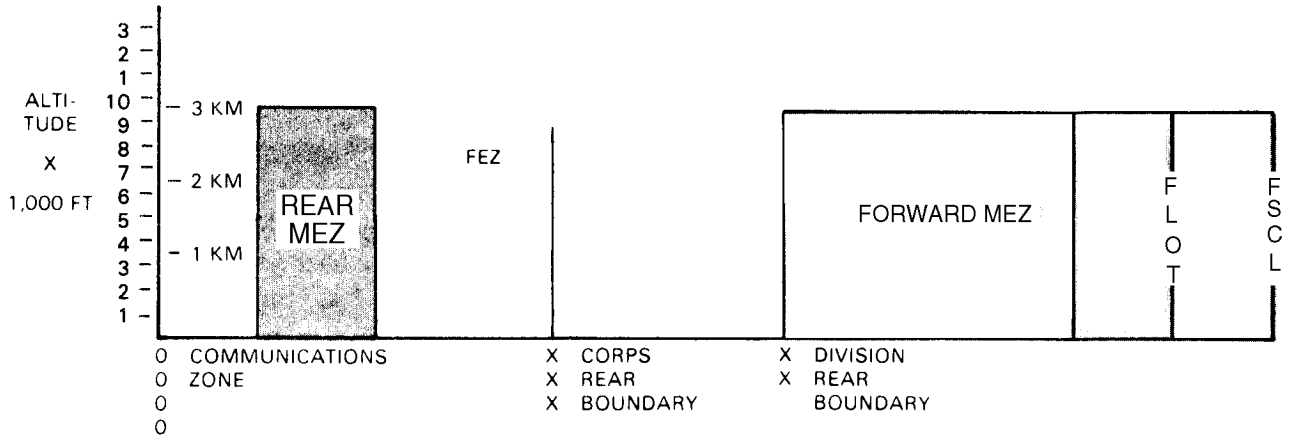
Temporary airspace restrictions. Temporary airspace restrictions can be imposed on segments of airspace of defined dimensions in response to specific situations and requirements. These can include combat air patrols, air refueling areas, HIDACZ, safe passage corridors, concentrated interdiction areas, and

WEAPONS ENGAGEMENT ZONE BOUNDARIES

TOP VIEW OF TYPE AIR DEFENSE REGION SHOWING WEAPONS ENGAGEMENT ZONE GEOGRAPHIC BOUNDARIES



SIDE VIEW OF TYPE AIR DEFENSE REGION SHOWING WEAPONS ENGAGEMENT ZONE ALTITUDE BOUNDARIES



LEGEND

FEZ — FIGHTER ENGAGEMENT ZONE

MEZ — MISSILE ENGAGEMENT ZONE

those areas which have been declared ADA WEAPONS FREE. The promulgation of such restrictions will include —

- Identification of the airspace user being restricted.
- Period, area, altitude, and height of restriction.
- Procedures for cancellation or modification of the restriction in event of communications loss.

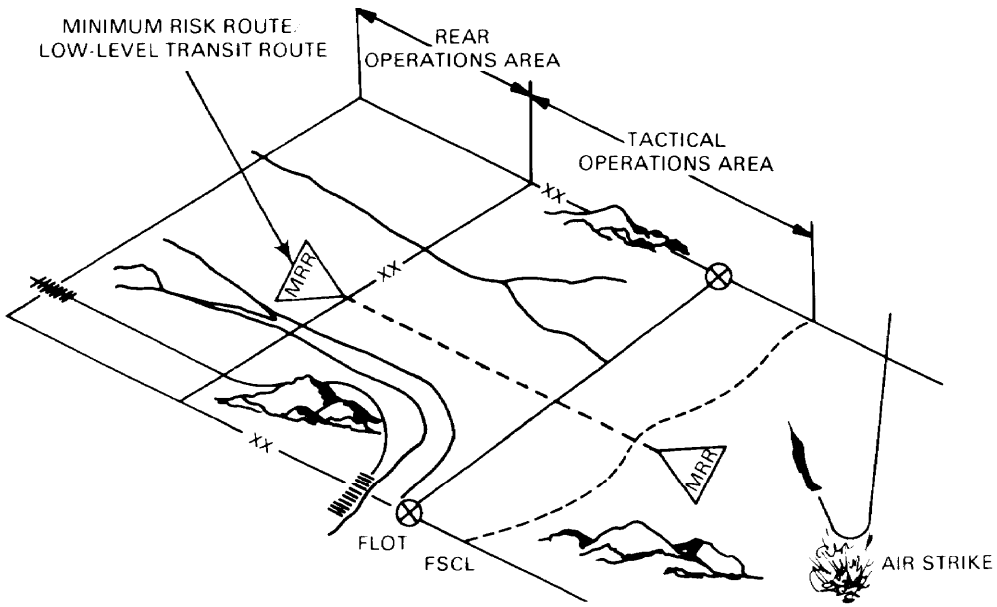
There are three common temporary airspace restrictions. These are restricted operations area, MRR/LLTR, and standard-use Army aircraft route.

Restricted operations area identifies airspace of defined dimensions within which the operation of one or more airspace users is restricted, generally for a short time. The airspace control authority establishes these areas in response to the requests of ground force commanders. Consequently, the maneuver unit commander will normally have complete WCS authority within an activated restricted operations area. Restricted operations areas for aircraft maximize ADA effectiveness. In such areas, the normal ADA WCS is WEAPONS FREE. Restricted operations areas for ADA maximize aircraft effectiveness. In such areas, the normal ADA WCS is WEAPONS HOLD.

An MRR/LLTR (see illustration) is a temporary corridor of defined dimensions passing in either direction through ADA defenses, through a HIDACZ, or through a restricted operations area. It permits high-speed aircraft to transit the tactical operations area at low altitudes. The WCS for MRRs/LLTRs will normally be WEAPONS TIGHT. This temporary airspace restriction will be used when and where there is inadequate timely control capability to permit a more flexible method of air defense. However, CAS aircraft transiting the tactical operations area are not required to use active MRRs/LLTRs. Each pilot must decide whether or not to use the corridor after considering mission requirements, degree of acceptable risk necessary for mission success, and CRC recommendations. In cases in which aircraft do not use the MRR/LLTR or in cases in which aircraft using the MRR/LLTR have nonoperational IFF/SIF transponders, established AD procedures will apply.

The WCS for ADA fire units whose engagement ranges intercept activated MRRs/LLTRs remains at WEAPONS TIGHT for that part of the route that is within the engagement range. Should it become necessary to change the WCS to WEAPONS FREE, the particular affected route would be closed by the commander who established it.

MRR/LLTR



Standard-use Army aircraft flight routes identify temporary corridors of defined dimensions passing in either direction through the rear operations area to designated points in the tactical operations area. These routes will terminate in relatively secure areas. Three points are important for Hawk units in connection with standard-use Army aircraft flight routes:

•Since high-speed aircraft should avoid standard-use flight routes, hostile criteria may provide that high-speed aircraft within these routes can be declared hostile.

•The WCS for ADA fire units whose engagement ranges intercept activated standard-use Army aircraft flight routes remains at WEAPONS TIGHT for that part of the route that is within the engagement range. Should it become necessary to change the WCS to WEAPONS FREE, the particular affected route would be closed by the commander who established it.

•Standard-use Army aircraft flight routes do not require joint approval and are therefore not

disseminated with air control orders. Hawk units under Air Force control will not routinely receive information on these routes. Army tactical aircraft in the corps area have no procedural means for safe passage through airspace defended by Hawk.

Sectors of interest and primary target lines. SOIs and PTLs assist in the distribution of Hawk fires and aid in the evaluation of targets for engagement. The battalion S3 normally designates the S0I and the PTL for the fire unit after a review of composite battalion radar coverage. The SOI enables the tactical director to specify which AFP should engage targets within designated areas. PTLs should be selected to cover expected avenues of approach, low-altitude avenues, or avenues meshed with those of other fire units. The SOI will be most useful in tight, well-developed point defenses. PTLs will be most useful in area defenses.

FIRE DIRECTION CENTER OPERATIONS

As mentioned in Chapter 3, brigade and battalion FDCs are equipped with the AN/TSQ-73 Missile Minder system. The system provides the commanders at both levels with the means to exercise automated fire control. At brigade level, the system provides the link between Army ADA and AD assets of other services. The AN/TSQ-73s at battalion and brigade levels establish voice links and ADLs with each other and with AFPs. The use of ADL allows computers at all echelons to "talk" to each other. Automated AD systems use several data languages. The AN/TSQ-73 uses ATDL-1 and TADIL-B, but it is important to have a good understanding of all three of the following:

•ATDL-1. Army Tactical Data Link One is a secure, point-to-point, full duplex (transmits and receives simultaneously) link for automatically processed data. It permits the flow of information among computers in the PCP, battalion AN/TSQ-73, and brigade AN/TSQ-73. ATDL-1 uses only UHF signals and is not used outside Army channels.

•TADIL-B. Tactical Digital Information Link B is a secure, point-to-point, full duplex link for data exchange in joint operations. TADIL-B is used by Air Force MPCs and Marine Corps TAOCs. The Army AN/TSQ-73 (brigade or master battalion) uses TADIL-B, as does the Patriot ICC, to exchange information with other services.

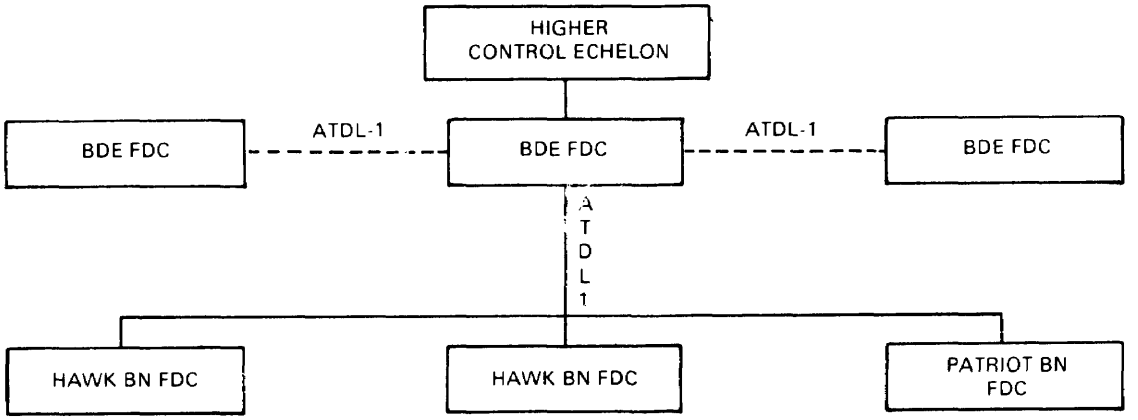
•TADIL-A. Tactical Digital Information Link A is a half-duplex system (transmits and receives in alternating time frames) that can use HF and UHF radios. TADIL-A is used extensively by the Air Force AWACS and the Navy's NTDS. The Air Force's MPC and the Marine Corps TAOC can use TADIL-A. TADIL-A data must be translated to TADIL-B at the CRC (MPC) or at the TAOC before it can be passed to Army ADA.

Army ADA brigades with RDF missions may receive early warning data directly from the AWACS if they have been provided with the ASIT. The ASIT is the forerunner of the JTIDS. Its data language is an updated form of TADIL-A called the IJMS. Like TADIL-A, IJMS is a half-duplex system transmitted over HF radios. The ASIT, collocated with the brigade AN\TSQ-73, translates IJMS into TADIL-B for use by the AN/TSQ-73.

INTRA-ARMY BRIGADE LEVEL LINKS

The AN/TSQ-73 of the brigade uses ATDL-1 data links and four-wire voice circuits to pass data between other brigade FDCs. Data links between brigades are normally activated only when a brigade loses communications with the system of a higher control echelon. (Redundant links with higher control echelons cause problems with parallax and closed loops. With multiple links, brigades would receive redundant information with no method of clearing their systems. Therefore, only one link with higher echelon per brigade is permitted, either by means of direct data link or through another brigade.) The brigade or master battalion AN/TSQ-73 will interface by means of four-wire voice and data link (ATDL-1) with the Patriot battalion ICC AN/MSQ-l 16, the Patriot FDC (see the Brigade Data Links illustration on page 4-22). Operational computer programs permit the system to control both Patriot and Hawk battalions. Track data, range, and altitude will determine which weapon system will be directed to engage specific targets when the level of control rests with the brigade.

BRIGADE DATA LINKS

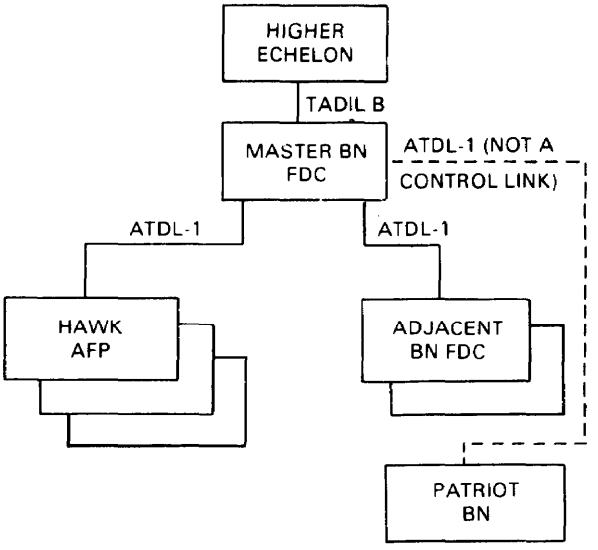


MASTER BATTALION OR BRIGADE LINKS

The battalion FDC has the same capability as the brigade FDC to establish links with higher, adjacent, and lower echelon elements. When the tactical situation demands, the battalion FDC can be reconfigured as a "master" battalion to control subordinate battalions as well as subordinate fire units. (See the Master Battalion Links illustration.) By means of ATDL-1 and voice circuits, the master battalion FDC can –

- Link with higher control echelons and up to six subordinate or adjacent battalions.
- Control up to 24 subordinate AFPs and up to 48 fire units belonging to other battalions.
- Establish a TADIL-B link to other services when necessary and available.

MASTER BATTALION LINKS

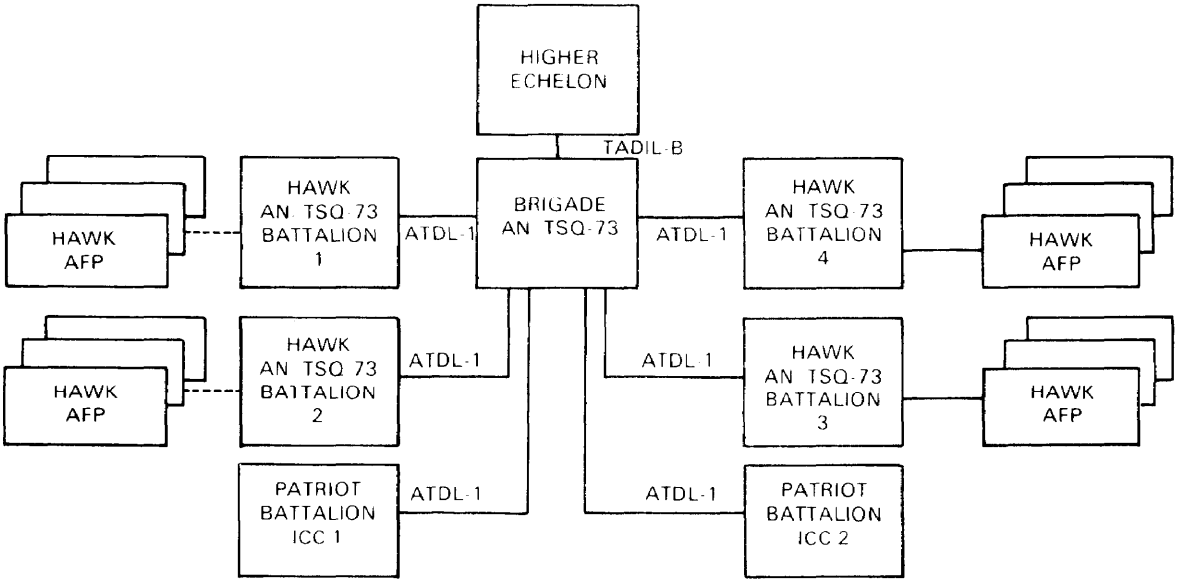


The master battalion capability provides several deployment options. The available options can best be visualized in contrast to the normal brigade configuration. TADIL-B links connect brigades to higher echelon, and ATDL-1 links connect them to their subordinate battalions. Master battalion deployment options are shown in the illustrations on pages 4-23 through 4-25. Processing will be the same for each type of deployment. The Patriot battalion currently lacks the software capabilities to operate as a master battalion. However, the Patriot systems will remain subordinate to the AN/TSQ-73 master battalion for early warning purposes only. The Hawk master battalion will not attempt to control adjacent Patriot battalions.

"Daisy Chain" Configuration

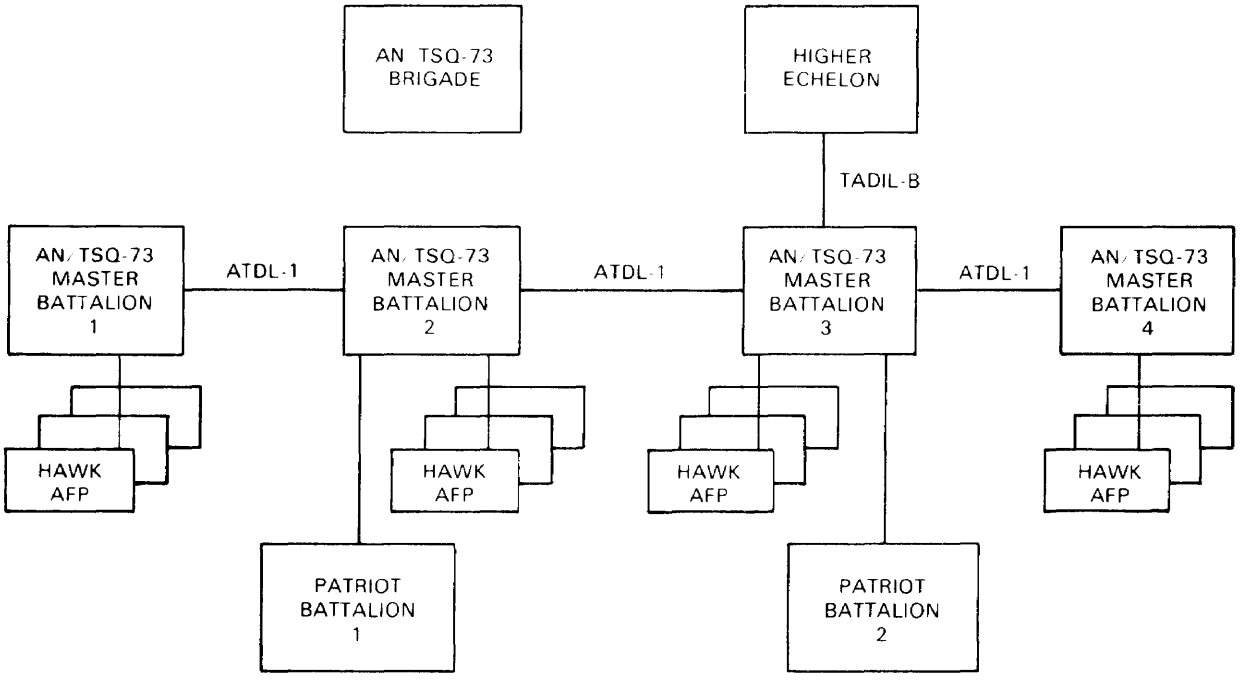
This configuration refers to the way in which adjacent battalion AN/TSQ-73s are linked together. All of the battalion AN/TSQ-73s activate the master battalion software and are capable of evaluating all other fire units

NORMAL BRIGADE CONFIGURATION



within the configuration. Only one of the master battalions, however, will activate a TADIL-B link. The local SOP will dictate the selection of this master battalion. In the daisy chain illustrated below, Master Battalion 3 is maintaining the TADIL-B link to higher echelon.

MASTER BATTALION "DAISY CHAIN" CONFIGURATION



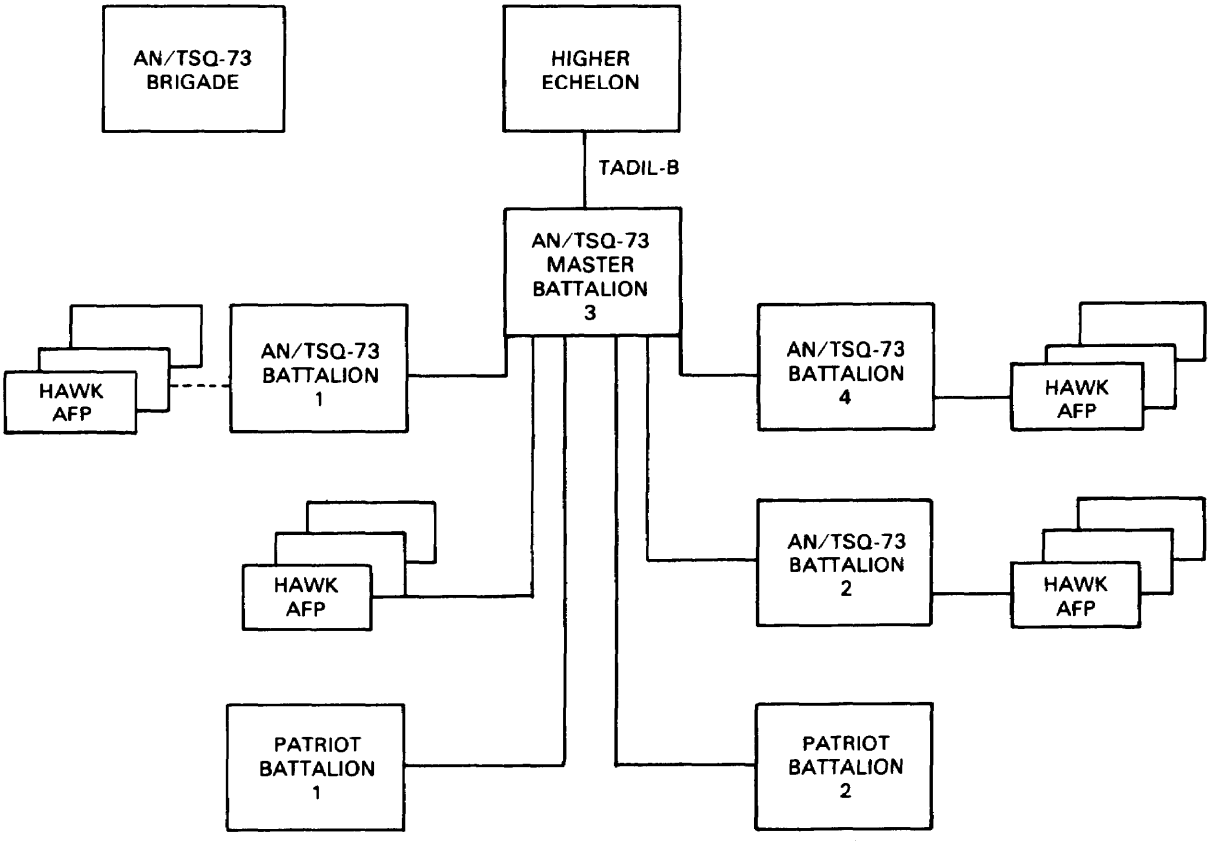
"Hub and Spoke" Configuration

This configuration is almost identical to a normal brigade configuration. One difference is that the unit that activates the TADIL-B link and activates the master battalion software must manage its own fire units as well as assign targets to the appropriate battalions in the defense. This configuration is shown in the Master Battalion Hub and Spoke Configuration illustration.

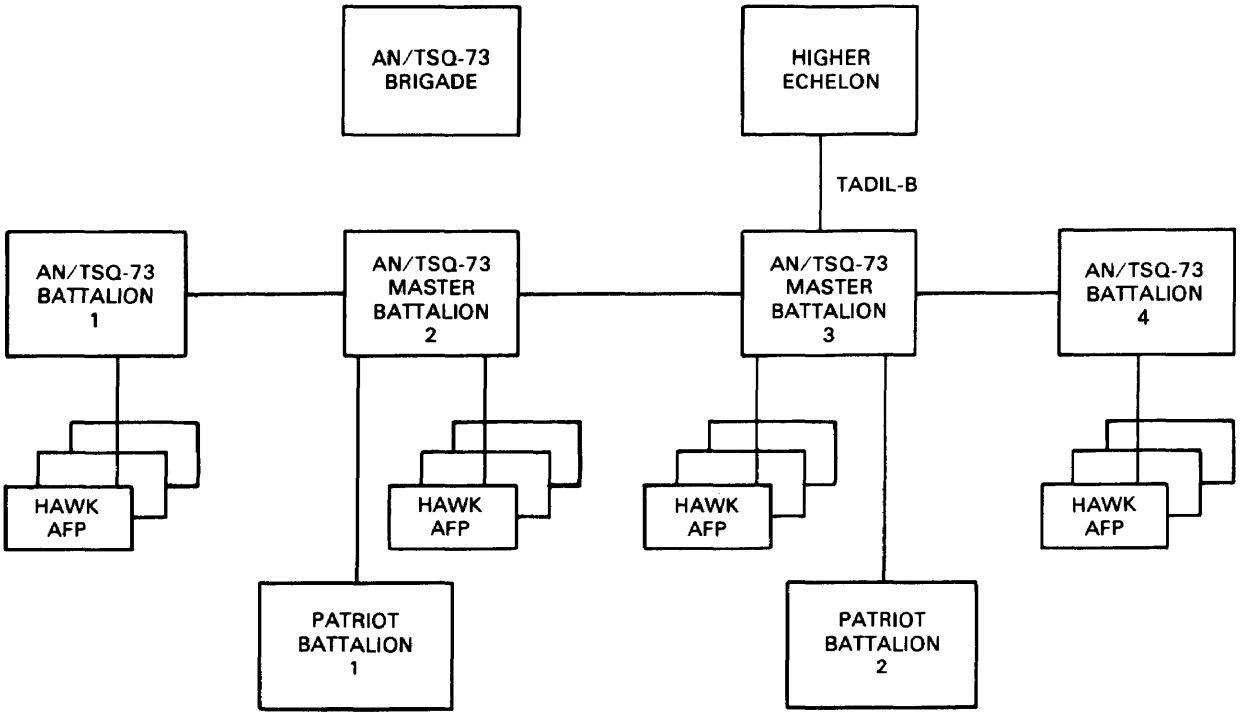
Combination Configuration

A third deployment option available to a tactical configuration of AN/TSQ-73 systems is a combination configuration. It combines the features of the "daisy chain" and the "hub and spoke." In the illustration of the combination (see page 4-25), two of the AN/TSQ-73 systems have activated the master battalion function while the other two remain in the subordinate battalion role. Again, activation of the master battalion, via the circuit card (CC143), is done according to the SOP. If a battalion connects another battalion (Hawk or Patriot) with a TADIL-B source, the battalion should be made a master battalion. This may require a battalion to become a master battalion even if the brigade system is operational. This arrangement is shown in the "Composite" Configuration illustration at the bottom of page 4-25.

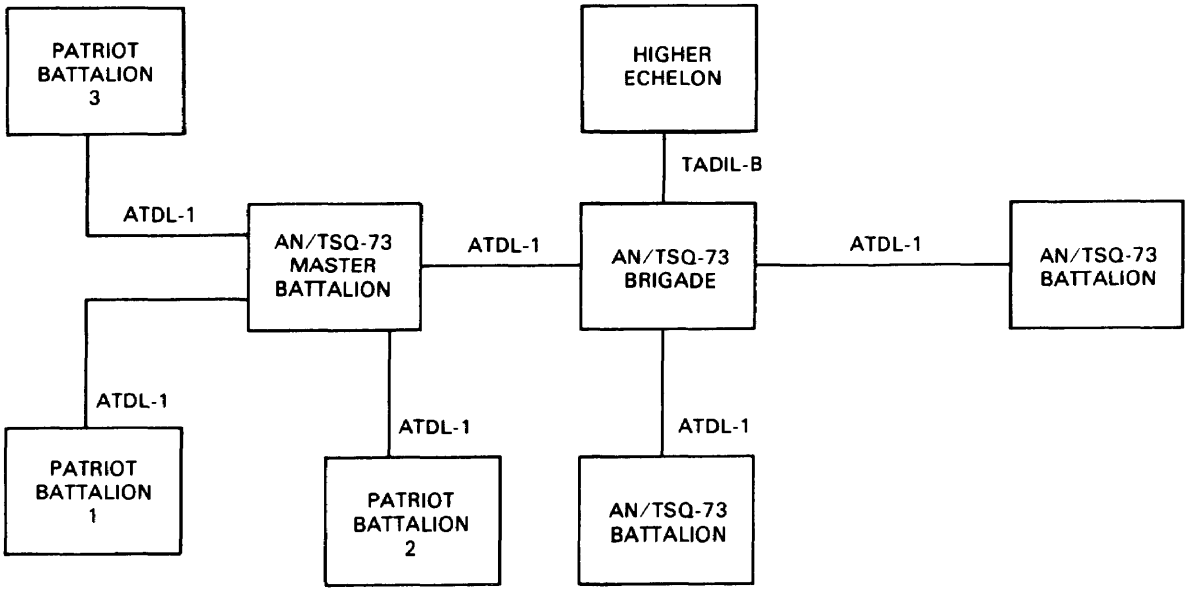
MASTER BATTALION "HUB AND SPOKE" CONFIGURATION



MASTER BATTALION "COMBINATION" CONFIGURATION



"COMPOSITE" CONFIGURATION



INTERSERVICE LINKS

The brigade (or battalion) AN/TSQ-73, using TADIL-B and associated four-wire voice links, interfaces directly with one of the following systems:

•USAF TACS AN/TSQ-91 .

•USAF MPC collocated with an AN/TSQ-91. (The AN/TSQ-91 will be replaced by the MCE AN/TYQ-23 sometime after 1990.)

•USMC MACCS.

Using the MPC collocated with an Air Force CRC, AN/TSQ-91, or the MACCS as forwarding elements, the AN/TSQ-73 can interface indirectly with the following systems via TADIL-B:

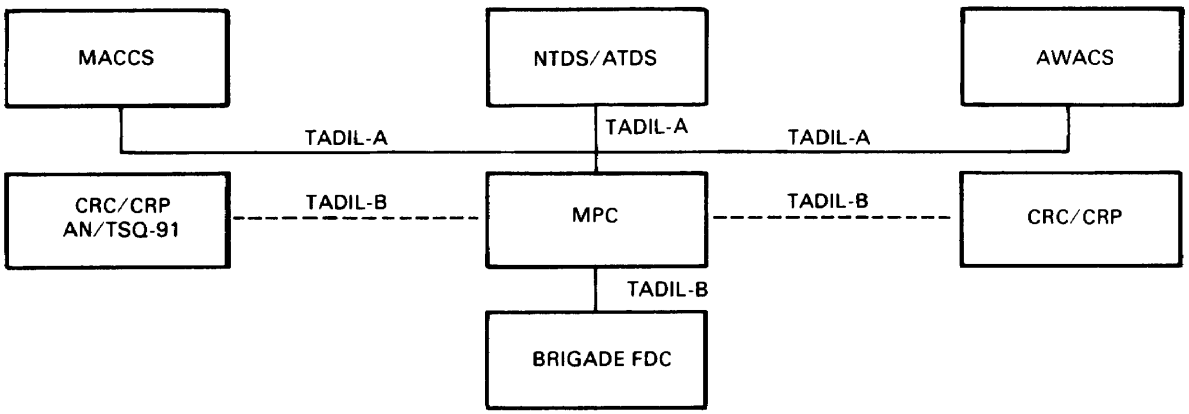
•NTDS or ATDS.

•USAF AWACS.

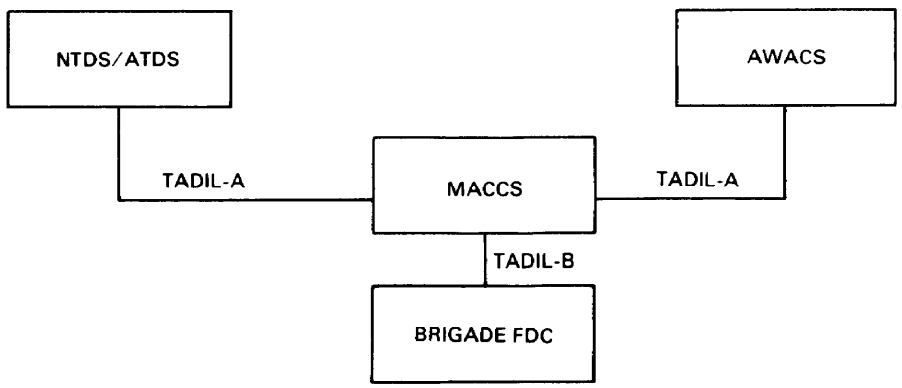
•MACCS and the MPC. MACCS and the MPC use TADIL-A to communicate with AWACS, with NTDS, and with ATDS. The AWACS, NTDS, and ATDS do not have TADIL-B to communicate directly with an AN/TSQ-73. They must use a facility that has command and control system or message processing equipment that can translate their TADIL-A messages to TADIL-B to exchange information with the AN/TSQ-73. See the MPG Link and MACCS Link illustrations at the bottom of this page.

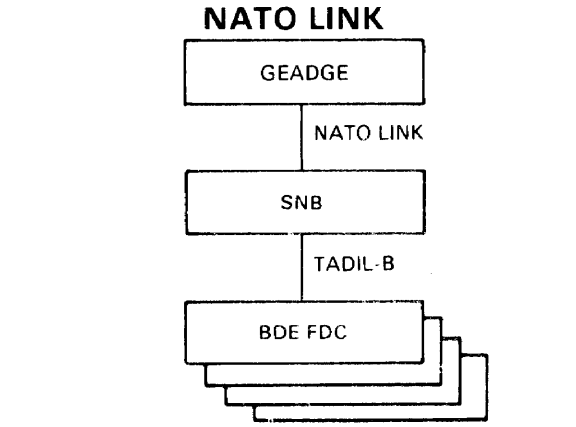
•The GEADGE - SNB combination allows Army ADA to link with the NATO air defense system. See the NATO Link illustration at the top of page 4-27.

MPC LINK



MACCS LINK





BRIGADE FIRE DIRECTION CENTER FUNCTIONS

By exchanging data with the other elements of the integrated command and control structure, the brigade FDC is able to perform the following functions:

•Monitor and report the readiness posture of subordinate units to ensure the brigade AD capability is in accordance with the current tactical situation.

•Evaluate the threat presented by non-friendly tracks designated by higher echelon and assign those tracks to the appropriate battalion for engagement.

•Monitor track data received from multiple sources and resolve track conflicts resulting from errors in registration, coordinate conversion, correlation/decorrelation, and IFF/SIF procedures.

•Allocate targets (whenever possible) to subordinate battalions to prevent undesirable multiple engagements, increase probability of successful intercept, and conserve missile resources.

•Assist in the identification of all friendly aircraft.

•Recommend to the AD commander appropriate adjustments to engagement zones, WCSs, and SOAs or readiness posture.

BATTALION FIRE DIRECTION CENTER FUNCTIONS

By data exchange with other elements of the command and control system, the battalion FDC –

•Monitors and reports the readiness posture of subordinate fire units to ensure the battalion's air defense capability is in accordance with the current tactical situation.

•Evaluates the threat posed by hostile and unknown targets and allocates the high-threat targets to appropriate fire units according to the established control modes.

•Monitors track data received from multiple sources and, through coordination, resolves track reporting conflicts.

•Supervises and coordinates tactical actions taken by subordinate firing units.

•Coordinates and executes redeployment orders to ensure a continuing air defense capability in the battalion's area of responsibility.

•lnforms the brigade FDC and subordinate units of the battalion's operational status.

•Supervises nuclear weapons employment in accordance with established procedures.

•Monitors missile inventory to maintain continuous air defense coverage of the battalion's area of responsibility.

•Assists in the protection of friendly aircraft.

TACTICAL DIRECTOR/ TACTICAL DIRECTOR ASSISTANT RESPONSIBILITIES

The AN/TSQ-73 is manned by a crew of three — one officer and two enlisted soldiers. The officer is an 02 or 03, MOS 14D, and is the TD. One enlisted soldier, E6 or E5, MOS 25L, monitors weapons control functions and is the TDA. The second enlisted soldier, the communications operator, monitors and maintains communications, The TD is responsible for all tactical actions within the unit during battalion air battle operations. Specifically, the TD identifies all targets. He should have the ***engage control*** and the ***friendly protect*** switches activated. The TD monitors and responds to alerts associated with identification, engagements, weapons control, and engagement overrides. The TD ensures that assigned SOR/SOE and current DEFCONs are posted. He monitors the battalion status and records the communications status for AFPs and for higher echelons. The TD monitors the status of the IFF and radar and ensures that all airspace control procedures are properly posted.

Tactical Director

The TD is responsible for resolving target identities. His main effort is to ensure that friendly aircraft are not made eligible for engagement. He is responsible for applying all engagement override fire control orders (hold fire, cease fire, cease engage). He also countermands those fire control orders when necessary. He monitors the IRR circuit (see Chapter 7). The TD's responsibilities include —

- Protecting friendly aircraft.
- Identifying targets.
- Activating and or deactivating IFF.
- Resolving identification conflicts.
- Monitoring situation display.
- Applying hold fire, cease fire, and cover orders as required.
- Implementing airspace control procedures.
- Monitoring higher echelon traffic.
- Monitoring IFF.
- Directing battalion EMCON.

Tactical Director Assistant

The TDA monitors or initiates all engagements. He is responsible for performing all functions associated with engaging targets. He monitors FDC and AFP equipment and communications status. He directs AFPs to radiate or to cease radiating based on the TD's orders and the battalion EMCON schedule, and he keeps track of their radiation periods. The TDA monitors computer and system faults and BITE. He monitors the ADC circuit (see Chapter 7). The TDA's responsibilities include —

- Assigning engagements.
- Monitoring status of battalion.
- Noting batteries' communications status and missile count.
- Directing FDC radar activation and or deactivation.
- Monitoring higher echelon traffic.
- Monitoring ADC.

CHAPTER 5

Operations

This chapter implements STANAG 3880, Edition 1, Counter Air Operations (ATP-42).

Effective employment of Hawk on the air-land battlefield requires sound, detailed operational planning. Hawk commanders and operations officers must have a thorough understanding of the Hawk system and the tactics, procedures, and techniques for its employment. Using the factors of METT-T, commanders must be able to quickly and competently analyze terrain, evaluate the threat, understand the mission and the tactical situation, and evaluate their own capabilities. Because of the highly technical nature of the Hawk system, detailed logistical and administrative planning is imperative. Extensive individual and collective training, as well as practiced application during field training exercises, are of the greatest importance during peacetime in preparation for war.

The limited number of air defense artillery weapons in the Army inventory is a fact of life. ADA commanders and force commanders at all levels must make the best possible operational use of the resources available. This chapter presents the combat support relationships and prioritization necessary to protect the force with its limited number of ADA weapons. This chapter also presents ADA employment designs, planning guidance, and operations security.

CONTENTS

CONTENTS (continued)

Section 1. Support Relationships and Force Allocation Guidelines

SUPPORT RELATIONSHIPS AND RESPONSIBILITIES

The assignment of tactical support relationships defines specific responsibilities between Hawk units and the units they support. Commanders who have organic, assigned, attached, or OPCON ADA unite may assign support relationships to those units. For example, the commander of an ADA brigade selects the appropriate support relationship for his subordinate Hawk battalion. He bases his selection on the mission he receives and the tactical situation which confronts him. This section describes the types of support relationships which are appropriate for the Hawk battalion and how the supported force commander's tactical operation may influence ADA force allocation.

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 following basic rules govern the application of a support relationship:

•The assignment of a support relationship implies no logistical or administrative support. Although such support may be coordinated, it is not a function of the support relationship.

•In all cases, ADA commanders operating with a support relationship may task organize to support the given priorities and the concept of operations and may subassign a relationship to subordinate organic, attached, or OPCON elements.

•The Hawk AFP is the smallest element which may be assigned a support relationship. However, since Hawk units normally fight as battalions, the support relationships should be assigned to the battalion. In normal circumstances, the battalion would not suballocate missions or relationships to its fire units.

•The support relationship is not compatible with the command relationship. The two will not be assigned simultaneously.

It is important to note that there is no ***normal*** support relationship for any ADA unit. The ADA commander may assign any one of the support relationships to a subordinate ADA unit based upon the situation, his own judgment, and the accepted definitions of the names of the relationships. Hawk battalions, however, would not normally be assigned a DS relationship because ADA units are organic to all units of division size and larger. Hawk units are not normally assigned support relationships below the battalion level, and Hawk units generally do not protect units smaller than divisions. The specific relationships and responsibilities formed by and inherent to the ADA support relationship are shown in the illustration on page 5-4. The four ADA 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. There are three rules which further define this support relationship:

•The Hawk commander develops and coordinates an air defense plan to support the priorities of the commander assigning the support relationship.

•Liaison with the supported unit is conducted through the parent unit or through the commander assigning the support relationship.

•The ADA plan is approved by the commander who assigns the support relationship.

GENERAL SUPPORT-REINFORCING

A Hawk unit in a GSR relationship provides coverage for the force as a whole and secondarily augments the coverage of another ADA unit. GSR units are not committed to any specific element of the force. There are three rules which further define this support relationship:

•The Hawk unit commander assigned a GSR support relationship protects the priorities of the commander who assigns the support relationship.

•The Hawk unit commander in a GSR relationship conducts liaison with the reinforced ADA unit.

•The Hawk commander coordinates his ADA plan with the reinforced ADA unit and secures the approval of the commander assigning the support relationship.

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 R Hawk unit and the reinforced ADA unit are committed to a specific element of the force. The following three rules further define this support relationship:

•The R Hawk unit protects portions of the reinforced ADA unit's priorities.

•Tactical employment of the R Hawk unit is the responsibility of the reinforcing unit commander.

•The Hawk commander coordinates his ADA plan with the reinforced ADA unit.

DIRECT SUPPORT

A Hawk unit in DS provides dedicated air defense for a specific element of the force that does not have assigned or attached ADA. The DS unit is committed to that specific element of the force. The following four rules further define this support relationship:

•The DS Hawk commander establishes priorities based upon the supported unit commander's concept of operations. The supported unit commander approves the priority list.

•The DS Hawk unit's operations plan becomes a part of the supported unit's operations plan. Consequently, the supported unit approves the plan.

•The DS Hawk commander serves as the principle advisor to the supported unit on AD matters.

•There can only be one ADA DS unit in support of a specific element at any given time.

SUPPORT RELATIONSHIPS

ACTION	GENERAL SUPPORT (GS)	GENERAL SUPPORT REINFORCING (GSR)	REINFORCING (R)	DIRECT SUPPORT (DS)
WHO RECOMMENDS ADA PRIORITIES?	THE COMMANDER ASSIGNING THE SUPPORT RELATIONSHIP (APPROVED BY THE SUPPORTED FORCE COMMANDER).	THE COMMANDER ASSIGNING THE SUPPORT RELATIONSHIP. THE GSR COMMANDER COORDINATES WITH THE REINFORCED UNIT COMMANDER.	THE REINFORCED ADA COMMANDER ASSIGNS ADA PRIORITIES TO REINFORCING HAWK UNITS.	THE HAWK COMMANDER (APPROVED BY THE SUPPORTED FORCE COMMANDER).
WHO POSITIONS ADA FIRE UNITS?	THE HAWK COMMANDERS IN COORDINATION WITH THE FORCE COMMANDER.	THE GSR UNIT COMMANDER IN COORDINATION WITH THE REINFORCED UNIT COMMANDER.	THE HAWK COMMANDER WITH APPROVAL OF THE REINFORCED ADA UNIT COMMANDER.	THE HAWK COMMANDERS (APPROVED BY LOCAL COMMANDER).
WHO ESTABLISHES LIAISON?	THE COMMANDER ASSIGNING THE SUPPORT RELATIONSHIP.	THE GSR UNIT COMMANDER.	THE REINFORCING HAWK COMMANDER.	THE HAWK COMMANDER.
WITH WHOM TO ESTABLISH LIAISON?	AS REQUIRED BY THE COMMANDER ASSIGNING THE SUPPORT RELATIONSHIP.	THE REINFORCED UNIT COMMANDER.	THE REINFORCED ADA COMMANDER.	THE SUPPORTED UNIT.
WHO ESTABLISHES COMMUNICATIONS?	THE HAWK COMMANDER.	THE GSR UNIT COMMANDER.	THE REINFORCING HAWK COMMANDER.	THE HAWK COMMANDER.
WITH WHOM TO ESTABLISH COMMUNICATIONS?	AS REQUIRED BY THE COMMANDER ASSIGNING THE SUPPORT RELATIONSHIP.	THE REINFORCED UNIT COMMANDER.	THE REINFORCED ADA UNIT.	THE SUPPORTED UNIT.

CLASSES AND TYPES OF AIR DEFENSE

Considerations which impact on the allocation of Hawk forces are the classes and types of air defense. The classes and types of air defense are explained in the following paragraphs.

CLASSES OF AIR DEFENSE

There are two classes of air defense. Air defense is either active or passive.

Active Air Defense

Active air defense is direct action taken to destroy enemy aircraft and missiles or to reduce the effectiveness of enemy air operations. It includes the use of aircraft, surface-to-air weapon systems, ECM, and weapons other than ADA when used in an air defense role. For further details about the use of small arms in air defense refer to FM 44-8.

Passive Air Defense

Passive air defense includes all measures, other than active air defense, taken to minimize the effects of hostile air action. These measures include, but are not limited to, the use of cover, concealment, dispersion, movement, EMCON, decoys, and deception.

TYPES OF AIR DEFENSE

Air defense artillery forces are allocated to provide two types of air defense — area defense and point defense. The air defense commander selects the type of air defense which will best

accomplish the mission. This selection must provide the greatest degree of protection to the supported commander's priorities within the constraints of available forces and according to the priority of each asset or area.

Area Air Defense

The area air defense is protection for a broad area. Air force counterair resources have primary responsibility for providing area air defense because of their flexibility, range, mobility, and reusability. In an area defense, no particular asset(s) receives priority of defense. A belt defense is a specialized application of area air defense. In a belt defense, HIMAD units deploy in a linear configuration to provide for early engagement and attrition of the enemy as he attempts to penetrate to rear areas. This type of defense maybe necessary to provide the best coverage of the force commander's priorities. No particular asset(s) receives priority of defense in a belt defense. However, fire units can normally be positioned within a belt to provide the best possible coverage of the ground commander's priorities while at the same time maintaining the belt defense. With limited ADA resources, however, spreading fire units in a thin line restricts the ability to mass ADA fires. Belt defenses also are vulnerable at the flanks to fly-around tactics.

Point Air Defense

The point air defense is a defense concentrated on a limited area, normally the locations of vital elements of a force or vital installations of the rear area. A point defense is characterized by priority of defense being given to specific assets. These assets can either be mobile or static, and they can be either organizations or installations. Although the Hawk battalion involved in a defense of a specific asset may provide air defense coverage over a wide geographical area, the term "area defense" does not apply. Defense of specific assets in priority, and fires designed with those assets in mind, are features of the point defense.

THE MIX–ALLOCATION OF OTHER ADA SYSTEMS

An additional consideration for the employment of Hawk forces is the number and type of other ADA systems to be employed in the defense. SHORAD systems usually provide point defense of maneuver elements and other high value assets in both forward and rear areas. SHORAD systems include SHORAD gun and missile systems and also MANPAD missile systems. SHORAD units are organic to the corps and theater ADA brigades. Each division also has an organic SHORAD battalion, each armored cavalry regiment has an organic SHORAD element, and each separate brigade has an organic Stinger platoon. HIMAD systems are deployed throughout the area of operations. The needs of the force commander determine their deployment. This normally results in HIMAD employment in both area and point defenses. For point defenses, priorities may inelude specified organizations, critical facilities, or installations.

FUNDAMENTAL CONSIDERATIONS WHEN ORGANIZING FOR COMBAT

To provide sound air defense guidance to the supported commander and to his own subordinate commanders, the Hawk commander must fully understand the fundamentals of offensive, defensive, retrograde, and contingency operations as they apply to force allocation. However, regardless of the type of operation, Hawk assets are ***never*** held in reserve.

USUAL HAWK EMPLOYMENT

Hawk units are normally deployed as an integral part of a larger theater or joint task force air defense deployment to support the theater commander's priorities or as part of a corps ADA brigade to support the corps commander's priorities. In special circumstances, Hawk may be used in support of a specific element of the force. In all cases, the Hawk battalion commander must analyze the supported force's OPLAN or OPORD for key elements of information. He must fully understand the commander's intent and the overall mission of the supported force. This information is critical because the air defense plan he develops must

accomplish the air defense mission within the context of the supported force's operation. In analyzing the mission, the Hawk commander considers the tactical operation being conducted by the supported unit and the air defense priorities of the supported commander.

TYPES OF OPERATIONS

The types of operations which will be supported by Hawk units are —

- Offensive operations.
- Defensive operations.
- Retrograde operations.
- Contingency operations.

Hawk in Offensive Operations

While Hawk units will normally protect a variety of assets in any offensive operation, the top priority will most frequently be given to the attacking maneuver elements designated as the main effort. When a division is designated as an air defense priority by the corps commander, it should be supported by ***no less than one Hawk battalion*** (six AFPs).

Offensive operations on the modern battlefield are extremely fluid and characterized by frequent, rapid changes in the direction and location of the main effort. Hawks units can expect to support operations featuring rapid transitions from the defense to the offense. Additionally, simultaneous deep strike operations and rear area operations will be conducted. Night combat will be normal on the air-land battlefield. Each of these characteristics must be considered from the outset of the operational planning to determine the composition and employment of the supporting ADA force.

Since offensive operations will nearly always require at least air parity, the low- to medium-altitude coverage provided by Hawk units will be critical to support the offense as well as to provide ADA protection of deep strike assets in the division and corps rear areas. This coverage complements that provided by Patriot, AD fighters, and divisional and nondivisional SHORAD assets.

Hawk units support offensive operations by providing coverage that allows maneuver commanders the freedom to maneuver and by providing coverage for the force commander's priorities. During such operations, the commander's priorities may include deep strike assets and support facilities, as well as the maneuver force itself. When protecting maneuver forces, the commander retaining fire control of the Hawk unit must accept the risk inherent in placing Hawk AFPs within 25 kilometers of the LD/LC. AFPs placed farther back will be unable to adequately cover units along the LC at low altitudes because of terrain and the curvature of the earth. In addition, as the attack moves forward, the ability of the Hawk unit to cover units on the LC at low altitudes is degraded.

In the past, continuous coverage of maneuver units was thought to be critical. While coverage is important, the ability to operate ***silently*** gives the Hawk commander several options. If the Hawk commander can successfully deceive the enemy about the location and operational status of the Hawk AFP, continuous coverage may not be necessary. Enemy pilots who cannot determine the location of Hawk units will be forced to fly as if Hawk coverage were continuous. When the speed of the attack outstrips the ability of the Hawk battalion to keep pace, deception may be as effective as actual coverage. (See Section IV of this chapter for more on tactical deception.)

Hawk In Defensive Operations

The immediate purpose of any defense is to cause an enemy attack to fail; however, an underlying purpose of all defensive operations is to create the opportunity to initiate offensive operations. All activities of the defense, to include air defense operations, must contribute to that end. Corps, divisions, and sister services will organize and fight a synchronized defensive battle within a framework that consists of the following elements:

- Deep operation in the area of interest to create windows of opportunity for decisive action against leading enemy echelons.
- Security force operation to support the main effort by providing forward security.
- A main effort in the MBA where forces are positioned to conduct the decisive defensive battle.
- Rear area combat operations to defend vital rear area assets such as lines of communication, support areas, C^2 facilities, and long-range fire support units.

•Reserve operations in the MBA or in the covering force area to support the main effort.

As there is no single technique for defense prescribed by Army doctrine, Hawk forces may be allocated to support several combinations of area and mobile defenses. In its area forms, the defense is oriented on the retention of terrain through the use of firepower from fixed positions. For this defense to succeed, the fixed positions require protection from air attack. The mobile forms of the defense focus primarily on the enemy's action and depend upon maneuver and fire to destroy the enemy force. Maneuver units will usually be the priority assets for air defense in defensive operations. Supporting ADA commanders should then typically allocate Hawk resources to maneuver elements, fixed firepower positions, reserve forces, C^2 facilities, and logistical elements in priority as determined by the supported commander.

Priority of Hawk coverage in defensive operations should go to deep strike assets, C^2 facilities, and logistics units. Hawk commanders supporting defensive operations must plan alternate positions both behind and forward of those currently occupied. This deployment supports either a subsequent offensive operation or a retrograde movement. Any alternate position will probably require clearing, survivability positions, revetments, and roadways. The Hawk commander must plan for all the support he will need if the situation demands that he occupy one of his alternate positions. It is critical for Hawk AFPs to avoid detection during the transition from defense to offense.

Retrograde Operations

A retrograde operation is an organized movement to the rear or away from the enemy. Each type of retrograde operation is characterized by difficulty of execution and risk. FM 100-5 discusses the three types of retrograde operations:

•Delay.

•Withdrawal.

•Retirement.

Delay. A delay operation is appropriate when there are insufficient forces to attack or defend, or when the defensive plan requires drawing the attacker into a vulnerable position. In delay operations, the unit falls back to successive battle positions each time the enemy deploys for attack, thereby gaining time for reestablishment of the defense. In a delay, Hawk resources will protect elements of the reserve, command posts, forward arming and refueling points, and maneuver choke points, such as bridges and defiles. These protected assets will be listed as AD priorities in the supported force operations order.

Withdrawal. In the withdrawal, friendly forces voluntarily disengage from the enemy so that the commander may reposition all or part of the friendly force. Withdrawal operations depend heavily on deception and security in execution and will likely occur in periods of darkness or limited visibility. ADA forces will usually protect the same type assets they protect in the delay with special priority given to C^2 facilities and reserves — assets which are vital to the execution of a successful withdrawal.

Retirement. A retirement is an administrative movement to the rear by a force that is not in contact with the enemy. The allocation of air defense forces to a retirement depends on the specific tactical situation dictating the operation. The scarcity of air defense assets frequently limits the amount of air defense available for administrative movements.

Contingency Operations

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

Currently, Hawk elements are designated to support contingency operations. In general, contingency operations are planned in phases as follows:

•Phase I (Deployment). The assault force moves into the contingency area to establish and secure an airhead or a beachhead.

•Phase II (Lodgement). Follow-on forces move into the area to reinforce the assault force and establish the lodgement area. This area will normally contain seaports, airfields, and other facilities needed for sustaining subsequent combat operations.

•Phase III (Expansion and Buildup). Once the situation in the lodgement area stabilizes, expansion of the logistic base and buildup of tactical forces foIlows. The contingency force initiates or continues offensive action to meet and defeat the enemy.

•Phase IV (Transition or Termination). The transition into a mature theater to enhance sustained tactical operations or the successful termination of conflict characterizes Phase IV.

Hawk units participating in contingency operations will defend the prioritized assets of the contingency force commander. Contingency operations typically cover vast areas, and the force will be vulnerable to air attack from any azimuth. Because of the unique characteristics of contingency operations, AD forces must orient their priorities toward assuring the survivability of the force.

ADA protection for contingency operations requires a combination of HIMAD and SHORAD elements. During the initial phases of these operations contingency forces are extremely vulnerable to air attack. Hawk units, therefore, will enter contingency operations as early follow-on forces to participate in composite HIMAD/SHORAD/air forces defense of arrival airfields or beachheads. To provide adequate protection and to ensure effective C^2, the Hawk element should be no smaller than battalion size and should include the FDC. The selection of 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.

•C^2 facilities.

•Logistical trains areas.

•Lines of communication and main supply routes.

•Maneuver forces.

•Other assets designated by the commander as critical to force survivability.

After the deployment and lodgement phases, follow-on air defense elements enter the airlift flow at intervals to increase the number of prioritized assets that can be adequately defended. Adding more Hawk elements to the force during the expansion and buildup phase increases the flexibility of the contingency force commander to provide adequate ADA protection to both his offensive main effort and the lodgement area. Throughout the fighting phases of contingency operations, flexible task organization of all ADA supporting forces will be essential to provide effective support to the commander's shifting priorities. The commander's priorities will change as the situation develops and as the vulnerability of critical elements of the force changes. In all cases, Hawk units orient their protection to assure the survivability of the contingency force. Positive management of the fires of the Hawk AFPs at battalion level wherever possible will optimize protection while minimizing airspace management problems. The fluid nature of contingency operations and the lack of an established C^2 structure will not always permit positive management. Procedural management directives must be available and must be practiced prior to deployment.

Section II. Designation of Priorities and Defense Planning

DEVELOPMENT OF AIR DEFENSE PRIORITIES

Air defense priorities must precede the use of ADA on the battlefield. To assist commanders in establishing priorities, a step-by-step decision-making process has been developed.

When the ADA commander carries out this process in close coordination with the supported commander, he can optimize the support afforded by his ADA resources. The product of the

decision-making process is a prioritized list of assets that the supporting ADA unit will protect. Development of AD priorities is the basis for planning effective air defenses to meet the needs of the supported commander within the constraint caused by the limited number of available ADA resources.

The supported force commander determines air defense priorities with the advice and assistance of the supporting ADA commander. Air defense priorities are those selected force assets which are most critical to mission accomplishment and which the supporting ADA unit must defend in priority. During the planning process, the supported force commander first evaluates his assets to determine the relative importance of each to the accomplishment of the force's mission. Next, the supporting Hawk commander compares his available air defense units to the listing of the supported force's most critical assets. Beginning with the most important, he determines which of these assets can be defended by the available Hawk AFPs. He then recommends to the supported force commander that these assets receive air defense priority. The supported force commander has three options. He may approve the Hawk commander's recommendation, he may reduce the listing (thus affording increased AD to selected assets), or he may expand the listing (thus reducing the degree of AD afforded each asset). After the supported force commander exercises his option, the list becomes part of the air defense annex to the supported force's operations plan. Factors considered in determining the relative importance of each asset and its need for air defense are criticality, vulnerability, recuperability, and threat.

CRITICALITY

Criticality is the degree to which the asset is essential to the force commander's concept of the operation. Assets in decreasing criticality are categorized as those which, if damaged —

- Are capable of preventing the execution of the plan of action.
- Will cause immediate and serious interference with the execution of the plan of action.
- Can ultimately cause serious interference with the execution of the plan of action.
- Might cause limited interference with the execution of the plan of action.

VULNERABILITY

Vulnerability is the degree to which the asset is susceptible to attack on the battlefield. Consideration should be given to the asset's hardness, its specific mission in the overall operation, the degree to which the asset can protect itself by dispersing or displacing to another position, the degree to which it can provide its own air defense, the amount of engineer mobility and survivability support available, and the amount of protection afforded by passive air defense measures.

RECUPERABILITY

Recuperability is the degree to which the asset can recover from inflicted damage. It is measured in terms of available manpower and the time and equipment necessary to make the asset again able to perform its mission.

THREAT

Threat is the probability of an asset being targeted for attack by enemy air. Planners must assess this probability if they are to achieve economical allocation of ADA resources. Targeting information provided by intelligence estimates, enemy attack methods used in the past, and current enemy doctrine are all useful in determining which assets require active air defense protection.

IMPACT OF THE AIR-LAND BATTLE

The intense and lethal nature of the air-land battle requires Hawk commanders to expand the scope of consideration in determining the need for providing air defense protection to any asset. Formerly, combat efforts focused on winning the fight only in the MBA. The extension of the battlefield in depth, time, and resources to include deep operations, close-in operations, and rear area combat operations forces commanders to redefine air defense priorities to include all three kinds of operations. Assets that were formerly seen as most vital when only main battle operations were considered may not be so vital to deep operation or to the rear area operations. Conversely, commanders must now consider that certain assets,

formerly not so vital to main battle operations, should have very high priority in terms of the overall concept of operations. See the Setting Priorities illustration.

In determining the need for active air defense protection to any asset, commanders should consider certain characteristics which would make that asset a lucrative target to the enemy. Both sides recognize the relationship between winning in the deep operation and the outcome of conflict. The enemy's targeting strategies emphasize the early destruction of those assets which contribute the most to the deep attack. Some characteristics of deep attack assets which provide the means for the commander to measure the need for air defense protection include the —

•Contribution the asset makes to the execution and cohesion of the defense or to the momentum of attacking units in the offense.

•Location on the battlefield where the asset makes its greatest contribution to the integrity of the second echelon forces as they prepare to join the battle.

•Effect at the FLOT which would result from destruction of the asset at its present location.

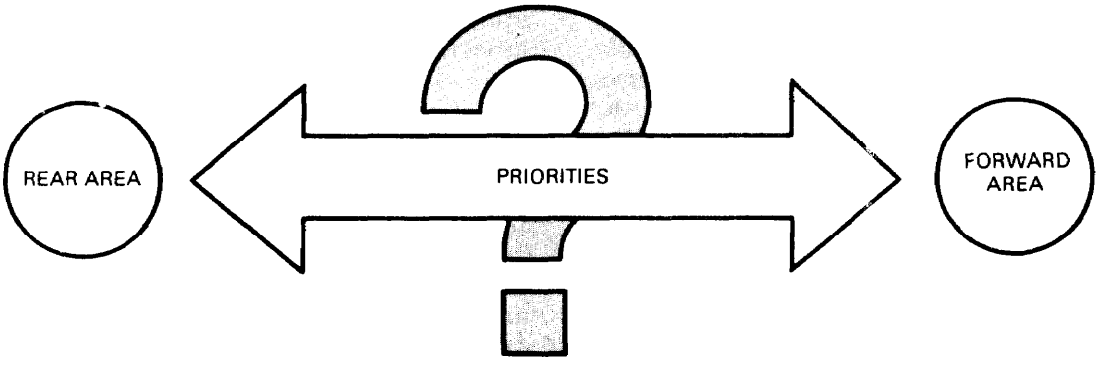
•Threat which the asset poses to enemy air operations which are vital to the enemy's deep attack capability.

•Effect on the ground operations that the threat force expects to achieve by destroying the asset.

•Probability that the asset has been targeted by threat aircraft.

Based on these considerations, there may be times when close-combat elements will use self-defense and passive air defense measures while assets such as corps artillery units, Army aviation forward assets, division artillery, and critical nuclear delivery units will be given priority for active air defense protection. Intelligence acquisition assets, C^2 facilities, and specific weapon systems which are vital to deep attack must be given careful consideration by the commander establishing air defense priorities. Failure to do so may result in the degradation of our forces' ability to conduct deep attacks. In the projected scenario of the air-land battle, this degradation of ability is tantamount to defeat.

SETTING PRIORITIES



THE DEFENSE PLANNING PROCESS

One of the major challenges faced by Hawk commanders is the proper use of the limited number of air defense resources for the protection of critical forces and facilities in the air-land battle. Air defense planners must achieve a balance between effectiveness of protection and economy of force on the air-land battlefield. Two factors which impact directly on this problem are the inability of existing ADA resources to provide adequate air defense protection to every vital asset and the lack of adequate defense planning frequently provided to those defenses. Concepts such as habitual association and the simplistic application of ADA employment guidelines and principles to the exclusion of other factors reduce defense planning

to an unreliable, mechanical process. Such types of predictable templating are doctrinally unsound. Proper planning is a command responsibility which begins with the establishment of air defense priorities based on the force commander's concept of the operation and follows a sequential process of four phases:

- Analysis.
- Design.
- Evaluation.
- Implementation.

It is important to note that defense design, which considers employment guidelines and principles, is only one phase of the defense planning process. A formal or an informal analysis must precede it. It is not the purpose of doctrine to dictate specific defenses for specific type assets. Defenses must vary with the changing tactical situation. However, this section provides commanders with the basic planning framework from which to construct effective protection in any tactical situation. See the Defense Planning illustration.

ANALYSIS PHASE

Following the establishment of air defense priorities, the Hawk commander begins the sequential process of planning the air defenses. The commander must plan each air defense to fit the current and projected tactical situation. Prior to any operation on the battlefield, the Hawk commander conducts an analysis of the situation. in which he considers the factors of METT-T. The product of this analysis is a recommendation for an initial allocation of Hawk AFPs to protect the prioritized assets of the supported force commander. Subsequent phases of the defense planning process may drive changes to this recommended initial allocation. Force allocation is the responsibility of the ADA brigade at corps as well as at echelons above corps.

Mission

Mission analysis must consider the intent of the supported operation, essential specified and implied tasks, the degree of risk to the Hawk unit that is acceptable, constraints or limitations on Hawk fires, probable follow-on missions, and the number and type of assets prioritized by the supported force commander. The Hawk commander must determine the most effective allocation of his resources to sustain the supported force commander's concept of the operation.

Enemy

An analysis of the enemy forces the unit is likely to encounter is critical to planning an effective air defense. Because of the wide variety of options normally available to threat forces to attack friendly assets from the air and the limited number of Hawk fire units available to defend them, commanders and planners must plan the protection of a prioritized asset to counter the most likely threat against that asset. In the past, planners used the worse case threat.

DEFENSE PLANNING

PHASES	CONSIDERATIONS
ANALYSIS	MISSION
	ENEMY
	TERRAIN
	TROOPS
	TIME AVAILABLE
DESIGN	AD EMPLOYMENT PRINCIPLES
	ADA EMPLOYMENT GUIDELINES
	HAWK DEFENSE DESIGN REQUIREMENTS
EVALUATION	FIREPOWER ANALYSIS
	DEFENSE REDESIGN
IMPLEMENTATION	OPERATION PLAN/ORDER

This often caused an inefficient allocation of ADA resources. For the best allocation of resources, planners must consider the type aircraft most likely to attack the asset, the most probable avenue of approach, the most likely threat attack tactics, the probable ordnance, and the most likely ordnance release points. If such intelligence is available, it permits the planning of a specific air defense designed to counter the most likely air threat to each defended asset. Such threat analysis is critical to the proper and economical allocation of Hawk units.

Terrain

An analysis of terrain is also critical in the initial defense planning phase. All aspects of the topography of the battlefield must be considered: trafficability, relief, vegetation, and obstacles. Planners must identify key terrain — terrain upon which the mission is dependent and which would give either side an advantage if seized or held. Dominant terrain surrounding the assets to be protected which provides identification points for the enemy to fix the target may be key terrain. It is particularly critical for Hawk units operating in the forward area of the battlefield to identify low-level avenues of approach into the divisional and corps rear areas. In situations in which specific low-level avenues of approach are identified, the Hawk commander may choose to locate his AFPs so that his unit's firepower is concentrated along the avenue of approach. In the terrain analysis the planner must identify both friendly and enemy observation areas and fields of fire. Terrain that affords protection as well as line-of-sight observations is critical to the positioning of Hawk AFPs. Further consideration must be given to cover and concealment provided by terrain, the impact of weather on terrain, the impact of terrain on communications, and the degree of visibility afforded by terrain. Units capable of dispersing and blending into the terrain to take advantage of natural concealment may not require active air defense protection. This permits Hawk AFPs to protect units without effective passive air defense means. Engineer topographic units provide terrain data and maps directly to operational elements of the maneuver force, weapons systems, and support elements. Topographic units provide expedient topographic products to meet the specialized needs of command, maneuver, weapons, and support systems. Topographic units can also provide a survey control network to ensure weapon systems have accurate orienting and siting data for effective target engagements.

Troops

This factor in the analysis phase of planning is an evaluation of troops available. For the Hawk commander, this is a total assessment of his combat power. He considers such diverse factors as personnel strength, disposition of equipment, state of training, maintenance and supply readiness, adequacy of combat support and combat service support, troop morale, and the quality of subordinate leaders.

Effective analysis of available ADA resources also requires coordination among all air defense commanders in a given area. Planners must consider the coverage afforded by adjacent ADA units. It could be a misallocation of ADA resources to dedicate Hawk AFPs to low-altitude coverage of a river valley when a Patriot unit has dedicated some of its fires to that specific avenue of approach. In making the coordination to determine adjacent ADA unit coverage, the commander must also determine the impact of moves by adjacent units and must establish a means of receiving notification should the adjacent unit coverage change for any reason.

When analyzing combat power, commanders must consider actions to keep or make the maximum number of AFPs operational. Units must minimize the effects of limited battle damage or equipment malfunction. For example, a commander would not assign coverage of a low-altitude avenue of approach to an AFP with a nonoperational CWAR, even though the AFP retains a fire capability.

Time

It takes time to conduct reconnaissance, movement, and logistic support. It takes time to war-game various courses of action. Planners may eliminate some courses of action because they cannot be executed within the time constraints of the mission. Experience and training will help reduce the planning time needed.

The commander considers the factors of METT-T, weighs them against the list of AD priorities, then develops an initial allocation of

ADA resources to protect those priorities. Beginning with the highest priority asset, he decides how many of each type of ADA resource to allocate to the protection of each asset. Because the Hawk battalion fights most effectively as a single integrated unit, the commander reviews the list of assets and their geographical relationship to determine how many assets the unit can adequately defend.

The ADA commander presents the list of ADA priorities and the AD resources he recommends for their defense to the supported force commander for approval. The force commander may approve these recommendations, reduce the list to increase the air defense protection for selected assets, or expand the list to increase the number of assets afforded ADA coverage. He must understand, however, that expansion reduces the effectiveness of the overall defense. During this phase of the defense planning process the Hawk commander plays a critical role. He must provide the supported commander with the advice that can make the difference between adequate and inadequate air defense protection. Difficult choices will have to be made. Some assets will have to depend upon passive air defense measures and nondedicated air defense capabilities for their protection, so that the Hawk battalion may effectively defend those assets highest on the priority list. Finally, the list of those assets which the supported force commander approves for active air defense becomes the air defense priorities list in the ADA annex to the operations order.

DEFENSE DESIGN PHASE

After the decision has been made concerning the number and type of ADA resources to be allocated to each priority, the ADA commander begins the second phase of the defense planning process — defense design. Hawk defense design is the process of considering AD employment principles, ADA employment guidelines, and Hawk defense design requirements in conjunction with the weapon system capabilities to determine the positions of individual AFPs. ADA commanders at all levels must design defenses to accomplish the air defense mission within the specific tactical situation. Commanders use principles, guidelines, and requirements to increase the effectiveness of air defenses and to enhance Hawk survivability. However, protection cannot simply meet principles, guidelines, or requirements. Providing an air defense that meets all the principles and guidelines is pointless if threat aircraft can release their ordnance and destroy the protected asset before the air defense can destroy them. The focus for any operation must be the protection of the asset or area. The Hawk commander applies principles, guidelines, and requirements to defense design with this focus in mind. (S) FM 44-1A provides classified data on Hawk system capabilities and planning data. It is a standard reference for designing defenses.

AD Employment Principles

Four AD employment principles provide the doctrinal basis for ADA defense design and underlie the effective employment of Hawk on the air-land battlefield. The judicious application of these principles to fit the needs of the tactical situation can enhance the effectiveness of the defense and increase the survivability of Hawk. These principles are mass, mix, mobility, and integration.

Mass. Mass is the concentration of combat power. Massing ADA combat power is the allocation of a sufficient number of fire units to the protection of priority assets or areas to adequately protect them against the air threat. To achieve mass, Hawk planners should deploy their systems in noless than battalion strength (six fire units) for a point defense or for a 40 x 40 kilometer area defense. Failure to adhere to the principle of mass subjects the individual fire units to the risk of being defeated piecemeal by the air threat and consequently risks the destruction of the protected assets.

Mix. Mix of complementary weapon systems goes hand in hand with the principle of mass. By employing a variety of systems in sufficient mass, AD complicates the problem of the attacker. The attacker must consider the different characteristics of each weapon system in the formulation and execution of his offensive strategy. Ideally, the ADA brigade coordinates Hawk, Patriot, and SHORAD ADA units in composite defenses to ensure the best mix of weapon systems.

Mobility. Mobility is the third principle. To apply the principles of mass and mix in the dynamic environment of the air-land battlefield, ADA systems must be highly mobile. Frequent changes in unit positions will defeat the

enemy's reconnaissance cycle and enhance the ability of Hawk units to survive suppression attacks. While movement is dependent upon the tactical situation, Hawk units in the forward area should move at least twice a day because of the lethal ground and air suppression threat. AFPs that must compromise their locations by continuous operation of acquisition and tracking radars may have to move more often than twice a day. The Hawk battalion FDC and Hawk AFPs in the rear area may move less frequently, but normally they should move at least once a day for survivability. While the tactical situation may dictate otherwise, ideally no more than two fire units should be moving at any one time (one when the FDC is also moving). Whenever possible, units should move at night or during periods of reduced visibility. Pre-planned positions should be incorporated into the supported commander's plans to ensure that all needed support is available.

Integration. Integration is the close coordination of effort and unity of action which maximizes the operational effectiveness of ADA protection while minimizing mutual interference among operating forces. The Hawk battalion must fully integrate into the force commander's scheme of maneuver and into the battle for air superiority as well. Effective integrated C^2 procedures function through liaison elements and communications links with higher and adjacent headquarters. Integration must also encompass defense design, roles, and missions of all participating ADA units.

ADA Employment Guidelines

In conjunction with the AD employment principles, the six ADA employment guidelines are the desirable characteristics of an ***ideal*** air defense. They are aids to Hawk commanders for positioning individual AFPs when designing a specific defense. The commander incorporates the employment guidelines into his planning according to the tactical situation and the availability of AD assets. Applying all of the guidelines in any tactical situation is seldom possible. The size and shape of the asset, the number of AFPs available, the adequacy of terrain for coverage and emplacement, and numerous other tactical considerations limit the commander's ability to satisfy all the guidelines equally. Planners must not design defenses which focus more upon meeting guidelines than upon providing adequate coverage. If a defense designer builds a defense to optimize balance and mutual support without regard to other factors, the defense design may position AFPs too close to the asset to provide protection from realistic ordnance delivery methods.

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 to protect the ground operation from air attack.

The ADA employment guidelines are balanced fires, weighted coverage, early engagement, defense in depth, mutual support, and overlapping fires. These guidelines are described in the following paragraphs.

Balanced fires. Position and orient AFPs to provide approximately equal firepower in all directions. It will be difficult to accomplish this guideline with less than a full Hawk battalion and still meet other employment guidelines. Balanced fires are employed to counter an omnidirectional threat.

Weighted coverage. Position and orient AFPs so that they combine and concentrate their firepower toward the most likely air avenues of approach. The defense planner will employ weighted coverage when he can identify probable enemy attack routes or when he has insufficient assets to provide balanced fires.

Early engagement. Position AFPs so that they are capable of engaging aircraft prior to ordnance release. Intelligence estimates of threat capabilities and techniques and the expected altitude of attack will influence how far from an asset or boundary the Hawk defense designer can position units and still achieve early engagement.

Defense in depth. Position mutually supporting AFPs to absorb and progressively weaken the attack. Defense in depth subjects the attacking aircraft to an ever increasing volume of fire as it nears the protected asset. The designer achieves defense in depth by deploying ADA forces in mutually supporting echelons and by adhering to all other employment guidelines. Integration and coordination of all air defense weapons used in the defense maximizes defense

in depth. Defense in depth will also significantly reduce the effects of aircraft maneuvers on the ability of AFPs to engage.

Mutual support. Position units so that Hawk AFPs can fire into the dead zones of adjacent AFPs. Mutual support maybe provided by or for other ADA units. Mutual support offers the greatest degree of survivability to the defense as a whole. The distance between AFPs for mutual support varies depending on speed and altitude of the threat and upon terrain masking of Hawk radars. Twenty kilometers between Hawk AFPs is a good planning distance, but against low-altitude targets the actual range for mutual support will depend upon the terrain.

Overlapping fires. Position and orient AFPs so that their engagement zones overlap. In many instances, because of terrain limitations, the size of the defended area, or a scarcity of available AFPs, it may not be possible to achieve mutual support. In those instances the defense planner should plan for overlapping fires. Additionally, overlapping fires help the AN/TSQ-73 to provide ranging data to fire units being jammed. For planning purposes, 40 kilometers between AFPs is a good distance, but as with mutual support, the actual distance will be determined by radar coverage and threat capabilities.

Defense Design Requirements

The third set of factors the Hawk commander must consider in his defense design is the specific ***defense design requirements.*** These factors are based on a consideration of the elements of METT-T ***in conjunction with the specific weapon system characteristics.*** Defense design requirements are supported force scheme of maneuver, supported force AD priorities, threat, system tactical and technical requirements, terrain and weather considerations, and allocation of available firepower.

Supported force scheme of maneuver. A scheme of maneuver is a battle plan. The supported force scheme of maneuver is the tactical battle plan of the supported force.

Supported force AD priorities. Supported force AD priorities are those assets, selected by the supported force commander, which must be protected in priority by the supporting Hawk unit. Development of the priorities is contained in Section II.

Threat. By using characteristics of the enemy, determine the appropriate ADA systems to protect the specific asset and design the most effective protection for that asset. Threat characteristics include enemy location and strength, type of enemy aircraft and ordnance (including the capabilities and limitations thereof), past enemy attack patterns, and enemy doctrine.

System tactical and technical considerations. Certain requirements for defense design are based upon the following capabilities and functions of the equipment:

•Line of sight. The AFPs need line of sight, directly or through relay units, to the battalion FDC to permit use of the UHF multichannel communications system. The integration of the AFPs into the C^2 structure is vital to maximize the capabilities of the Hawk system. Each Hawk battalion has organic assets to relay UHF links from its AFPs to the battalion FDC.

•Emission control. Strict control of radar emissions must be standard procedure for Hawk units. EMCON procedures and modes of operation are discussed in Section III.

•Range denial ECM at AFPs. During daylight, the VGTR can be used by all AFPs to visually range an aircraft which is using ECM to deny radar ranging information, However, during hours of darkness or when the VGTR is inoperable, TCOs may be able to obtain range cueing from the AN/TSQ-73. To request cueing, depress the POINTER INITIATE switch with the TCC tracking symbol on the azimuth of the jammer. TDs at the FDC should then check for intersecting jam strobes along the azimuth of the jammer. Range can be provided to the requesting AFP in the form of a RAMIT or pointer. This requires good, reliable communications (see Chapter 7).

•Proximity to the FEBA, FLOT, or the LD/LC. When determining locations for Hawk AFPs defense planners must, based upon the type of operation to be conducted, consider the FEBA (defense only), FLOT (offense and defense), and LD/LC (offense only). The defense designer's intent must be to ensure that radiating Hawk units are not positioned within range of enemy cannon artillery and to provide reaction time to adjust to changes in the FEBA or FLOT.

•System dead zone. The Hawk system is not capable of engaging aircraft which are within a specific range of the AFP (see (S) FM 44-1A). The defense designer must consider this system dead zone in determining mutual support distance and in employing organic Stinger crews.

•Maximum slope for emplacement. Major items of the Hawk system cannot be emplaced on slopes greater than 10°. Hawk RSOPs consider the slope of the terrain when selecting sites for equipment.

•Terrain masking. In selecting positions for AFPs, the Hawk commander must consider the effect of local terrain features on his unit's ability to engage aircraft. Radar coverage depends on line of sight between the radar and the aircraft. Although current radar systems are capable of eliminating the appearance of clutter resulting from terrain masking, radar systems will not detect aircraft which are physically masked by terrain. Radar coverage diagrams must be prepared and analyzed to select the best positions, to determine the limitations of each fire unit's coverage, and to ensure that mutual support or overlapping fires exist. (See FM 44-90-1, Appendix B).

•Firmness of ground. Hawk positions must have a firm ground surface to support the major equipment items of the system. All radars and fire control vans of the Hawk system must be level for proper operation. Positions with soft surfaces will require frequent correction and realignment of equipment. Entrances and exits for positions must be firm enough to support movement of heavy equipment.

Terrain and weather considerations. Hawk defense planners may use the key terrain identified in the supported force's operations plan to begin analyzing terrain for suitability as Hawk positions. Planners must consider that during swift movement maneuver forces may occupy the key terrain. Emplacing Hawk on certain key terrain may result in interference with the supported force's plan, and will therefore require careful coordination.

Weather will also have a significant impact on a commander's choice of positions. Areas which are marginally firm in dry weather may be unable to support equipment or allow easy access to the position in rain or snow.

Allocation of available fire units. Allocation of Hawk AFPs must comply with the force commander's priorities. The defense planner must use all ADA assets and consider OR rates. Never hold ADA units in reserve. The need for mass, coupled with the limited number of AFPs available, requires employment of all resources at all times. Hawk commanders must ensure that the maximum number of AFPs is available for combat. If AFPs are nonoperational, the battalion commander may direct the exchange of equipment between units or request the transfer of the necessary end items from operational readiness float assets (see Chapter 9).

Also consider the operational status of each AFP in the design of air defense protection. It would not be practical to position an AFP with a nonoperational CWAR (hence, no low-altitude acquisition capability) to cover a critical, low-altitude avenue of approach.

Commanders must also consider the effect of the operational readiness posture or profile in allocating specific numbers of AFPs to defenses. If the commander determines that a specific operation requires six AFPs, and if the readiness posture of the available AFPs is poor, the commander may have to allocate other AFPs to that avenue of approach or request help from other sources.

EVALUATION PHASE

Regardless of the tactical situation or the mission of the supported unit, the Hawk commander who conducts the analysis and defense design phases must plan alternatives for providing ADA support. It is his responsibility to evaluate the alternatives and to select the plan that provides the most effective, flexible air defense protection possible to the supported commander. This implies that no single plan will provide the degree of support desired by the force commander, and that no single plan can adequately protect each and every one of the designated AD priorities. The Hawk commander must evaluate each plan for its performance of the ADA mission — retain freedom of maneuver, protect C^2I, sustain the battle, and kill enemy air the first time. In that light, the Hawk commander must select the best plan.

The defense designer must consider the degree of air defense protection provided by each plan against the expected air threat. This is best accomplished by preparing a detailed firepower analysis for each alternative defense design, based on the capabilities of the Hawk weapon system and the projected threat bomb release lines.

The Hawk defense designer must evaluate the initial design of the defense for its ability to accomplish its assigned mission. This process requires the use of Hawk burst locators. Hawk burst locators are included in (S)FM 44-1A. Select the one that most closely matches threat conditions.

Following firepower analysis procedures, the defense designer reevaluates protection to determine if adjustments are required. The reevaluation may result in complete redesign of the defense or in only minor adjustments to construct the best possible defense. If major changes are needed, the entire design process must be started over from the design phase. The planner must evaluate and adjust the new design until the best possible defense has been designed. The air defense designer operates under two powerful constraints — the time available and the limited number of air defense weapons available. The best possible protection in the time allowed and with the material available is the designer's goal.

Detailed information on the preparation and use of radar coverage diagrams and Hawk burst locators is found in (S)FM 44-IA, FM 44-90-1, and Appendix A of this manual. Information on Hawk system design characteristics is also found in these references.

IMPLEMENTATION PHASE

After the commander decides on the specific protection for the AD priorities, he briefs the supported commander on the capabilities and limitations of the selected defense. If the Hawk commander needs additional resources, he identifies the need and forwards appropriate requests to the next higher commander.

The Hawk commander then prepares essential operations plans, and annexes to plans, and disseminates this information to his subordinates. Each subordinate, in turn, follows the eight troop-leading steps to respond to the mission. These troop-leading steps are simply a more detailed and specific application of the procedure which resulted in the establishment of AD priorities and established the initial allocation of ADA resources to the operation. The steps (modified as necessary to fit the level of command and the tactical situation) are as follows:

- •Receive the mission.
- •Issue the warning order.
- •Make a tentative plan to accomplish the mission.
- •Initiate the necessary movement sequence.
- •Reconnoiter.
- •Complete the plan.
- •Issue orders.
- •Supervise and refine.

Section III. Hawk Employment

BATTALION OPERATIONS

Successful employment of Hawk on the air-land battlefield requires a thorough understanding of defense design, system capabilities, EMCON, mobility, and tactical deception. This section discusses design planning factors, techniques for the use of emission control, survivability, and tactics for deceiving the enemy about the deployment and capabilities of the Hawk battalion.

HAWK BATTALION OPERATIONS

Though it normally consists of six (corps) or eight (theater) AFPs which are independent fire units, the Hawk battalion normally fights as a battalion. Defense designs seeking to make the best use of the ADA employment guidelines function best when the battalion fights as an integrated unit with one mission. Limited resources force planners to prioritize the use of Hawk. Suballocation of missions, command relationships, and support relationships to AFPs within the battalion is tactically unsound and should be avoided because it ignores the principal of mass and limits the usefulness of the ADA employment guidelines as they apply to the area and point defenses described in this section. Additionally, C^2 becomes unwieldy if Hawk is allocated in less than battalion strength.

LIMITED TRANSMISSIONS

Control of radio frequency emissions is indispensable to the survival of the Hawk battalion. Threat direction finding, integrated fire support, and ARM capabilities make it vital that Hawk units radiate no more than absolutely necessary.

Through the use of ADLs for acquisition, Hawk AFPs are able to eliminate all radar transmissions prior to engagement of the target. This procedure, called EMCON, involves three modes of operation:

- Passive — An AFP which is emplaced and is ready to fire, but has never radiated from its present position, is operating in the passive mode.
- Silent — An AFP which has been ordered to radiate to engage or acquire targets, but has subsequently returned its radars to a non-radiating condition, is in the silent mode.
- Active — An AFP which is radiating is in the active mode.

AREA DEFENSES

Typically, Hawk battalions establish area defenses in the tactical operations area. Against the Phase I-type attacks discussed in Chapter 2, the mission of Hawk battalions is to engage and destroy enemy aircraft attempting to attack deep into rear areas. Against Phase II-type attacks, the mission of the Hawk battalion changes to protection of units in contact.

In large area defenses, such as those currently deployed in NATO, a linear or belt configuration may be used to cover large areas. In small defenses, or after some attrition of ADA units has occurred, a cluster of Hawk units is appropriate. The cluster defense derives from the area or belt defense. It allows gaps in coverage, but it continues to protect the most critical assets. Patriot or Air Force air defense assets fill any gaps in Hawk coverage.

BROAD COVERAGE OF AREAS

The best area defense would be multibattalion in size, provide continuous all-altitude coverage both laterally and in depth through the entire area to be defended, and be composite (Hawk, Patriot, SHORAD, Air Force) in nature. The protected area must be sufficiently limited or there will not be enough ADA assets, and certainly not enough Hawk, to provide such coverage.

BELTS AND CLUSTERS

At times, especially after heavy engagements when missile supplies may be low or when reconstitution of AFPs is in progress, overlapping fires of AFPs may not be available to provide even lateral coverage of the area. At such times, Hawk coverage should be clustered along avenues of approach. Brigade planners should attempt to fill gaps between clusters with overlapping Patriot fires and supporting SHORAD fires.

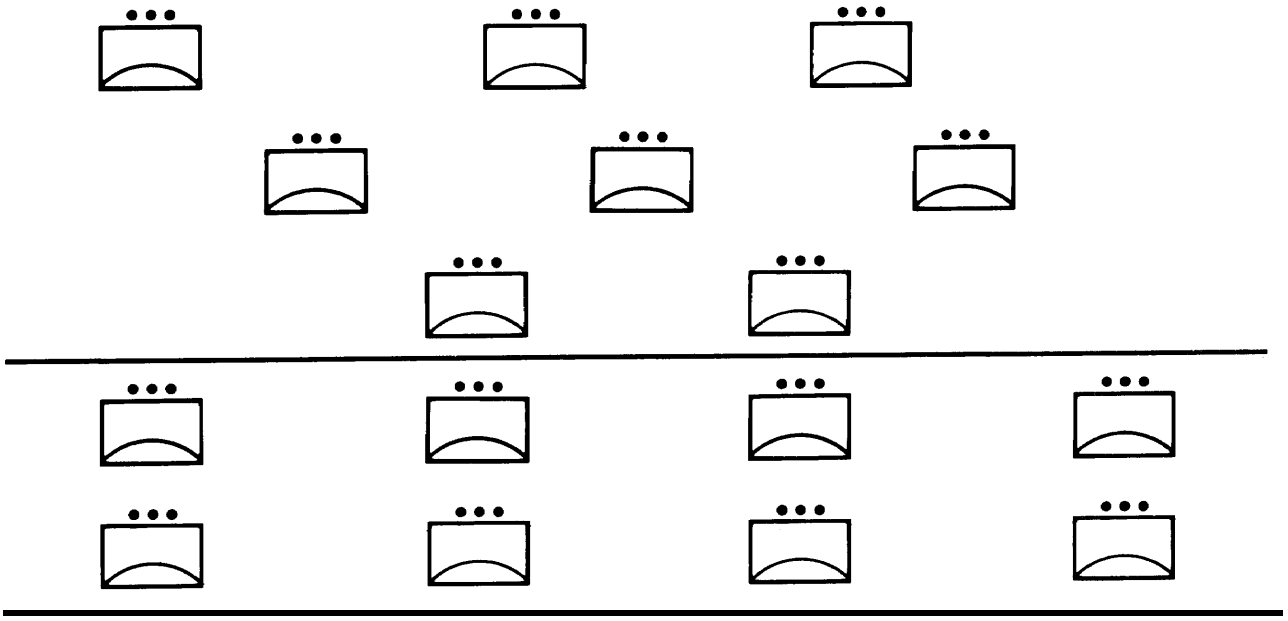
A cluster defense can be compared to a division conducting defensive operations in its assigned sector. The basis for deployment is an analysis of the factors of METT-T. Battalions concentrate their fires on avenues of approach. For Hawk units, the keys to success lie in concentrating Hawk fires on low-level avenues of approach, coordinating Patriot and SHORAD fires, and skillfully deceiving the enemy about

Hawk deployment. More on tactical deception is found in Section IV of this chapter.

EMPLOYMENT GUIDELINES FOR AREA DEFENSES

Battalions deployed in an area defense (including belt or cluster defenses) should always position AFPs to achieve mutual support, early engagement, and weighted coverage. Defense in depth is also desirable if there are enough AFPs available to support it. To the area defense, balanced fires are less important than weighted coverage along avenues of approach. When covering a very large area, or when the number of AFPs is limited, overlapping fires may substitute for mutual support, but the Hawk commander must understand and accept the heightened risk this poses for the Hawk battalion. The following illustration depicts various positioning possibilities which achieve all of the ADA guidelines mentioned above in a multi-battalion area defense. (S)FM 44-l-A explains in greater detail the results of terrain and separation distance on the effectiveness of the defense. These are examples which do not take terrain into account. Actual deployments will be affected by terrain.

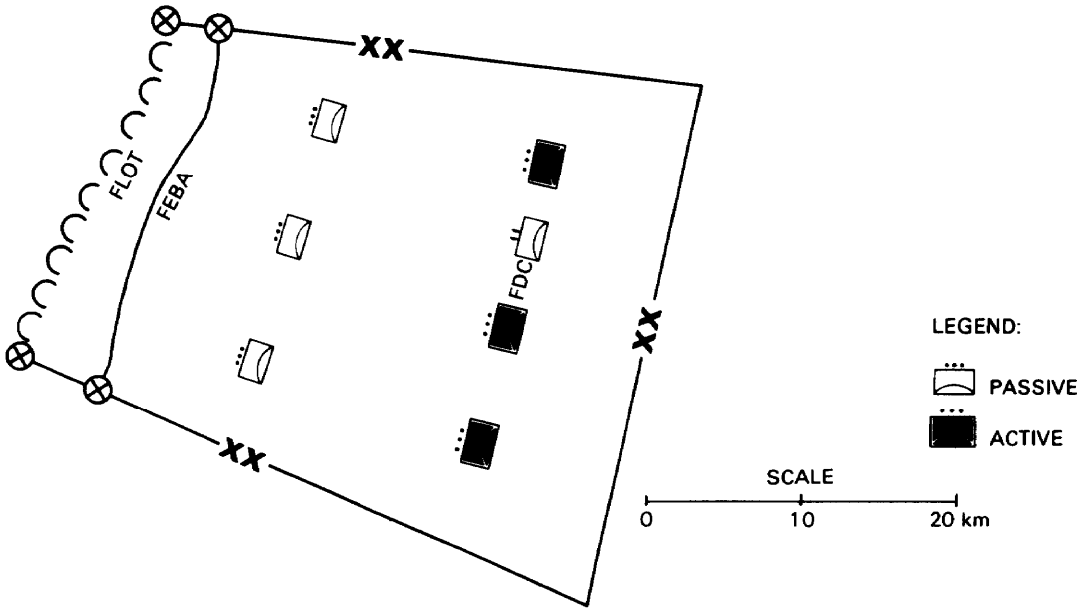
TWO TYPES OF AFP DEPLOYMENT — AREA DEFENSE



The illustration on page 5-20 shows a corps Hawk battalion providing area air defense to a division defending in sector. Note that passive/silent AFPs are positioned about 10 kilometers behind the FEBA, while active AFPs are positioned out of medium artillery range at about 25 kilometers from the FEBA.

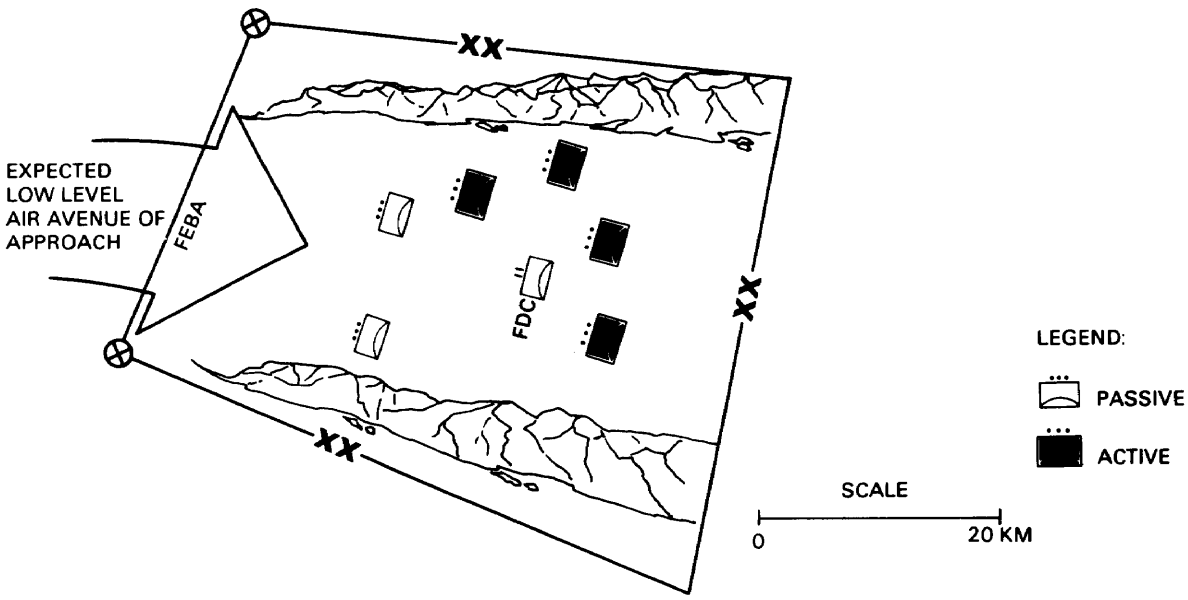
The ADA brigade organic to the heavy corps, as well as the ADA brigade organic to the light or contingency corps, includes one Hawk battalion. The type of corps, the tactical situation, the number of systems available, and the mission will influence the employment of weapon systems. This influence will extend to positioning, priorities, movement, and security requirements.

CORPS HAWK AREA DEFENSE OF DIVISION DEFENDING IN SECTOR



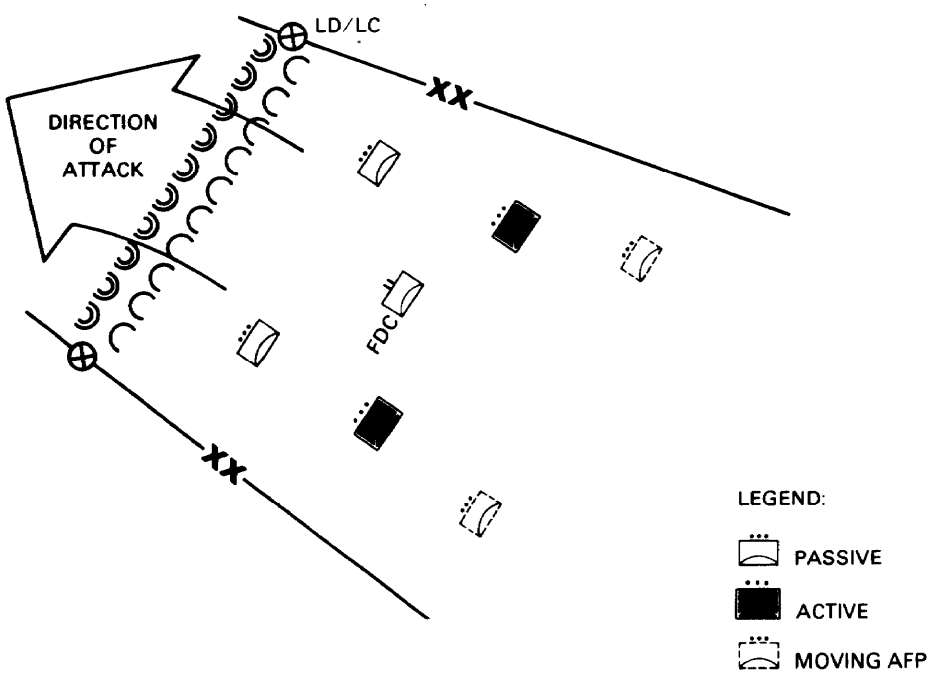
The illustration below depicts a corps Hawk battalion clustered along a low-altitude avenue of approach into the area of a division defending in sector. Note that forward AFPs are passive/silent and that battalion fires are concentrated against the low-level threat, creating a kill zone.

CLUSTER DEFENSE OF A DIVISION DEFENDING IN SECTOR



Hawk battalions involved in area defenses must be prepared to move when the asset they are protecting moves. The following illustration depicts a corps Hawk battalion protecting a division in the attack. Note that only one-third of the battalion is moving. Passive/silent AFPs forward can augment the fires of the active AFPs when the intensity of the air battle increases.

CORPS HAWK BATTALION AREA DEFENSE OF A DIVISION IN ATTACK



Area defense design follows a number of general planning guidelines. These area defense design factors are shown in the illustration below.

AREA DEFENSE DESIGN PLANNING FACTORS

MAXIMUM SURVEILLANCE RANGE	— SEE (S)FM 44-1A
MAXIMUM INTERCEPT RANGE	— SEE (S)FM 44-1A
DISTANCE BEHIND LD/LC OR FEBA	
ACTIVE AFP	— 25 KM
SILENT/PASSIVE AFP	— 10 KM
SEPARATION DISTANCE BETWEEN AFPS	— 15-20 KM
SEPARATION DISTANCE BETWEEN ADJACENT BATTALIONS	— 30-40 KM

POINT DEFENSES

Typically, Hawk battalions establish point defenses in the rear operations area. Theater Hawk battalions would take up positions in the communications zone or in the corps rear area. Typical assets considered for Hawk protection include long-range delivery systems (both aircraft and missile), ports, logistics complexes, C^2 facilities, and reserve forces.

TYPES OF POINT DEFENSE

No fewer than a battalion of Hawk AFPs should be deployed in a point defense. However, the range of Hawk will normally make it possible to provide incidental protection to a number of other assets simply because they are close to the defended asset. There are two types of point defense: weighted point defense and balanced point defense.

Weighted Point Defense

The weighted point defense concentrates available Hawk fires along an expected air avenue of approach. It should be used only when the probability is very high that air attack will come from a particular direction, and when there are sufficient AFPs able to redirect fires should the attack come from an unexpected direction. Should the situation lack either of these conditions, the balanced point defense should be used.

Balanced Point Defense

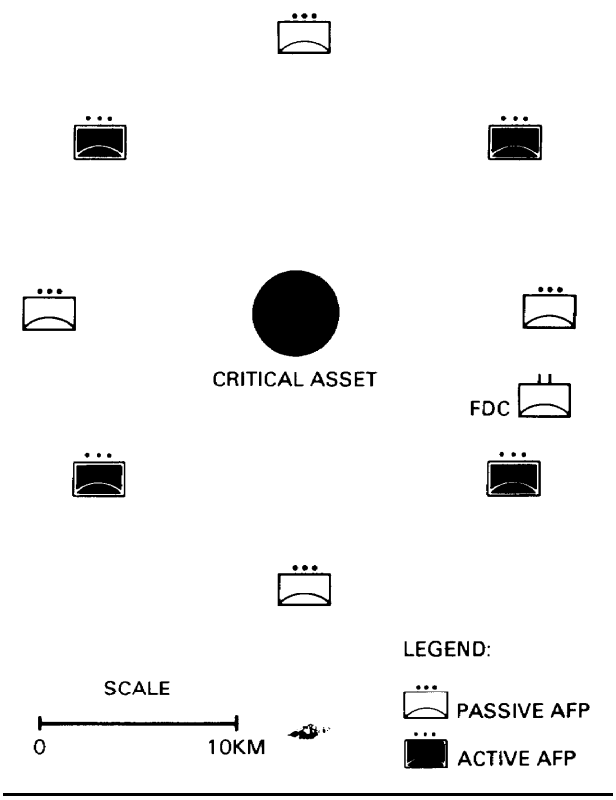
The balanced point defense distributes Hawk fires in all directions around the protected asset. It is the norm for Hawk battalions. In either type point defense, the defense designer should position Hawk AFPs no less than ten kilometers from the asset(s) they protect. The defense designer should establish a kill zone for Hawk to compensate for Hawk's comparatively low rate of fire. The kill zone is a refinement of the ADA employment guideline of mutual support. It is an area, most likely along the expected avenue of approach, in which all Hawk AFPs in the defense can engage targets. Although no more than one Hawk AFP should engage a single aircraft at any one time, the kill zone assures that every target in the zone can be engaged by at least one AFP. The size of the kill zone will depend upon the distance between AFPs and the ability of most or all AFPs to engage the same targets. Establishing a kill zone places additional demands upon the FDC to prevent simultaneous engagements which would waste precious assets.

If the Hawk battalion is involved in air base protection, close coordination between the air base operations center and the battalion FDC is necessary. This coordination should preclude the possibility of fratricide and ensure that the effectiveness of the Hawk is not limited by unnecessarily restrictive C^2 procedures.

DEPLOYMENT

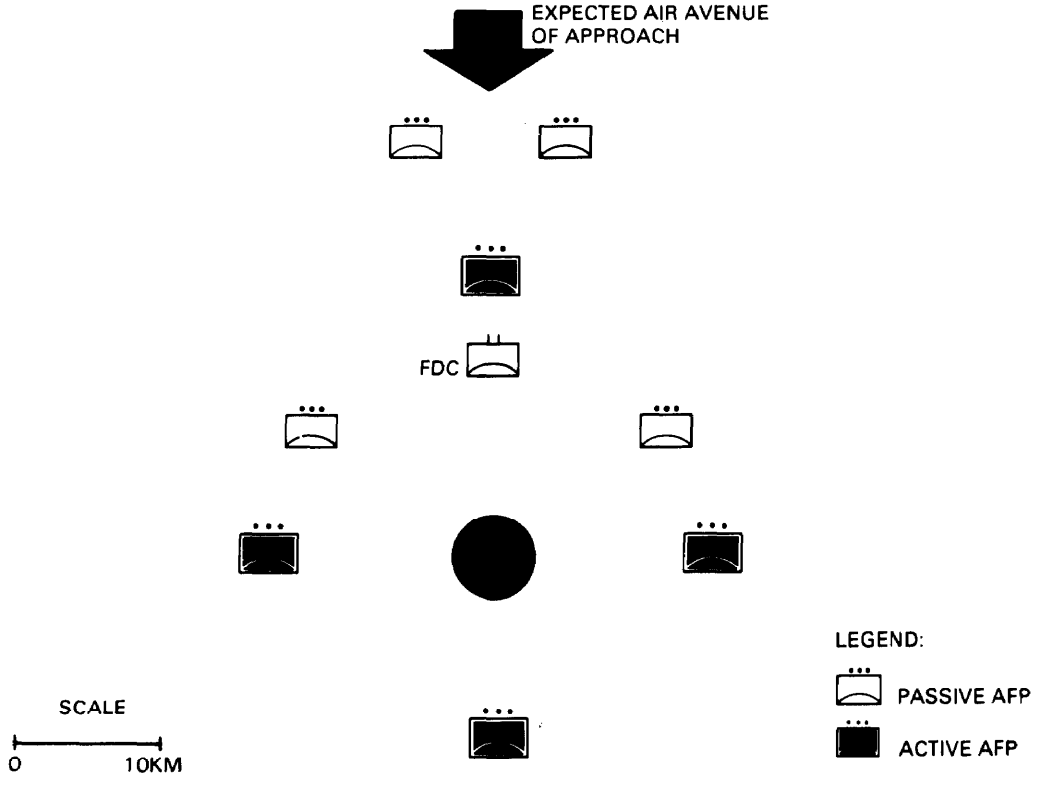
AFP deployment varies depending upon whether the point defense is weighted or balanced. In either type of defense mutual support, defense in depth, and early engagement are desirable characteristics of the defense. In the balanced point defense, all AFPs form a perimeter no less than ten kilometers from the defended asset. Note in the following illustration that the kill zone, or the area in which Hawk fires are most intense, is directly over the asset.

THEATER HAWK BATTALION IN BALANCED POINT DEFENSE



With the weighted point defense, the defense is concentrated toward the enemy by placing AFPs along the axis of the approach. Note in the illustration below that some AFPs may be positioned as far as 20 to 25 kilometers from the defended asset. Forward AFPs may be passive or silent and remain ready to enter the air battle when needed. Also note that the kill zone for this defense is located along the axis of approach and not directly above the asset. This makes the weighted point defense a good choice for air base protection because it minimizes Hawk use of the airspace over the base.

THEATER HAWK BATTALION IN WEIGHTED POINT DEFENSE



HAWK AND PATRIOT INTEROPERABILITY

Air defense protection of theater army and corps assets usually requires composite defenses. By taking advantage of each system's capabilities, the defense designer emphasizes strengths and compensates for limitations. For interoperability in the same defense, HIMAD weapon systems must link through C^3 channels.

IMPLEMENTATION

Full interoperability among ADA systems requires a number of changes in hardware and software. The changes are being implemented in steps or phases.

Initial Deployment – Brigade Level

Software modifications to the AN/TSQ-73 which incorporate Patriot weapons assignment and display of Patriot detected targets in the AN/TSQ-73 have been designed and fielded. Interoperability between Patriot and Hawk battalions can occur only through the brigade level AN/TSQ-73 as long as it remains in operation. If the brigade AN/TSQ-73 goes out of action,

the brigade communications links can be assumed by the AN/TSQ-73 of the Hawk battalion designated as the master battalion.

Patriot/Hawk, Battalion/Brigade, and Joint Air Defense

Patriot and Hawk interoperability is a requirement for effective air defense. Direct Patriot/Hawk battalion interfaces and interoperability with joint air defense forces will be possible with the embedding of the JTIDS communications in the AN/TSQ-73 and the Patriot ICC.

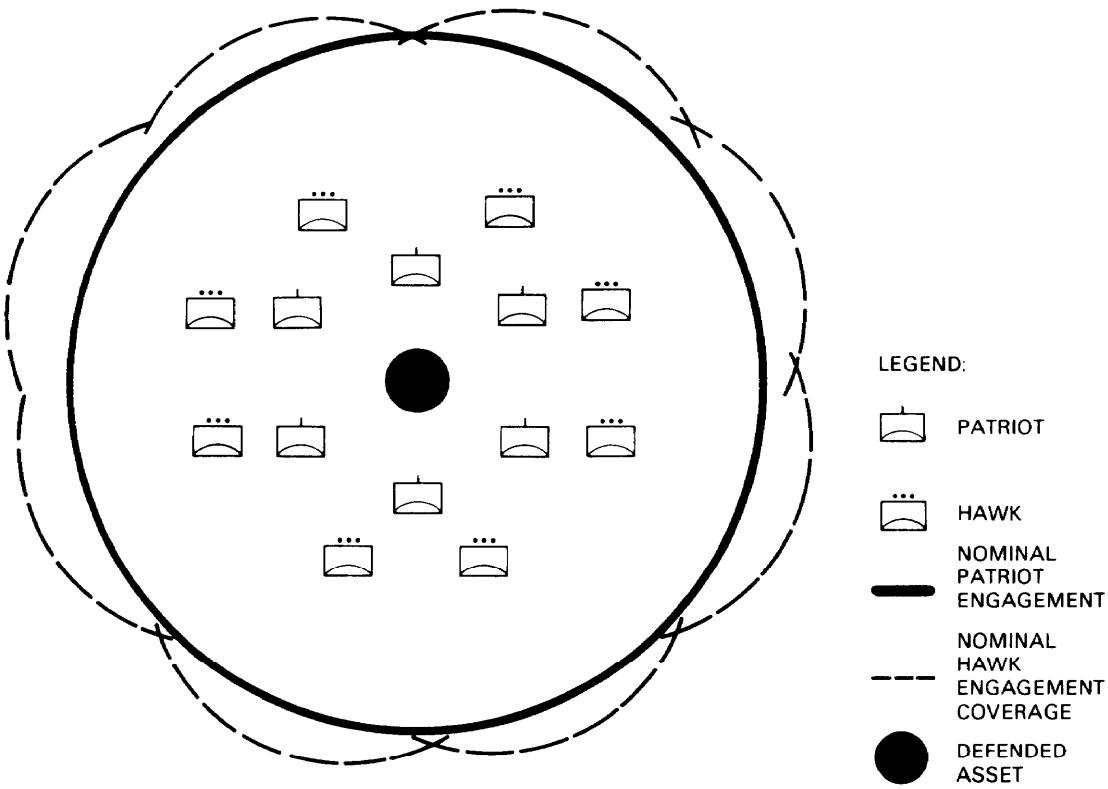
Additional Steps

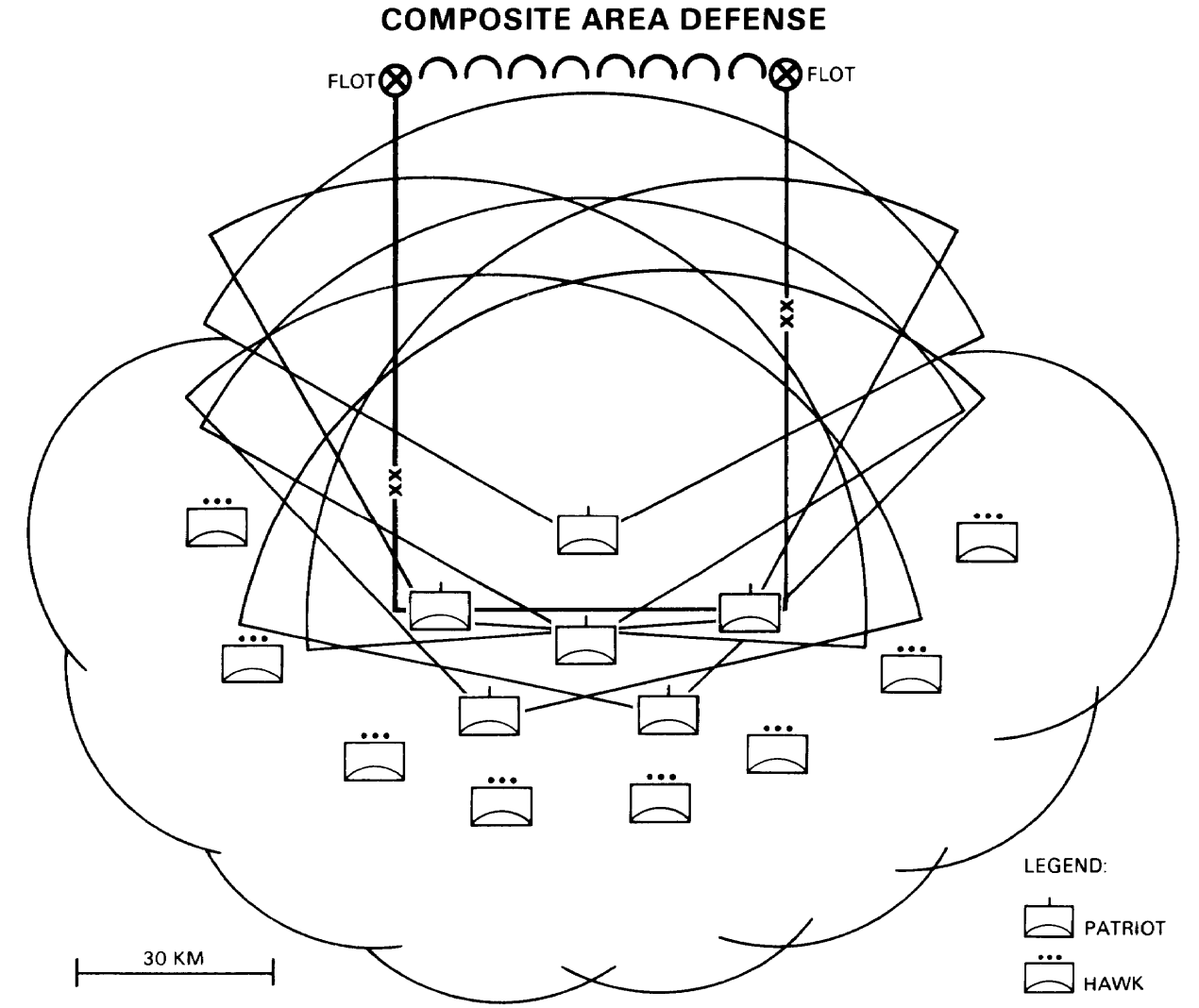
Follow-on steps will permit interoperability between AN/TSQ-73s and forward area air defense C^2. These steps will eventually permit interoperability among Hawk AFPs and Patriot ICCs even in the absence of the AN/TSQ-73.

COMPOSITE DEFENSES

When Hawk and Patriot are employed together within the forward area as shown in the illustrations below and on page 5-25, Hawk is employed according to the needs of the defense. For example, Hawk could extend very-low- to low-altitude area defense forward into brigade zones, especially when SHORAD assets are limited. If SHORAD protection is adequate but defenses to the flanks and rearward of Patriot coverage are questionable, Hawk should provide defense in depth, mutual support, and rear and flank coverage, and should fill in lateral very-low- to low-altitude coverage. This maximizes forward coverage that Patriot provides. In the rear operations area, Hawk is sited along low-altitude avenues of approach and in positions which will provide mutual support to Patriot units.

COMPOSITE BALANCED POINT DEFENSE





Section IV. Security

OPERATIONS SECURITY

To successfully accomplish its mission on the air-land battlefield, the Hawk battalion must deny the enemy information about its activities, plans, locations, capabilities, and operations until it is too late for enemy forces to effectively react. Hawk units are "thin-skinned." Their survivability depends upon the coordinated application of a wide range of techniques and procedures designed to preserve their OPSEC. OPSEC is common sense applied systematically to the unit's situation and mission to provide force security. To achieve that security, OPSEC must be a totally integrated effort of Hawk commanders, their staffs, subordinate units, and individuals.

For Hawk units, OPSEC basically involves four kinds of actions:

•Countersurveillance — prevents the enemy from learning the true status of friendly activities and operations.

•Countermeasures — eliminates or reduces the enemy intelligence and electronic warfare threat to US Army activities.

•Tactical deception — creates a false picture of friendly activities and operations.

•Countersuppression — acts to directly defend or enhance the defense capability of the unit.

Measures taken to prevent discovery of the location of the Hawk battalion and its AFPs by visual, electronic, or photographic means fall into the area of countersurveillance. Contersurveillance encompasses SIGSEC, ECCM, and information security.

SIGNAL SECURITY

SIGSEC includes the actions units can take to minimize enemy interception and analysis of radar and radio signals. Categories of SIGSEC are ELSEC, COMSEC, and TEMPEST.

Electronic Security

ELSEC is the protection of transmissions by noncommunication devices from detection and interception. It includes measures such as approved operating procedures, proper siting techniques, maintenance procedures, and training programs. Radar emission control is the principal ELSEC measure and is addressed in Section II.

Communications Security

COMSEC includes measures taken to deny the enemy information from friendly communications. This includes crypto security, transmission security, emission security, physical security of COMSEC information, and measures to ensure the authenticity of communications.

Crypto security. Crypto security centers on the use and control of speech secure equipment and codes. Speech secure equipment currently consists of bulk encryption devices, such as the KG-27 used with the AN/GRC-103 UHF radio, and the VINSON family of speech secure devices.

This equipment sends out a signal which is unintelligible to receivers not having the same equipment. If the enemy has a limited SIGINT capacity, monitoring this type of secure net will probably be of lower priority than monitoring nets operating in the clear.

Secure radio nets allow easy, rapid communications and are not vulnerable to certain forms of ECM. To maintain secure nets, it is essential to use proper encryption codes and authenticators. Codes are changed regularly as prescribed.

Transmission security. When using directional antennas (dipole, flyswatter, dish), units should position antennas to keep transmitters from radiating directly toward the enemy. This will decrease vulnerability to ESM and ECM. Whenever possible, units should emplace equipment so that terrain will mask transmitters from the enemy. This is especially important for Hawk units using organic UHF directional radios.

Emission security. Brevity is one of the keys to COMSEC. Unless a need exists to transmit, radios should remain silent. Necessary AM and FM transmissions should be kept short — 8 to 10 seconds -- RATT messages should be concise. As much reporting as is tactically feasible should be transmitted via written reports and courier. The remainder should be channeled into the UHF system because that system normally operates 24 hours a day.

Physical security of COMSEC information. COMSEC materials must be very closely controlled. Limited dissemination is very important. Generally, radio operators should have no more than two or three changes of secure codes. If operations need closer control, the new codes should be issued only on an “as needed” basis.

Physical security of radio encryption equipment is also of great importance. If a properly coded KY-57, for example, fell into enemy hands, the enemy would have access to the most sensitive unit communications. Therefore, speech secure devices must be properly guarded. They must be properly stored, accounted for, and handled much the same as are classified documents.

Authenticity of communications. When secure nets are not available, TACOPS codes

must be used. Operators must use authentication tables to prove authenticity of clear text messages. It is imperative that all radio transmissions be secured or authenticated.

TEMPEST hazards. TEMPEST addresses those SIGSEC considerations that are less obvious. For example, radios, telephones, and computers may leak identifiable signals. These are known as TEMPEST hazards. If RF shielding of radar and fire control shelters is damaged, the unit may be transmitting in directions that are unplanned. A TEMPEST hazard that may occur in crowded command posts is the collocation of secure and non-secure lines. As a general rule, to prevent coupling from one line to another, secure and non-secure lines must have at least a six-foot separation.

ELECTRONIC COUNTER-COUNTERMEASURES

ECCM protects friendly electronic emitters from enemy detection, location, and identification. ECCM, ***in this OPSEC context,*** includes antenna siting, the use of low power settings, masking and remoting radio antennas, equipment checks for radiation leakage, and proper training of personnel.

Siting

Units should attempt to emplace radar and radio antennas so that side and backlobes are absorbed or blocked. If this is not possible, they should try to orient antennas so that the side and backlobes extend parallel to or away from the line of enemy forces. This reduces the emitter's vulnerability to detection and jamming. Antennas operated remotely, at some distance from the unit, may reduce the likelihood that enemy gunners will be able to target and destroy the unit.

Power Levels

It is sometimes possible to burn through ECM by stepping up the power of the transmitter. To preserve this option, always operate on the lowest power level that will get the signal through. Low power levels will also reduce the range at which the enemy can detect radio and radar transmissions.

Antenna Selection

Radar antennas are directional by design, as are certain radio antennas. Directional radio antennas should be used whenever possible. They will channelize the signal and have the effect of boosting the radiated power in the desired direction.

INFORMATION SECURITY

Compromise of information security is the primary means used by enemy forces to collect the bulk of their intelligence. Some sources are lost documents, improperly disposed of classified waste, sensitive information passed over communication channels in the clear, and classified matters discussed in unsecured areas.

Control

The most important element of information security is document control. Not only do documents contain a wealth of information, but their compromise almost always affects more than one organization.

Considerations. Two considerations in document control are administrative control and physical security. Administrative control is the use of access rosters and classification markings. Physical security is the protection of information during storage, use, and transportation of documents.

Dissemination. Custodians should verify the clearance and the need-to-know of anyone requesting access to classified information. Custodians should extract and distribute only the minimum information necessary to the accomplishment of the mission and only to those personnel who have the required clearance and the need-to-know.

Denial. Units must prepare plans to deny their classified material to enemy forces. Denial measures range from simple evacuation to the destruction of materials. Since rapid destruction may become necessary, units should maintain documents in central storage facilities. If documents and equipment must be destroyed, use document destroyers and thermite grenades. Place document destroyers in file drawers; place thermite grenades either inside or on the outsides of containers. It is better to overuse these destruction devices than to leave classified materials for the enemy.

Field Security Procedures

Units should exercise the same care to safeguard classified material in the field as they do

in garrison. However, units should implement certain additional procedures in the field.

Storage. In most cases, regular four-drawer safes are too heavy to transport or are unavailable to units in the field. Usually, field safes or field filing cabinets are available. These containers are generally too small for the number of documents in a HIMAD unit. Additionally, field filing cabinets are not secure. Therefore, units must store documents in a continuously manned location (CP, staff operations vans).

Classified waste. All classified waste (carbons, typewriter ribbon, extra copies or superceded material) must be securely stored until it can be destroyed. Units should burn classified waste daily. (Keep the smoke signature in mind!)

Site police. Each unit should conduct a thorough clean up of paper scraps to ensure that no classified material is inadvertently lost. Units should bury all unclassified document waste.

TACTICAL STANDING OPERATING PROCEDURES

Unit SOPs should cover countersurveillance procedures such as camouflage, concealment, pattern painting, light and noise discipline, and physical security. All soldiers should be well trained in these procedures. Survival of any unit depends upon reducing the enemy's ability to see and target that unit on the battlefield.

Camouflage and Concealment

These are the two traditional and extremely effective methods of reducing visibility on the battlefield. With the great variety of sensors available to modern armies, camouflage and concealment have become more important than they ever were in the past.

Camouflage screen systems. Screen systems come in two types: radar/infrared scattering and radar transparent. The radar/infrared scattering screen is the primary system and comprises the bulk of the unit's issue of camouflage screens. Radar scattering screens are used to camouflage selected unit equipment other than radar and radio antennas. Radar transparent screens are used specifically for antennas so that radars and radios can operate under camouflage without significant signal degradation. Because these screens are not interchangeable, unit personnel must ensure that each is used for its intended purpose. There are also different color schemes for both types of screens — woodland and desert.

Camouflage screen systems are not effective without properly employed support systems. The poles and spreaders must raise the screen off the top and away from the sides of the camouflaged item. This is to disguise the outline of the equipment under the screen. When using radar transparent screens, poles should not be placed in front of the radar antenna. Care must be used when camouflaging missile launchers. Laucher crew members must arrange their camouflage nets so that the nets may be quickly struck if the unit must fire a missile.

Vegetation and terrain. The design of the Hawk system makes it difficult for the radars and launchers to operate properly in woodlines. All equipment except the radars and launchers should be concealed in woodlines whenever possible. When emplacing the PCP in a woodline, as shown in the illustration on page 5-29, the operators may remote the IFF antenna to ensure proper operation along the PTL.

Emplacing in and around woods has the following advantages:

•Camouflage is natural and not likely to attract attention.

•Radar/infrared scattering screens can be employed primarily along the sides of equipment to disguise the echo returned to SLAR.

•Branches and leaves spread heat from equipment and shadow heat sources. This reduces infrared detectability.

•Trees provide some natural protection against small arms, fragments, and NBC. Trees also reduce and screen missile backblast and launch flash.

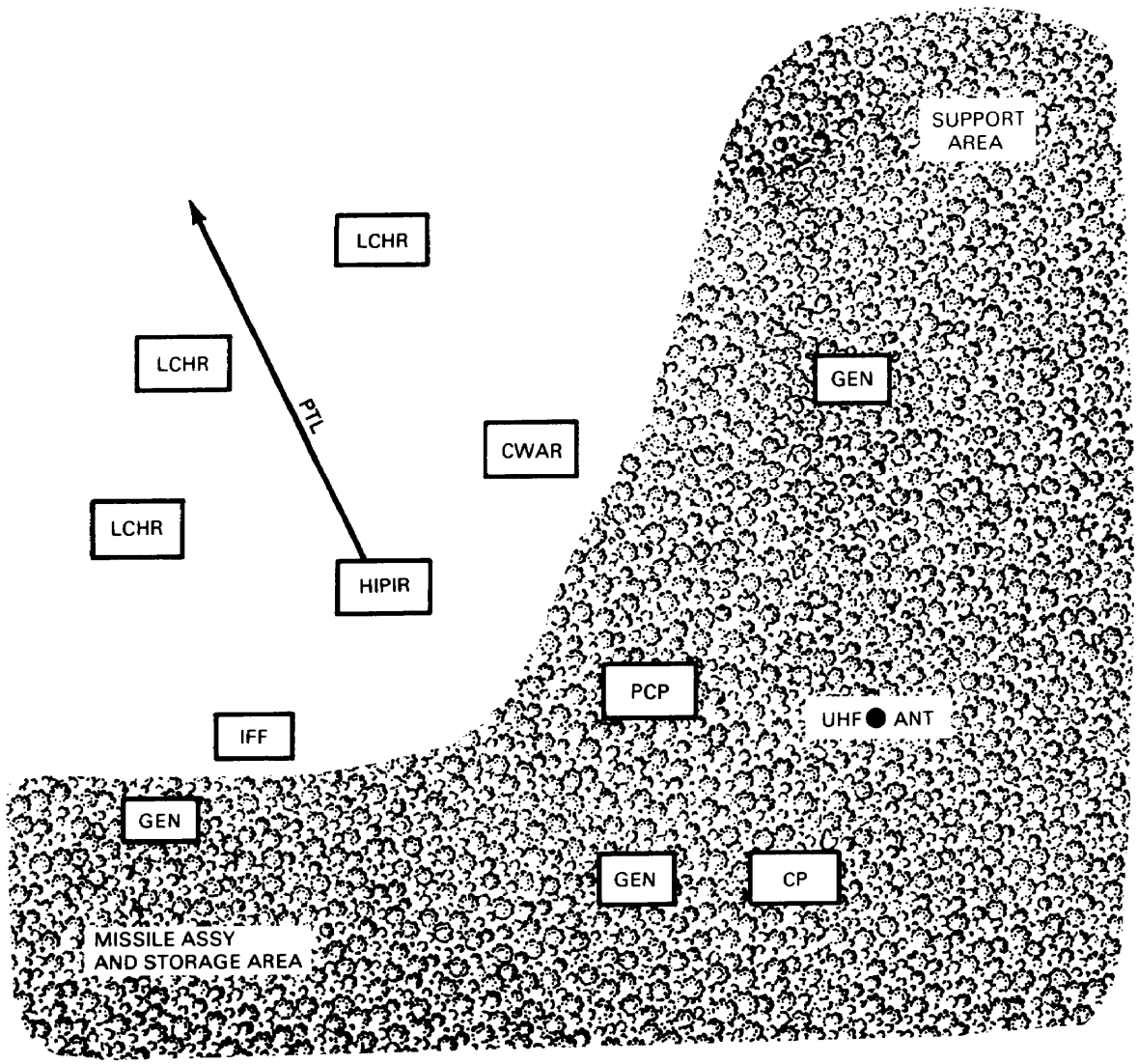
•Personnel can move freely when concealed by vegetation.

•Trees absorb radar and radio sidelobes and backlobes.

Deploying a Hawk unit in a town or village has advantages but calls for a different approach. Place equipment other than radars and

launchers in and around buildings. Park and camouflage generators and vehicles in places where shrubbery would normally be found. A camouflaged truck standing in the middle of a parking lot is not hidden. A town or village may also provide shelters, billets, a CP, and decontamination facilities, as well as land-line communications. When emplacing the Hawk system, ensure that structures do not mask the unit along the PTL. Launcher cut-outs prevent launching missiles into obstructions, but they may limit the effectiveness of the system, especially if the threat is expected to fly at extremely low altitudes.

HAWK AFP EMPLACED IN WOODLINE



Tone Down

By themselves, camouflage and concealment are not sufficient to completely hide a unit, Even a well-camouflaged position can be revealed if proper tone down has not been accomplished.

Reflective surfaces. Reflectors, lights, mirrors, and windows will reflect and "flash" sunlight if they are not covered. Materials such as canvas, clothes, grass, mud, and sandbags can be used to cover shiny surfaces. The only limiting factor is the ingenuity of soldiers and leaders.

Infrared sources. One way to tone down a vehicle windshield is to raise the hood. This method is good if the engine is cold. However, raising the hood when the engine is hot exposes a very strong infrared source to enemy detection; therefore, the hood should stay down until the engine block is cool. Other infrared sources that are easily identified include —

- •Exhaust pipes.
- •Tires (heated by road march).
- •Exhaust vents.
- •Power cables.

Cover all surfaces with proper camouflage screening or infrared absorbing paint. Smear tires with mud. Bury or cover cables. Units may consider carrying a supply of white material to serve as winter camouflage if there is snow.

Tracks. When driving into positions, it is inevitable that some tracks (ruts in mud or soft earth, trampled grass and weeds) will be left. These tracks are excellent indicators of occupied positions, as well as individual sites within a position. After the system is operational, personnel should take the following actions:

- •Fill in any rutted areas.
- •Rake over or stand up any flattened weeds or grasses.
- •Move vehicles away from the points where they entered the woodline.

To avoid leaving obvious trails to unit locations apply the following rules:

- •Enter and travel through fields and meadows on the edges. Tracks are hard to see near boundaries, and often trails are already established.
- •When crossing a plowed field, cross in the same direction as the furrows.
- •Emplace equipment near the edges of open areas, close to woods or roads and trails. This provides covered routes or even already existing farm trails to equipment locations.
- •Refuel using five-gallon cans. This will avoid leaving trails with the unit tanker.

If revetting is to be accomplished, obtain dirt from covered or distant locations, or use the dirt excavated when placing equipment in trenches or dugouts. The revetment must be camouflaged to prevent noticeable contrast when viewed from the air.

Noise and Light Discipline

Even if all other passive defense measures are implemented perfectly, they are useless without noise and light disciplines. Noise discipline is difficult to implement fully because of the requirement to operate generators. Vegetation and buildings will deaden the noise somewhat. Use ducting materials to further muffle exhaust sound. Minimize these distinctive sounds:

- Metal striking metal.
- Loud voices.
- Ringing telephones.
- Gunfire.

These sounds need not be loud, but they are typical of military units and they will draw attention easily. While noise control is a consideration 24 hours a day, light discipline really only comes into play during night operations. White light can be seen for extremely long distances at night, and even the red vehicle "blackout" lights are visible for some distance. Follow these procedures to reduce the light signature from unit locations:

- •Cover bottom flaps of all tents. Repair holes and tears in canvas to prevent light leaks. Keep ventilation flaps closed at night; the night air is cool enough to keep temperatures down.
- •Turn out all lights when entering or exiting tents or shelters. Proper entry control will eliminate problems. Use shades on all lights. Use blue or green bulbs wherever possible.
- •Use blackout drive and road guides when moving at night. Use a blue or green filter on flashlights. Avoid shining lights upward.

•Emplace equipment as much as possible on reverse slopes away from likely approach routes. Emplace equipment in covered locations whenever possible.

•Use no fires. Keep mess burners inside at night.

•Keep covers on lighted control panels closed. Open lighted panels only under cover (a poncho or blanket).

•Clear flammable material from launcher backblast areas.

Site Hardening

As with all electronic equipment, Hawk units are extremely vulnerable to damage from small arms fire and shell fragments. The most common method of protecting equipment from hostile fires is to use the existing terrain. Emplacing nonsystem equipment in gullies, ravines, woods, and buildings provides cover from attack. Many Hawk units have organic earth-moving equipment which can be used to revet radars, launchers, and other ancillary equipment. Coordinate major site improvement support from engineer units. Commanders should keep in mind, however, that survivability will be enhanced more by moving often than by digging in. (Refer to FM 5-1O3 for Hawk parapet positions.)

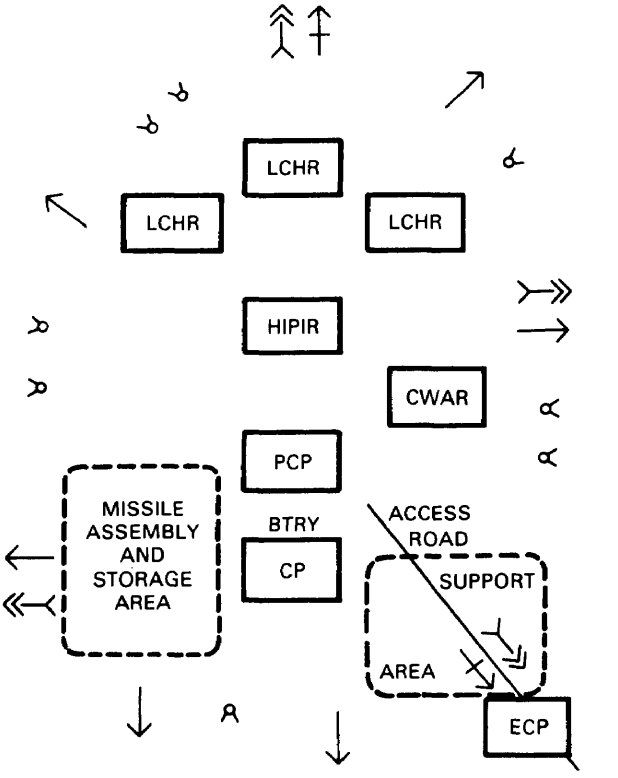
The Hawk unit should devise fortifications for its individual and crew-served weapons to enhance its ability to survive ground and air attack. Obviously, the amount of site hardening will depend on how long the unit occupies a particular position. Bunkers and fighting positions should have overhead cover as a defense against napalm and NBC. This overhead cover should not interfere with small arms fire against ground or aircraft targets.

Whether or not time is available to revet and fortify, dispersal of equipment enhances the chance of survival. In a highly mobile situation, dispersal may be the only way to protect the unit.

Physical Security

The principal threat to the physical security of Hawk units deployed in rear areas is individual saboteurs, small squads of Spetznaz troops, or terrorists (level 1 threat). Because Hawk units must spread equipment and personnel over relatively large areas, commanders must plan to defend large perimeters. To accomplish this, they must employ all available means of defense. The illustration below presents atypical ground defense scheme for an AFP collocated with a battery CP.

TYPICAL GROUND DEFENSE PLAN



Barriers and entry control. If possible, block all high-speed avenues of approach (roads, trails, open terrain accessible to vehicles). Methods to accomplish this include —

- Mines.
- Wire barriers.
- Roadblocks (vehicular).
- Earthworks (engineer support needed).
- Cratering (engineer support needed).

One route should be left open and monitored by personnel at an ECP. Cover any unblocked access routes with light antitank weapons, M203, or crew-served weapons. If the unit

has access to indirect fire support (field artillery, mortars), the defense planner should coordinate preplanned fire missions to protect approaches. Whenever possible, units should use available engineer support to assist in constructing barriers.

It is necessary to have access to the unit's position but unit personnel must rigidly control passage through the ECP. To achieve control, it is necessary to halt vehicles and personnel. For this reason, an ECP should have overhead cover, or have a covered holding area nearby. Communications between the ECP and the unit CP are essential. Most organizations collocate their ECP with a perimeter defense bunker, providing medium weapon coverage and communications through the perimeter defense net.

The function of the ECP is to halt, identify, and record the passage of personnel and equipment in and out of the battery position. Personnel who are not assigned to the unit should not be allowed to enter until authorized by the CP. An element of the battery headquarters normally mans the ECP.

During night operations, personnel manning an ECP should operate in two teams: a control team and a security team. The control team challenges vehicles and personnel and records entries and exits. The security team provides cover from a concealed overwatch position. During night operations, Hawk units may face as much danger from friendly units as they do from the enemy. Control of the perimeter is a necessity.

Bunkers and weapons sites. Sites for M60 machine guns should provide all-around defense. Planners should select M60 sites to give the best defense the terrain allows. Trip flares, booby traps, and claymore mines, when available, will cover gaps in the machine gun fields of fire. LAWs should be available along vehicle approach routes. If time permits, personnel should bunker crew-served weapon sites to enhance their chances of survival. These crew-served weapons are the backbone of the ground defense and will be targeted. Personnel should first dig fighting positions for all individual and crew-served weapons. Bunkering is a desirable second priority.

Each weapon site should have a range card showing sectors of fires. The bunkered sites must have communications to the command post. Wire communications are preferable; FM radio may serve as a backup until wire is laid. Troops will continuously man perimeter defense weapon sites according to the level of security demanded by the tactical situation.

Observation posts and listening posts. The ground defense plan should include continuously manned OPs or LPs along covered avenues of approach. Properly positioned OPs and LPs provide early warning and may provide fire direction if artillery support is available. These posts must have wire communications to the CP. Short stretches of wire will not hamper unit mobility. The posted personnel can recover the wire as they return to the perimeter.

The wire lines provide a ready guide for personnel returning to the perimeter at night. By following the lines, soldiers will enter the perimeter at the same place each time. Because this might provide an enemy with a premarked route of entry into the perimeter, personnel must exercise extreme caution. To facilitate safe passage and control, the wire lines should pass through a bunker or ECP. In addition to 0Ps and LPs, small patrols may operate as additional physical security measures.

Reaction forces. The Hawk unit will designate quick-reaction teams to counter small-unit, saboteur, and terrorist attack. The quick-reaction teams remain on standby. These teams will —

- Defend the firing battery, especially the fire control areas, launcher areas, and CP.
- Contain penetrations of the perimeter.
- Counterattack to restore the perimeter.
- Act as hunter teams to suppress snipers.

The fact that these teams are available does not remove the requirement for all available personnel to respond to ground attack and return fire. No more than one quick-reaction team should be dispatched to an area unless necessary. This will prevent overcommitting manpower to a feigned attack.

Alarm systems. It is not feasible to depend on voice warnings to alert all soldiers. Therefore, units use audible and visible area alarms, Standard means for both types are prescribed in a variety of publications such as STANAGs and joint manuals. Control of the alarms may be

automatic (as with chemical M8 series) or manual. Manual alarms can be sounded by anyone detecting a hazard or at the direction of the CP. Alarm points and visible markers ensure that all personnel receive warnings of hazards. The alarms range from vehicle and equipment horns and sirens to metal ring and bar systems, colored flags, or geometric shapes. All unit personnel must recognize and react promptly to all alarms.

Control of ground defense operations. All activities conducted to ensure the unit is defended must be integrated into a central control element at the battery or platoon CP. The commander can then oversee his entire defense, direct actions, and monitor the status of the perimeter from one location. The CP also collects and evaluates tactical information from bunkers, ECPs, OPs, LPs, and quick-reaction teams. The CP must have communications with the subordinate elements. Wire is preferred over radio, and two separate networks should be available. Ground defense nets relay NBC reports and warnings to and from the perimeter.

COUNTERMEASURES

Countermeasures are those measures taken by Hawk units to reduce the enemy suppression threat. One of the enemy's primary objectives is to destroy or neutralize Hawk units to permit his own freedom of action. To counter this, Hawk commanders must employ an array of ***coordinated*** tactics and techniques designed to confuse the enemy about the location, disposition, and capabilities of the Hawk battalion. For Hawk units, counter-countermeasures fall into three broad areas:

- •Emission control.
- •Movement.
- •Tactical deception.

No discussion of Hawk tactics is complete without a thorough analysis of these areas. It must be understood how these broad areas interrelate and how they enhance the fighting capability of the Hawk battalion.

EMISS1ON CONTROL

The normal operating mode for the AFP is either ***silent or passive.*** The AFP will radiate its HIPIR ***only*** when necessary for self-defense or when ordered to engage. The AFP will investigate COVER commands from higher echelons first using the VGTR, weather and light conditions permitting. The units should radiate acquisition radars (especially pulse acquisition radars) only under the following conditions:

- •When a higher echelon orders the unit to provide an air picture to higher and adjacent units.
- •When the unit cannot establish reliable UHF communications between the AFP and battalion.
- •When the AFP is the only source of target acquisition for a particular avenue of approach.
- •When the intensity of the air battle requires that the AFP computer threat order targets and provide the TCO with engagement recommendations. (The computer will not process targets for engagement recommendations unless those targets are acquired by organic acquisition radars.)

The distance between the unit initially acquiring the target and the passive or silent unit as it relates to the enemy's avenue of approach affects the range at which the passive or silent unit will first be able to detect the target. If that distance exceeds 15 kilometers, it seriously limits the engagement range of the passive or silent AFP.

The defense planner must ensure that the passive or silent fire unit falls within the sector of interest of a fully active fire unit and is designated a priority 1 defended asset at the AN/TSQ-73. Normally the sector of interest used by a fire unit furnishing an air picture to a passive or silent unit should be the maximum technically allowable. (See (S) FM 44-1 A.)

Defense planners and TDs must understand that a passive or silent fire unit will not always be able to engage every enemy target which it receives by ADL from the active sites. Some of the targets received over ADL may be in areas masked to the passive or silent AFP. To enable the FDC to determine the actual engagement coverage of each fire unit, the S3 must provide the FDC with the ***deliberate*** coverage diagrams used in his defense planning. (See FM 44-90-1.)

The normal operating mode for the FDC is ***passive.*** The FDC should rely on target acquisition from higher echelons or from its own AFPs. Its acquisition radar should radiate only when external sources of target acquisition data are not available, or when higher echelons request an air picture from the battalion.

When the battalion uses both active and passive or silent AFPs to fight the air battle, the following considerations apply:

•Each passive or silent AFP should fall within the designated sector of interest of an active AFP.

•Each passive or silent AFP should be designated a priority 1 defended asset at the AN/TSQ-73 to provide elementary threat ordering of hostile targets to the AFP.

•No passive or silent AFP should be placed farther than 15 kilometers away from the nearest active AFP along the enemy's most likely avenue of approach.

•During highly mobile operations, passive or silent AFPs must become active as other AFPs move.

PROXIMITY TO THE ENEMY

The FEBA, a defensive operations term, defines the forward edge of the main battle area. The FLOT is a line which indicates the most forward positions of friendly forces at a specific time. In defensive operations, the FLOT is the forward edge of the covering force, if a covering force is employed. The FLOT may be at, beyond, or short of the FEBA on the modern, non-linear battlefield. In offensive operations, the LD/LC represents the forward limit of the main battle area.

When planning and executing air defenses, the FEBA, the FLOT, and the LD/LC, as well as the EMCON mode of operation, will affect the positioning of Hawk AFPs on the battlefield. The S3 uses planning factors to ensure that active AFPs are not placed within tube artillery range and that silent or passive AFPs make the best use of the increased survivability afforded by operating without radiating. Active AFPs are placed not less than 25 kilometers from the FEBA, LD/LC, or FLOT and passive or silent AFPs are placed not less than 10 kilometers from the FEBA, LD/LC, or FLOT.

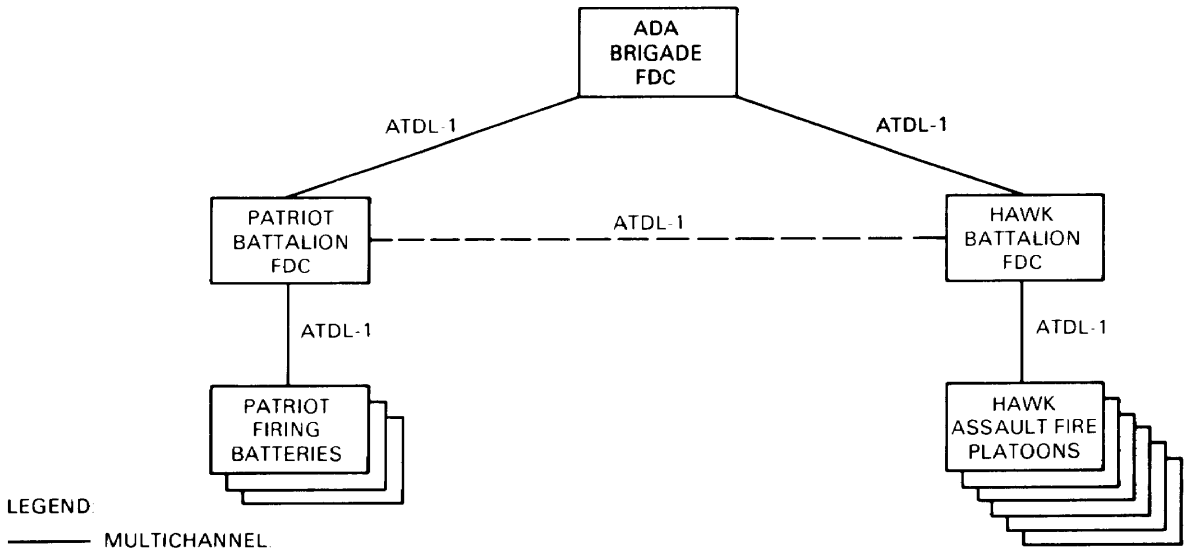
The decision as to which control measure to use when placing Hawk units depends upon the type of operation, the shape and terrain of the battlefield, area security, and the maneuver commander's concept of the operation.

In the defense, for example, the depth of the covering force area as well as the mission of the covering force are major factors in deciding whether to place active fire units 25 kilometers from the FLOT or 25 kilometers from the FEBA. If the depth of the covering force area is 10 kilometers and the mission of the covering force is to hold that area, placement of active AFPs 25 kilometers from the FLOT is probably a reasonable risk. If, on the other hand, the mission of the covering force is to avoid contact and to fall back to the FEBA when pressured by the enemy, commander's should position active AFPs 25 kilometers from the FEBA. There is no one control measure for all cases. The FEBA, the FLOT, and the LD/LC must all be considered in conjunction with the threat and the ground commander's intent when determining positions for Hawk units.

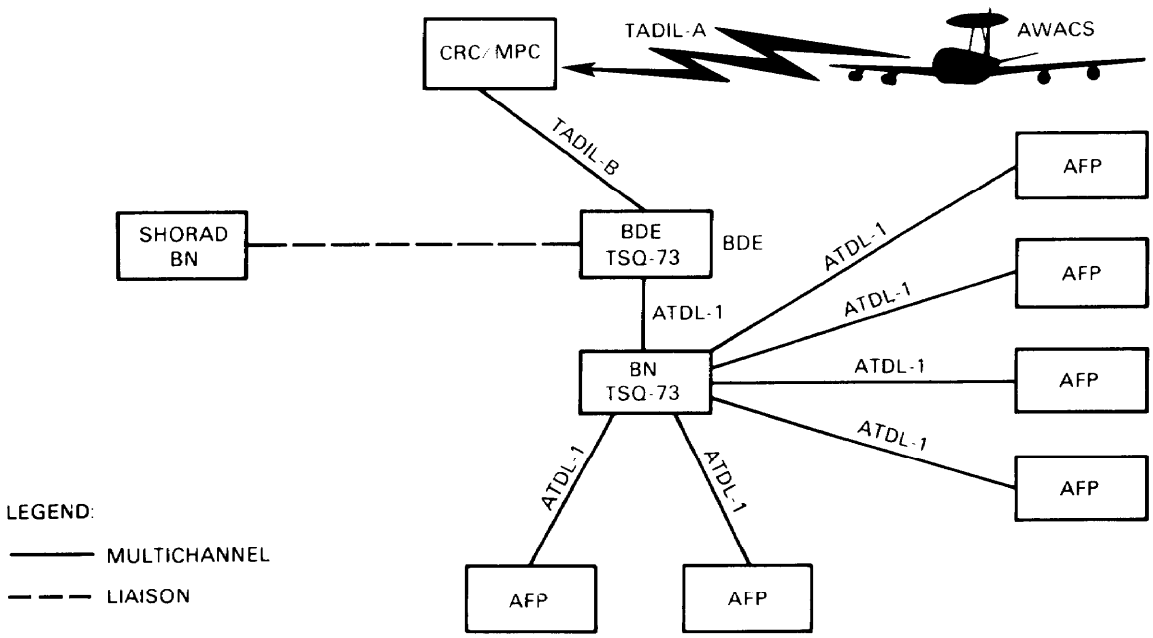
NORMAL OPERATIONS

Because the normal mode of operation for Hawk units is passive or silent, units must make the best use of passive capabilities and of reliable acquisition sources outside the battalion. When outside sources of acquisition data are available, the Hawk battalion should not radiate its organic acquisition radars. Only when ordered to engage targets should the AFP radiate its HIPIR and then only for the amount of time necessary to acquire lock, fire, and intercept. If the target is out of range at lock, attempt a VGTR lock. Once a VGTR lock is achieved, the AFP should shut down the HIPIR and wait until the target is in range, then radiate again and fire. The following illustrations depict methods of obtaining target acquisition data at the AFP without using organic radars.

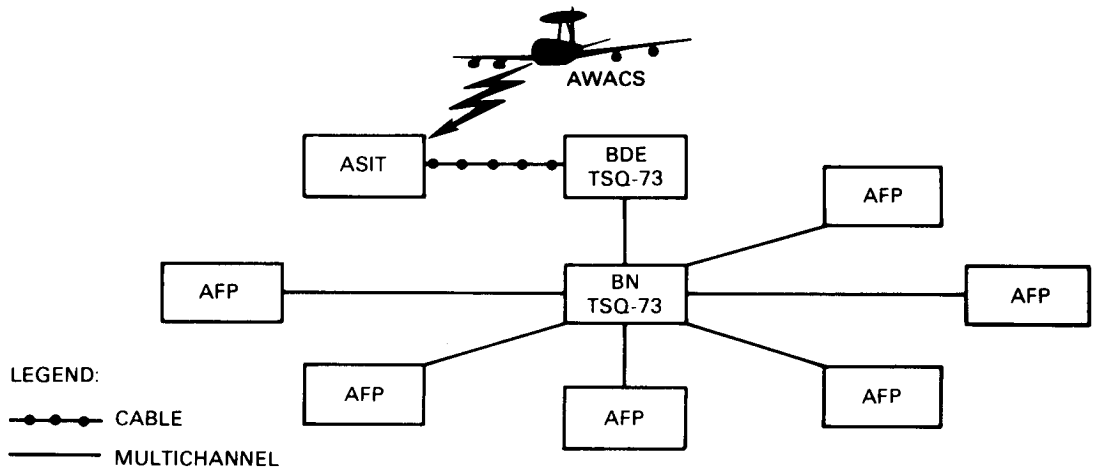
TARGET ACQUISITION USING PATRIOT



TARGET ACQUISITION USING AWACS



TARGET ACQUISITION USING ADAPTABLE SURFACE INTERFACE TERMINAL (ASIT)



When reliable external acquisition sources are not available, the Hawk battalion must use its own internal sources. If two or three AFPs can maintain surveillance over essentially the same area, coverage may be alternated between units. EMCON schedules, used to determine which units radiate and when, are prepared at battalion level. Units must consider the following when developing an EMCON schedule:

- Do not follow a set pattern. Choose AFPs at random to provide coverage for the battalion. This will help to limit information provided to the enemy.
- Times for "blinking on" should vary but should never exceed 15 minutes. Shorter radar blinking periods increase survivability by reducing the effectiveness of enemy radio direction finding efforts.
- Movement of AFPs that have radiated is mandatory. The tactical situation and experience will dictate how long an AFP can remain in one location blinking its acquisition radar on and off. Short radiation periods and scheduled movement are two keys to the success and survival of Hawk in the air-land battle. The following illustration depicts a typical EMCON schedule for a corps Hawk battalion.

TYPICAL EMCON SCHEDULE

	RANDOM TIME PERIODS								
AFP	1	2	3	4	5	6	7	8	9
A1	S	E	S	E	S	S	E	S	S
A2	S	S	E	S	S	E	S	E	S
B1	S	S	E	S	E	S	E	S	S
B2	E	S	S	S	S	E	S	S	E
C1	S	E	S	S	E	S	S	S	E
C2	E	S	S	E	S	S	S	E	S

LEGEND: E=EMITTING
S=SILENT

Note that only two AFPs are radiating at any one time. The FDC is not included in this particular schedule, but it could also take a share of the radiating time by using its organic surveillance radar. This would further reduce the necessity for AFPs to radiate.

HAWK MOVEMENT

The Hawk battalion must move quickly and efficiently if it is to survive on the air-land battlefield. Frequent moves and moves at night are necessary. The factors of METT-T determine when the individual AFP will move, but the commander may use several rules of thumb to determine how often to move Hawk units:

•Hawk units in the tactical operations area should move at least twice a day.

•No more than two AFPs should be moving at any one time.

•Hawk units in the rear area should move at least once a day.

•Only one AFP should move when the FDC is moving.

Movement of Hawk units is the means by which the battalion integrates its EMCON plan and its deception plan into a coordinated air battle plan. More on the specifics of movement is contained in Chapter 6 and in FM 44-90-1. Tactical deception is discussed below.

TACTICAL DECEPTION

Tactical deception is deliberate action that military units take to achieve surprise against enemy forces and to manipulate or deceive enemy intelligence-gathering efforts. Surprise is striking the enemy when, where, or in a manner for which he is unprepared. It is not essential that the enemy be taken totally unaware, only that he become aware of the deception too late to react effectively.

Hawk units use deception to conceal their true location, disposition, and intentions. This minimizes losses and causes the enemy to expend firepower and intelligence resources unprofitably. A unit may deceive the enemy through manipulation of the signatures which identify Hawk on the battlefield. Those signatures are —

•Visual.

•Infrared.

•Electronic.

Careful integration of deceptive signatures into one coordinated deception effort is the goal. Enemy intelligence collectors will try to cross-reference the visual signature of Hawk units with the electronic or infrared signature. When this cross-referencing leads the enemy to accept a false signature, the deception effort is effective, and the enemy is led to an incorrect conclusion. Hawk units may use some or all of the following to effect this deception:

•Decoy sites.

•Feints and demonstrations.

•Distortion of activity so it is not what it appears to be.

Decoy Sites

Hawk units may construct decoy AFPs from available materials or nonoperational or battle damaged equipment. When possible, decoys should present an electronic signature, an infrared signature, and a visual signature. For example, if an AFP has sustained battle damage to its HIPIR but its CWAR can still radiate, it might be used as a decoy. By radiating its CWAR it would produce an electronic and infrared signature to the enemy. When using decoys, several rules apply:

•Decoys, whether constructed from available materials for visual effect or made from nonoperational Hawk equipment, must appear to be deployed in the same manner as operationally capable AFPs.

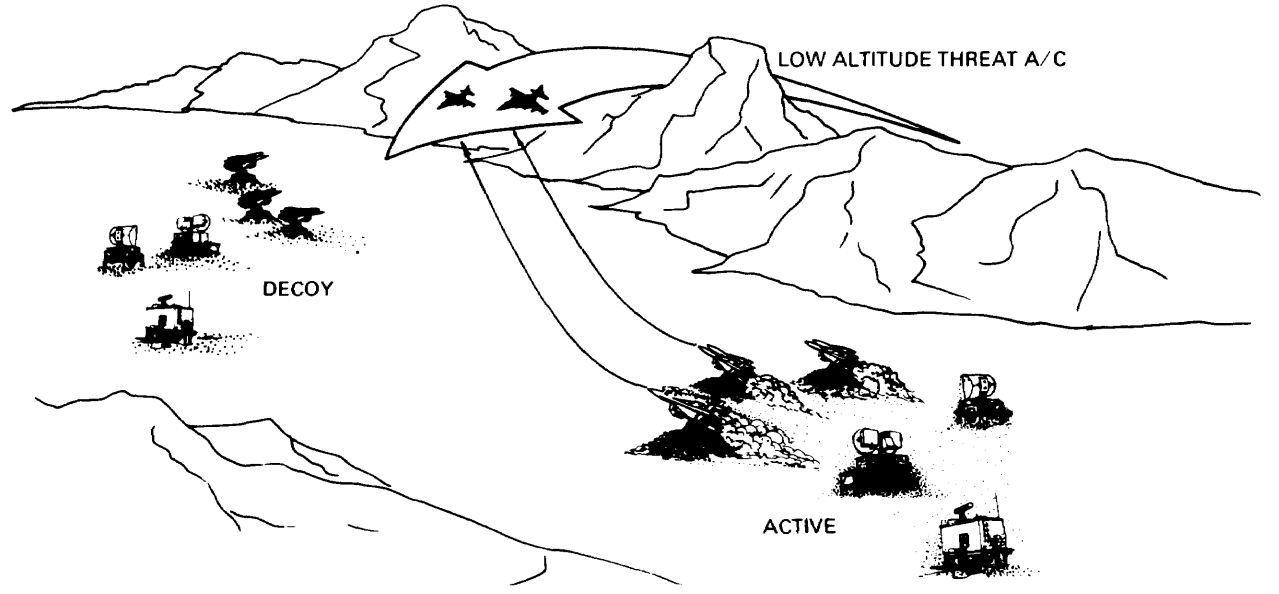
•For the decoy to be effective, it must be detectable. However, techniques used to ensure detection must at the same time look real to the enemy observer. The decoy should be included in EMCON schedules. (An AFP that radiates continuously will probably be recognized quickly as a decoy.) Movement in the decoy AFP will enhance detection. Radar antenna rotation, smoke from generators, and moving vehicles are good sources of movement. Making vehicle tracks in and around the site will enhance detectability. Camouflaging that displays sharp equipment outlines will indicate the presence of equipment. Minor breaches of camouflage and light discipline and litter in the area will add to the effect.

•When deployed as the bait in a Hawk trap as in the illustration on page 5-38, the decoy may use pyrotechnics to simulate missile

launches or to exaggerate the effect of air or artillery strikes. The unit may coordinate simulated missile launches with actual launches from other AFPs to further confuse the enemy. When the decoy site is the bait, personnel assigned to the decoy site should locate some distance away and should dig in. The decoy site should be prioritized as a defended asset at the AN/TSQ-73 to enhance the ability of the FDC to direct fires against aircraft accepting the bait.

•Moving decoy AFPs into locations being vacated by real AFPs increases the probability of a successful deception. This should occur at night or during periods of reduced visibility. When the real AFP returns to battle stations at its new location, it should remain passive until it is necessary for it to enter the air battle. The decoy, on the other hand, should make the best use of all its signature sources to deceive the enemy.

DECOY AS BAIT



Night Operations

Night combat offers opportunities to Hawk units to achieve objectives not always practical during daylight operations. Night operations mean continuous operations. The pressure of continuous operations, particularly against a weakening enemy, hastens his defeat. For Hawk units, the fundamentals of tactics remain the same 24 hours a day; however, the techniques and procedures used may vary between nighttime and daytime operations. Since the intensity of the air battle will likely be reduced at night, commanders should take advantage of reduced activity and the concealment afforded by darkness to —

•Move AFPs and the FDC to new positions.

•Perform required maintenance.

•Resupply (missiles, ammunition, rations, POL) AFPs.

•Improve positions.

•Allow crew rest as the situation permits.

Night Operation Considerations

The need for light and noise discipline increases at night. Consider the following:

Missile signature. Darkness and periods of reduced visibility do not reduce the effectiveness of any part of the Hawk missile system except the VGTR. However, the tell-tale missile signature is more noticeable in darkness than in daylight. The signature may disclose the location of friendly units to the enemy, thereby

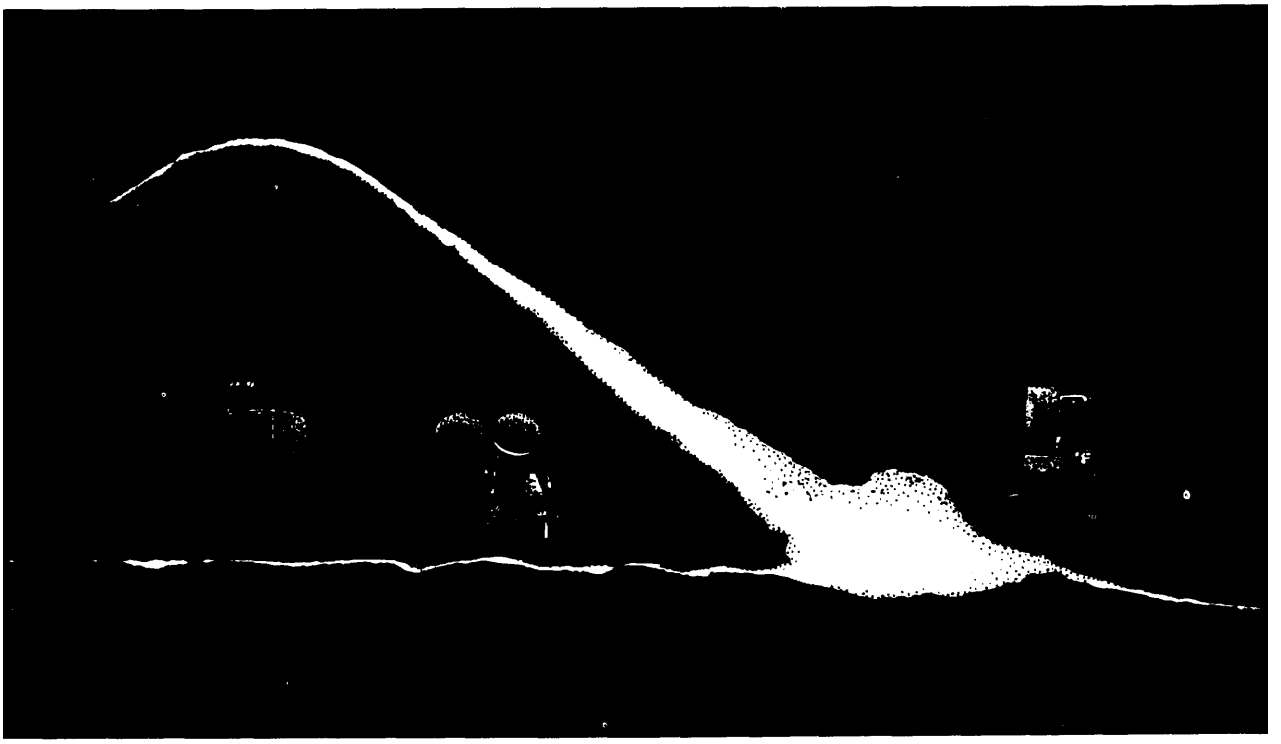
subjecting the defended area to close scrutiny by enemy intelligence collectors (see illustration below). This may result in air, tactical ballistic missile, or field artillery attacks on the Hawk unit or the assets it defends. Leaders should consider the use of smoke to reduce the the missile signature, realizing that smoke could also reduce the effectiveness of the VGTR.

Night moves. Night movement techniques are particularly important to Hawk units. Units and vehicles must be closer together at night than in daylight, but they must avoid nose-to-tail closeness. The principle of dispersion to minimize casualties and equipment losses from area or indirect fire is tempered by the need for control in poor visibility. Night convoy speeds are slower than daytime speeds. Navigation problems are significantly greater at night than in daylight. In planning night moves, unit commanders must take several factors into account. Night movements require the Hawk unit leader to be fully aware of his unit's mission and role in the overall operation. Moving, communicating, and firing Hawk missiles in support of night operations is extremely difficult. Coordination, both internal and external, is essential. All members of the unit must know and follow unit movement techniques and procedures. And Hawk unit leaders must be intimately familiar with the night employment techniques and procedures of the supported force.

Identification, friend or foe, on the ground. In all night operations troops and equipment are at considerable risk of being destroyed by friendly fire if they cannot be identified. Common sense techniques to make Hawk units recognizable include the use of —

- Blackout markers.
- Reflective panels.
- Color-coded filtered light.
- Reflective strips cut to geometric designs to indicate unit identity.

HAWK MISSILE SIGNATURE AT NIGHT



Feints and Demonstrations

Feints and demonstrations enable units of corps size and smaller to mislead the enemy or to induce him to do something counter to his interests. Hawk battalions will not normally use these techniques within the battalion, but will participate in larger operations in support of overall deception plans for larger elements of the force.

The feint is a limited objective attack which must appear to the enemy as a main effort. Feints require contact with the enemy to give the appearance of a realistic main attack. A demonstration, on the other hand, is a show of force on the battlefield where a decision is not the intended outcome. It is similar to a feint with the exception that there is no contact with the enemy. The Hawk unit's role is the same whether the operation is a feint or a demonstration. The mere presence of Hawk, because it is a limited combat asset, can lend credence to large deception operations. Normally, Hawk elements of battalion size or larger participate in this type of deception. Coordination is a must for a successful deception. The Hawk commander must understand fully the force commander's concept to ensure that the Hawk unit's participation in the deception does not become a liability rather than an asset.

When employing elements smaller than battalion size to support a feint or demonstration, commanders must ensure that they do not sacrifice C^2 of the battalion. They must also ensure that they can change Hawk AFP positions and redirect fires to the main effort with minimum loss of time.

Some Deception Ideas

The following are thought provokers. The possibilities are limited only by the imagination. Hawk commanders should expand, adjust, and envision these possible deceptions on the air-land battlefield:

•Consider the simulation of unit movement. Convoys can provide the enemy with much information about Hawk units. Simulated movements should terminate in logical areas.

•Use spare antennas and vehicles to deceive the enemy about the location of the FDC.

•Consider planned COMSEC leaks. While most communications within the Hawk battalion are secure, a breakdown of the FM secure system could be faked long enough to plant a deception story, (Remember: always coordinate deception plans with the force G3.)

•Place AFPs in locations not normally used by Hawk units.

•Remove or cover all unit markings, including shoulder patches, or use unit markings from a completely different type of unit, This may confuse the enemy on two counts.

•Use ORF radar assets to overload enemy collection capabilities. This will intensify his confusion and limit his ability to separate the real from the false.

•Tape record simulated air battle traffic, then broadcast it in the clear on channels separate from actual traffic during or after attack by enemy aircraft.

•Use host nation support to move essential supplies and munitions.

•Use a smoke haze over all positions to prevent the enemy from distinguishing decoys from operational systems.

FM 90-2 contains more information on tactical deception. This manual is **required reading** for all air defenders.

COUNTERSUPPRESSION

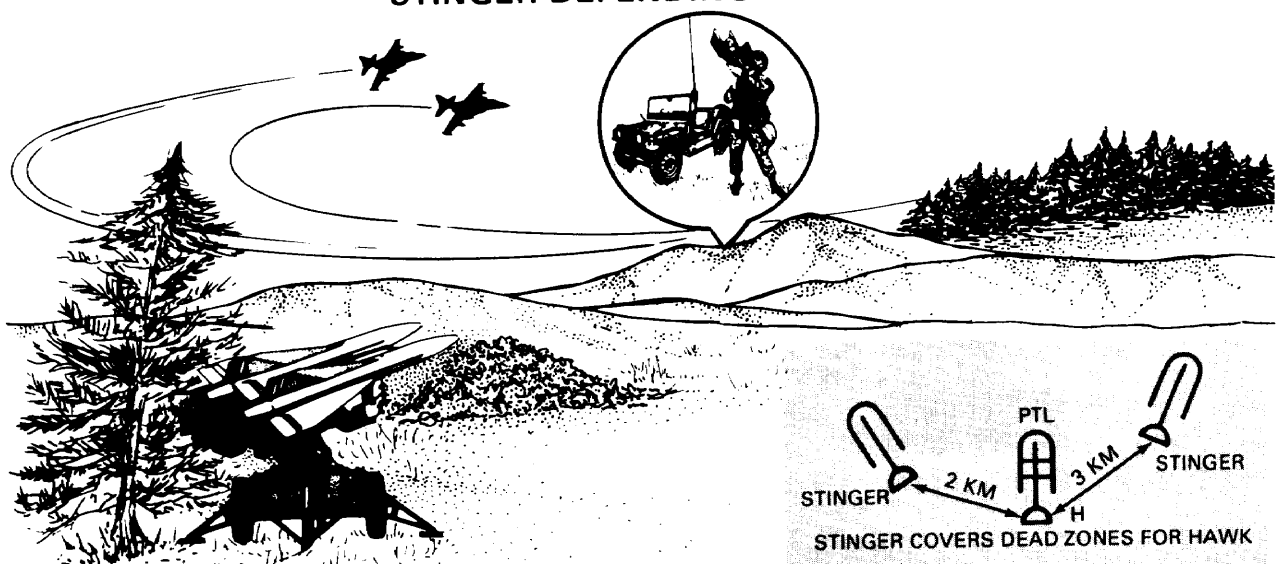
Countersuppression actions are those active measures Hawk units take to increase their survivability against suppression attacks by aircraft. A well-designed defense with mutually-supporting Hawk fires is the best method of countering enemy suppression attacks. Firepower limitations of the Hawk system, however, require employment of other weapons as a last line of self-defense against air attack. Those weapons are Stinger missiles (see illustration at top of page 5-41) and small arms.

STINGER IN SELF-DEFENSE

STINGER EMPLOYMENT

When defending an AFP, Stinger crews should deploy nearby along expected avenues of approach. The intent is to satisfy two requirements. The first is to provide fires within the Hawk system dead zone (the zone immediately surrounding the AFP within which the Hawk missile cannot achieve intercept). (See (S)FM 44-1A for details.) The second is to provide fires in areas masked to the Hawk system. Stinger positions should be no more than two to three kilometers from the AFP and should meet both of these requirements. A typical deployment of Stinger in defense of an AFP is shown in the following illustration.

STINGER DEFENDING AN AFP



COMMAND AND CONTROL

A Stinger cell that is part of the battery or platoon CP is responsible for command and control of Stinger crews. This cell maintains direct communications with the TCO, who provides early warning information on targets that he determines to be threatening to the platoon. Changes in WCS, ADWs, operating frequencies, call signs, ground security information, IFF codes, and the like pass immediately from the Stinger cell to the Stinger crews. The CP monitors the personnel and equipment status of its Stinger crews, and directs position changes when necessary. Stinger crew member training must include visually acquiring and identifying aircraft without the benefit of early warning alerting and cueing. If a SHORAD battalion is operating in the same general area as the Hawk battalion, Stinger crews may be able to effectively use the SHORAD EWBN. FMs 44-18, 44-18-1, and 44-3 contain detailed information on Stinger crew operations.

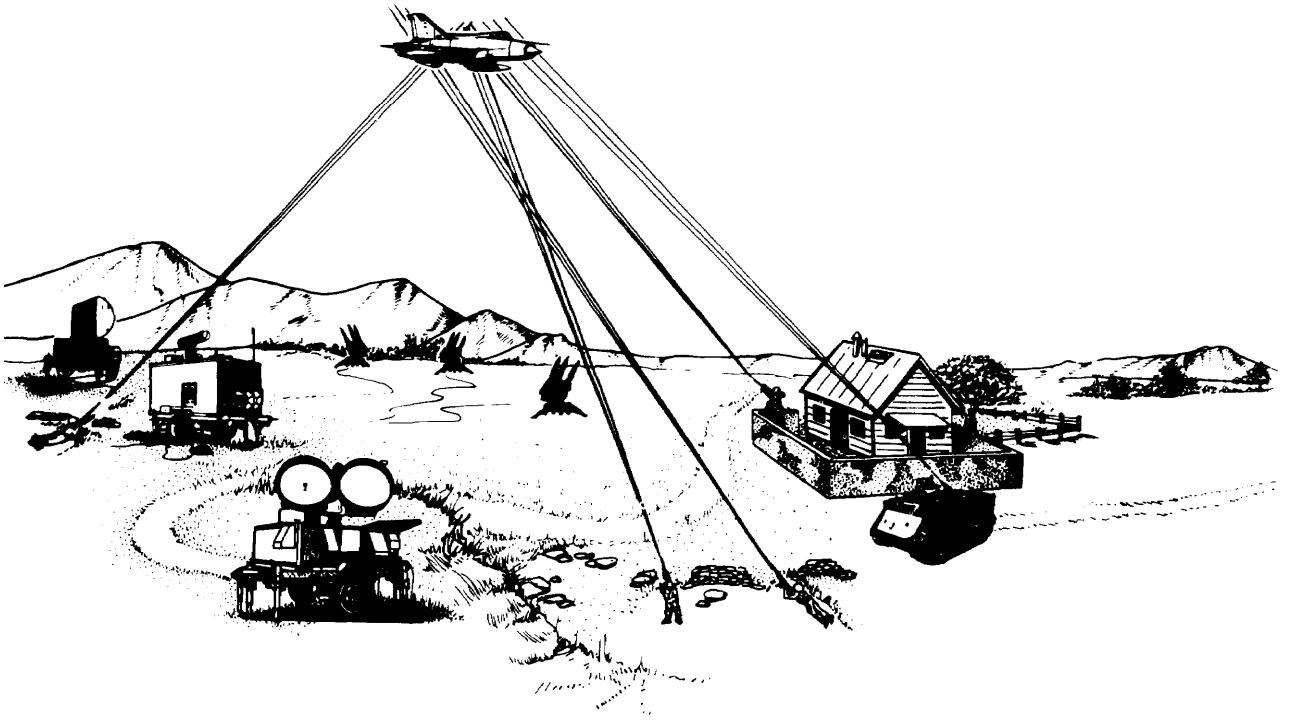
SMALL ARMS

Properly coordinated and controlled small arms fire is extremely effective against attacking aircraft. Ranges, however, are limited. In the air defense role the effective range of the M-16 rifle, the M-60 machine gun, and the M-249 squad automatic weapon is 350 meters. Most AFPs have a public address system which the unit can use to control the fires of these weapons.

Volume Fires

Volume fire (see the illustration below) is the key to effective small arms fire at attacking aircraft. Every soldier in the unit brings his weapon to bear on the target with the idea of placing as many bullets as possible in its path. Fires should not, however, be in some random direction. Instead, each soldier selects an aiming point in front of the target and fires at that point. No attempt is made to track the target or estimate target range or target velocity.

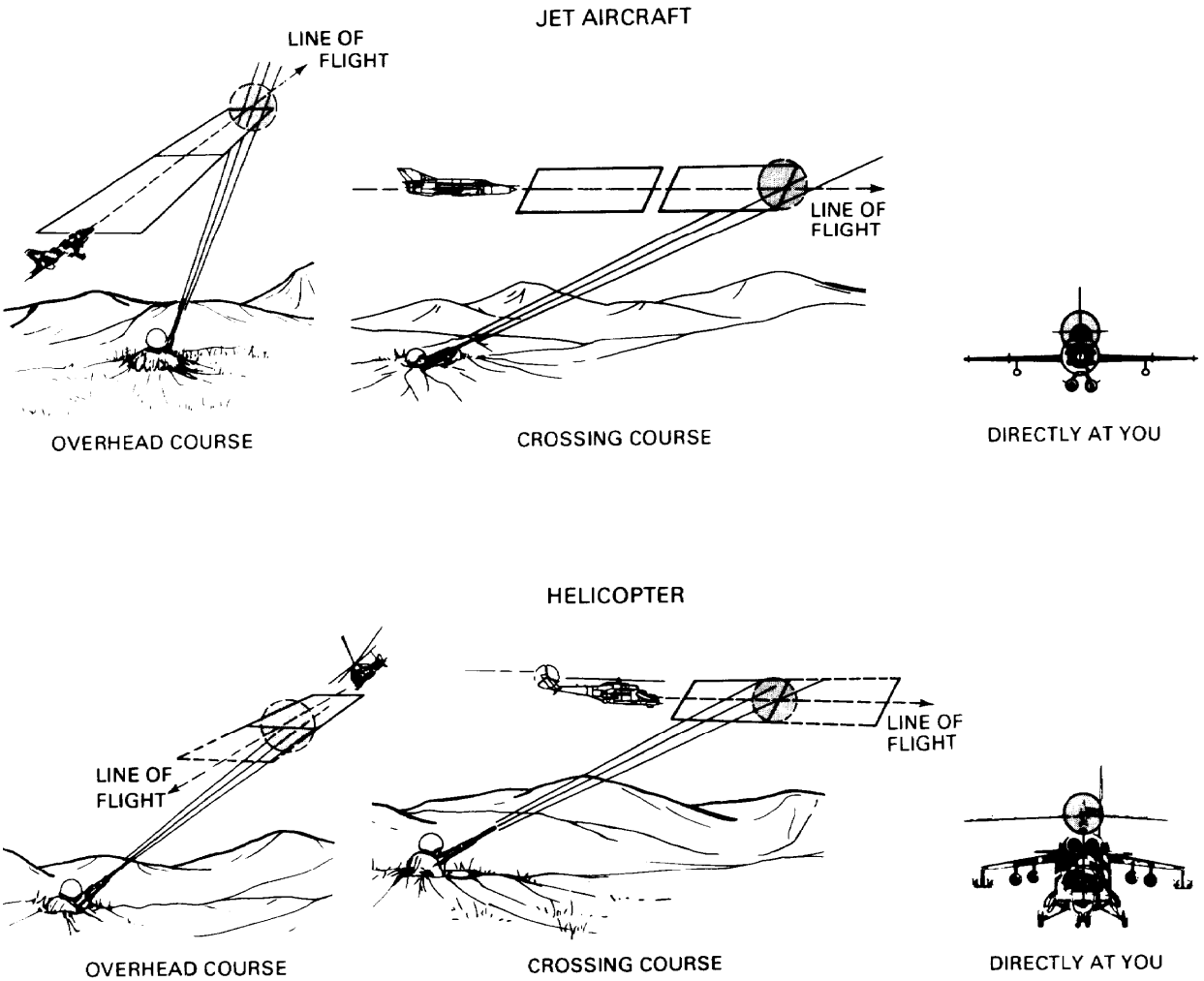
CONCENTRATED FIRE



Controlling Fires

Selecting the aiming point is an individual act, but it is done according to a standard set of rules. The rules define the amount of lead to be taken in units of football field length. Since just about everyone has played football or watched football on television, most soldiers have a concept of how long a football field is and can visualize a football field laid out in front of the target. When told to lead the target by one football field, everyone aims at approximately the same point in space. Aiming errors ensure that fire is delivered into a volume of space in front of the target, rather than on a small point. The differing perspectives from which the soldiers view the target will act to further distribute the fire over a volume of space. The illustration below shows small arms fire on fixed-wing aircraft and helicopters.

SMALL ARMS FIRE



The illustration shows the rules for selecting the aim point. They are simple, logical, easy to learn, and easy to retain.

Precision is not important; a coordinated, high volume of fire will get results. Personnel must deliver fire on command and not at the option of the individual. The possible sequence of an engagement is as follows:

- An aircraft commences an attack on the unit.
- Air sentries spot the attacker.
- Sentries alert the unit; for example , AIR ATTACK, INBOUND 5 O'CLOCK, PREPARE TO FIRE.
- Each member of the unit prepares his weapon to fire by placing the weapon in full automatic mode. He locates the target and waits for the command to fire.
- The person in command estimates the right moment and commands: FIRE.
- Each individual finds the aim point using the rules in the table below and fires at the aim point until he expends his ammunition or until the CEASE FIRE order is given.
- Everyone immediately reloads and prepares to engage follow-on attackers.

SELECTING THE AIM POINT

TYPE AIRCRAFT	COURSE	AIM POINT
JET	CROSSING	TWO FOOTBALL FIELDS IN FRONT OF NOSE
JET	OVERHEAD	TWO FOOTBALL FIELDS IN FRONT OF NOSE
JET	INBOUND DIRECTLY AT YOU	SLIGHTLY ABOVE AIRCRAFT NOSE
HELICOPTER	CROSSING	ONE-HALF FOOTBALL FIELD IN FRONT OF NOSE
HELICOPTER	HOVERING	SLIGHTLY ABOVE HELICOPTER BODY
HELICOPTER	INBOUND DIRECTLY AT YOU	SLIGHTLY ABOVE HELICOPTER BODY

Firing Positions

Except for the prone position, the rifleman's basic firing stances (shown below) stay the same. Firing at aircraft while lying down means the riflemen must lie on their backs, aiming their rifles into the air. If soldiers are in fighting positions, they will probably fire from a supported standing position. If they are not in fighting positions, they look for trees, large rocks, or any object to help support their weapons and provide some protection. Soldiers will soon learn to fire from some kind of cover and concealment, no matter how small.

SMALL ARMS FIRING POSITIONS

STANDING IN SHELTER

PRONE POSITION

KNEELING (HIGH)

SMALL ARMS FIRING POSITIONS (continued)

M16 WITH BIPOD

KNEELING (LOW)

EMERGENCY SUPPORT

M60 MG
ON IMPROVISED SUPPORT

The M60 gunner will also fire from some protected position if possible. The gunner needs to get the weapon up in the air. The soldier can hold the weapon up or use some support. In a real emergency, another soldier can act as a hasty firing support.

FM 44-8 further describes techniques any unit can use to employ small arms against attacking aircraft.

CHAPTER 6

Hawk Movement

Hawk units, whether employed in forward or rear areas, must move often to defeat an enemy's intelligence collection system. Units also must move to maintain coverage over defended assets, respond to the scheme of maneuver of supported forces, respond to changes in mission assignments, and enhance unit survivability. The Hawk unit movement sequence begins with the battalion commander's defense planning process (Chapter 5) and continues through issuance of an OPORD.

Since the Hawk AFP can only perform its mission when it is in a firing position, it must conduct moves from one position to another rapidly. Time is critical; the unit must hold system downtime for movement to the absolute minimum.

SOPS for tactical movement and RSOP must be part of every unit's tactical preparations and procedures. Unit personnel must understand their SOPS and must practice RSOP frequently. The SOPS must include both day and night operations and loading plans for each unit deployment option. SOPS must also be adaptable in terms of unit size movements by platoon, battery, or battalion. This chapter addresses Hawk tactical movement and transportability.

CONTENTS

Section 1. Road Movement

OPERATIONS ORDER

The purpose of an OPORD is to give subordinate commanders the essential information to carry out an operation. This includes the situation, the mission, the assignment of tasks, and the support and assistance the unit will receive. When the unit plans an operation which will take place immediately, the headquarters prepares the complete order, or a series of fragmentary orders, based on the commander's decision and concept. When a unit plans an operation for the future, the headquarters prepares an OPLAN. The OPLAN will include appropriate implementing instructions, or the commander will issue a fragmentary order when he wants his unit to execute the OPLAN. Fragmentary orders are the normal means of issuing changes to OPORDs. A new order is published whenever a significant change in the mission occurs or anew mission is received, as time permits. Orders should include only the necessary detail for subordinate commanders to issue their own orders and to ensure coordination. This coordination must include assignment of primary and secondary positions to ensure flexibility in the occupation of the positions identified in the defense planning process (Chapter 5).

WARNING ORDER

Warning orders give subordinate units advance notice of an order which is to follow. They help units and their staffs initiate the preparations for execution of a mission by giving them the maximum warning time and the essential details of impending operations, including planning time available. When used to alert units of a movement or implementation of an OPLAN or an OPORD, the warning order should state an execution time.

When the Hawk unit receives a warning order, the unit commander initiates action to prepare his units for movement. The commander —

•Briefs all key personnel and issues his warning order.

•Directs preparation for travel of all equipment not needed to maintain the engagement capability of the Hawk system.

•Reviews his OPORD.

•Instructs his RSOP leader on the route of march, alternate route of march, checkpoints, call signs and frequencies, RSOP party composition if not according to SOP, and any peculiarities of the movement and the new position.

RECONNAISSANCE AND SELECTION OF ROUTES AND SITES

This paragraph describes the basic actions necessary for the conduct of the reconnaissance and selection of the route and equipment sites in the position. These basic actions are modified to fit the tactical situation at the time of the move. The procedures are flexible enough to fit any situation, and the commander tailors the general procedures to the individual and collective proficiency of his unit. Detailed procedures are contained in FM 44-90-1.

The primary purpose of reconnaissance and selection of routes and sites is to ***facilitate orderly, rapid, and safe movement to, and emplacement at, the designated position.*** The RSOP party performs its function by reconnoitering and selecting primary and alternate access routes and sites for unit equipment and facilities within the position.

The RSOP party reconnoiters the routes of march and equipment sites. The Hawk commander or the OIC of the RSOP party assembles and briefs the RSOP party. The RSOP party departs the unit location immediately after receipt of a warning order.

ORGANIZATION AND EQUIPMENT

Normally, the unit SOP established the RSOP party's organization and equipment to fit most tactical situations. When issuing the

movement warning order to the RSOP leader, the commander directs any changes he feels necessary. The AFP normally continues to conduct air defense engagements while the RSOP party is conducting the RSOP. The actions taken to form the RSOP party and to prepare equipment for travel must not affect the mission capability of the AFP. The minimum number of personnel in the RSOP party is outlined in the following paragraphs.

Officer in Charge

The OIC has overall responsibility for the RSOP party. He must ensure that the party is properly briefed. He verifies the acceptability of the new position and is responsible for the detailed layout of the new position. The OIC is normally a commissioned officer but maybe a senior NCO.

Noncommissioned Officer in Charge

The NCOIC assists the OIC. He ensures that the new position is properly cleared of mines and secured prior to entry of the main RSOP party. The NCOIC ensures that the members of the RSOP party have local security, that they conduct a chemical and radiological survey, and that they notify the parent battery or platoon of the acceptability of the position(s) and route(s). The NCOIC must also reconnoiter alternate routes and provide information on these routes to the parent unit.

Security Team

The size of the security team depends on the tactical situation but is normally not less than a squad-size force. The security team will provide security for the RSOP party under the direction of the NCOIC. At least one security team member will be a tactical wire operations specialist.

Equipment Guides

Each major piece of equipment will have an assigned guide. During the RSOP party's entry into the new position, the guides assist the OIC in the layout. They also form a minesweeping team and a chemical and radiological survey team. The RSOP party will use the guides as a reaction force during the reconnaissance if needed.

Communications Personnel

Normally, a UHF operator and a tactical radioman familiar with wire communications are part of the RSOP party. They work together in erecting the RC-292 antenna group and the UHF antenna mast set and in laying out perimeter lines.

Road Guides

The RSOP party posts guides at turns which drivers may not be able to easily identify by landmarks. The last vehicle from the parent unit must pick up the road guides. The RSOP party should not use equipment guides as road guides.

Equipment

The RSOP party must have sufficient equipment to ensure accomplishment of reconnaissance, layout, and security of the new position. The fire unit RSOP party normally requires the following items:

- Truck, cargo, 21/2- or 5-ton 6 x 6.
- Truck, utility, with radio set, AN/VRC-46.
- Detecting set, mine, portable, metallic and nonmetallic.
- Detecting set, mine, portable, metallic, AN-PSS-11.
- Alarm, chemical agent, automatic, portable, with power supply.
- Radiacmeter, IM-174/PD.
- Telephone set, TA-312/PT.
- Antenna group, RC-292 or equivalent.
- UHF antenna mast set.
- Cable, telephone, WD-1.
- Measuring tape.
- Marking stakes.
- M2 aiming circle.
- Equipment for preparation of coverage diagrams.
- Maps of the area of operations.
- Binoculars.
- Camouflage screen system.
- Individual weapons and ammunition for all personnel including M-203s for two of the equipment guides (reaction force).

•Individual protective and load bearing equipment.

•Machine gun, 7.62-millimeter with tripod.

•Night vision sight, individual served weapon, AN/PVS-4.

•Sufficient rations and water for three days.

•POL.

RECONNAISSANCE

En route to the new position, the RSOP OIC must determine whether the route is acceptable. The OIC considers —

- Overhead clearance.
- Route security.
- Roadway trafficability.
- Roadway width.
- Bridge classification.
- Fording sites.
- Areas available for dispersion.
- Primary and secondary sites.
- Cover and concealment.
- Easily distinguishable landmarks.

When reaching the access road leading into the new position, all RSOP personnel will dismount. All vehicles will disperse. Two equipment guides use the mine detectors to clear the access road, and two other guides survey the area for radiological and chemical contamination. Two security personnel provide security for the minesweeping and survey teams. RSOP party vehicles should not enter the position itself because the surveying and securing of the position must be done as covertly as possible.

When the OIC of the RSOP party determines that the position is secure and free of contamination, the remainder of the party moves forward; the security team, under the supervision of the NCOIC, establishes a defensive perimeter. Communications personnel establish wire communications between the CP site and the perimeter bunkers.

If the RSOP party encounters enemy forces en route to or at the new position, it must not become decisively engaged but must immediately break contact. When contact is broken, the OIC of the RSOP party advises the commander of the situation, and the commander issues a fragmentary order directing movement to another position. If chemical or radiological contamination is present, the RSOP party must move to a concealed position, notify the commander, and request decontamination, if necessary.

SELECTION

Selecting the position includes determining acceptability and position layout. There are a number of factors to be considered when selecting a position.

Determining Acceptability

The RSOP OIC considers many requirements and factors in determining the acceptability of the tentative position. Once the OIC determines that the position is suitable, he informs the parent unit over FM radio. The OIC must keep his transmission short and should transmit from a point at least three kilometers away from the new position. If the tentative position is unacceptable, the OIC may reconnoiter alternate positions. He may have authority to reconnoiter positions within a given distance to which the OIC may go for a suitable position. The distance is usually no more than five kilometers. The unit must notify the battalion S3 if it occupies an alternate position. The S3 will assess the impact of changing positions on the overall defense.

The RSOP OIC judges the tentative position on the basis of the following factors:

•Size of the area. When deployed, the AFP requires an open area measuring approximately 200 by 400 meters for maximum dispersion.

•Maximum allowable slope. The unit must emplace all items of the Hawk system on land with less than 10° slope.

•Field of view. An unobstructed radar field of view is extremely important within the sector of fire and ***especially along the PTL.***

•Field of fire. During emplacement, Hawk crew members program their launchers to shoot over or around obstructions. However, the programmed fire cutouts affect missile performance and lengthen emplacement times. Personnel must orient launchers toward the PTL and avoid obstructions, especially in the sector of fire.

•Concealment. Wood lines and built-up areas adjacent to the position can provide concealment for the missile storage and vehicle parking areas, mess area, administration area, bivouac area, and latrine.

•Surface firmness. RSOP personnel must ensure that the composition and drainage of the ground surface will support Hawk equipment in a level attitude. They must also consider the effect of weather on surface firmness for the site and its access routes.

Laying Out the Position

The RSOP OIC normally lays out the position. The primary considerations for position layout are —

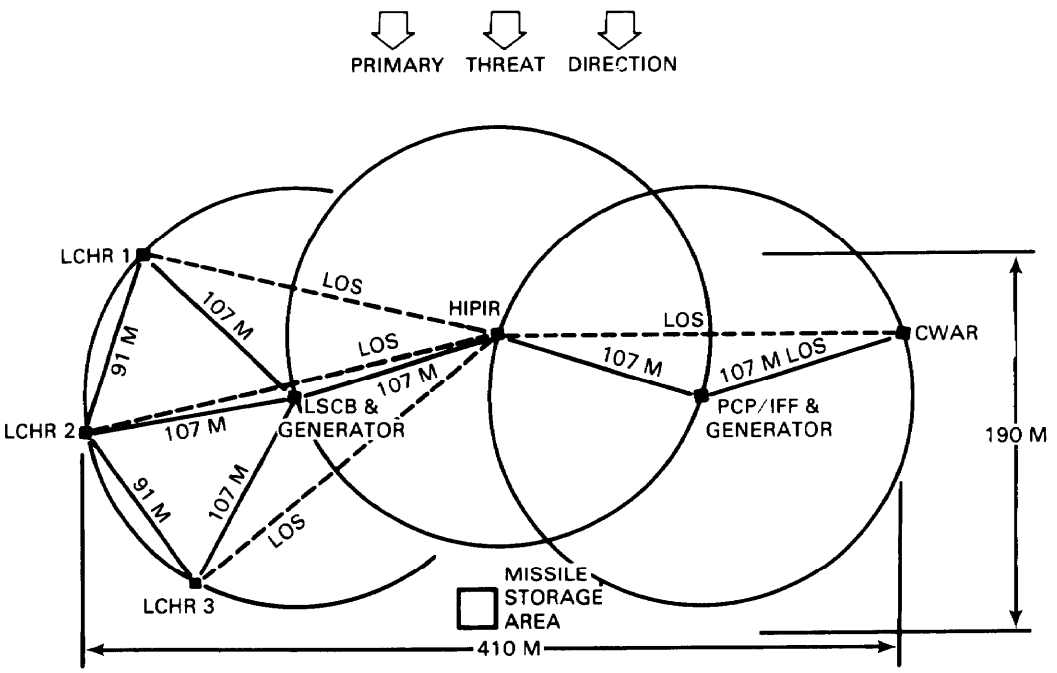
- Determining the direction of the PTL.
- Dispersing equipment.
- Determining cable lengths.
- Establishing line of sight for alignment.
- Selecting high terrain for the CWAR.
- Placing the PCP so the door faces away from radars.
- Placing generators and high-speed engines so they are out of line of sight with all CW radars.

Suggested tactical site layouts for the AFP are shown in the following illustration (continued on the next page). An additional factor is important when emplacing the AFP: the number of generators available for power. If the AFP uses two (or more) generators for power, any layout (or variation) shown in the illustration can be used. However, limiting the AFP to one power generator restricts emplacement possibilities (see Layout 3).

AFP Layouts 1 and 2 provide maximum exposure of all radars to the primary threat direction and minimize missile launch over the platoon area. These layouts require two power generators. Layout 3 reduces real estate required for emplacement and maximizes exposure of all radars to the primary threat direction (IFF can be remotely located from the PCP), but increases the possibility of missile launch over the platoon area. Layout 3 requires only one power generator.

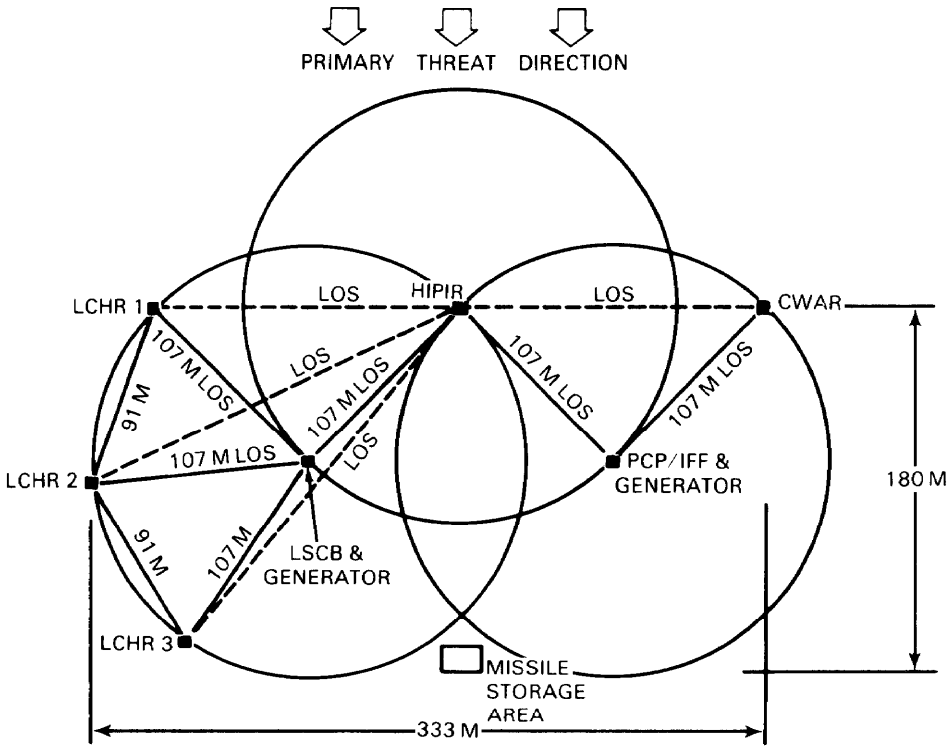
AFP LAYOUTS

LAYOUT 1

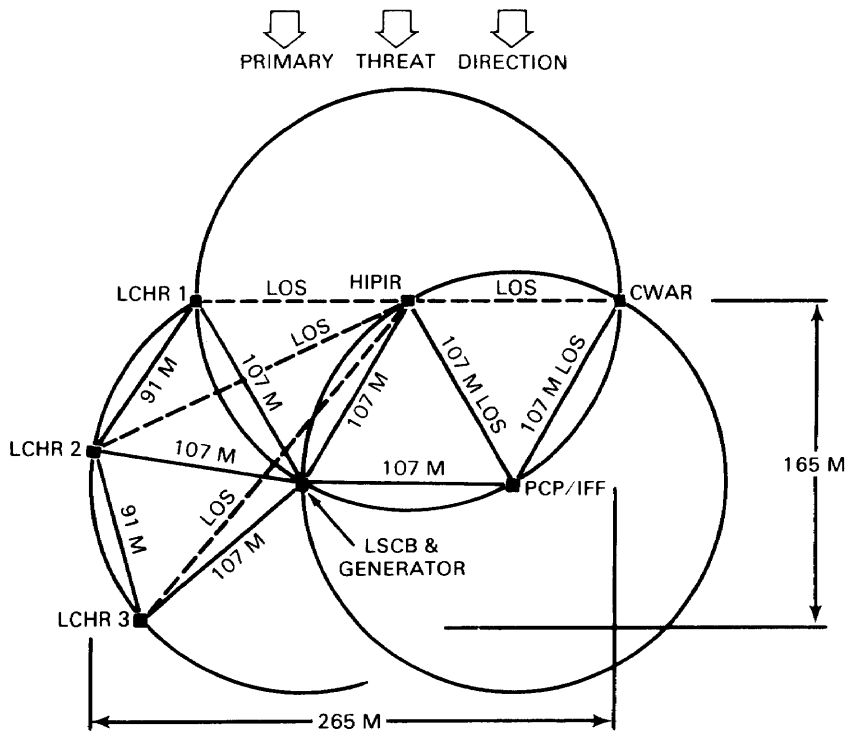


AFP LAYOUTS (continued)

LAYOUT 2



LAYOUT 3



During the position layout, the OIC establishes a KRP for the base piece of equipment (normally the HIPIR, the CWAR, or the IFF, in that order). A KRP is a prominent terrain feature or man-made object. The OIC should select two KRPs, one for day use and one for night use. He uses the M2 aiming circle to determine the azimuths to the KRPs based upon grid north. The KRP also provides a reference for the VGTR. The OIC also selects Stinger crew positions.

Prior to the arrival of the main body and after completing site layout, the RSOP OIC prepares a hasty radar coverage diagram for-the HIPIR. FM 44-90-1 provides instructions on how to prepare radar coverage diagrams.

CONDUCT OF UNIT MOVEMENT

At the time specified in an OPORD or fragmentary order, the Hawk unit begins moving.

PREPARATION FOR TRAVEL

The time during which the Hawk unit is out of the air battle begins with the time the unit is released from the AD mission and ends with completion of the "move and shoot" checks (TM 9-1430-1535-12-1). At release time, the unit prepares all equipment for travel and begins loading. Crew members hook up each vehicle to its assigned towed load and move out of the area in the designated order of march.

The preparation of equipment for travel is one of two operations in which the unit can save time. The amount of time the unit can save depends on the quality, type, and amount of training the unit has had. Units must practice preparation for travel regularly. Because most Hawk moves are conducted at night, units should train under blackout conditions. (See Chapter 5 for a discussion of night operations.) The battery commander or the platoon leader designates the order of march.

The order of march allows orderly access to the position based on new equipment sites and ensures the arrival of critical items of equipment first. (See Major Items of Equipment, Chapter 3.) Operators must maintain vehicle dispersion until the convoy forms. Prior to departure, the convoy commander briefs the drivers and air guards of all vehicles on the route of march, actions to be taken upon ground or air attack, convoy speed, planned halts, and actions to be taken should vehicles breakdown. During this briefing, the drivers receive strip maps showing the route of march.

ROAD MOVEMENT

Since Hawk units are vulnerable to attack during road movement, units should maintain radio silence to prevent the enemy from discovering and attacking the convoy. It is important for vehicle drivers to maintain open-column intervals and to know what actions to take under various combat conditions.

The RSOP OIC meets the convoy on its arrival at the new position ECP. The OIC escorts the commander or platoon leader to a position from which he can supervise the occupation and give direction.

OCCUPATION

The occupation of the position is the second operation in which the unit can save time. The unit must move quickly and smoothly into the new position. The unit is extremely vulnerable during occupation of the position. An equipment guide meets each vehicle at the ECP and leads it to its selected site. Units conduct night occupations under blackout conditions. For night occupations, equipment guides must have flashlights with blue or green lenses. (Lights with red lenses can be easily detected by infrared sensors.) The unit should maintain radio listening silence until it is ready to conduct engagements. Stinger crews occupy their firing sites as soon as light and weather conditions permit them to engage aircraft.

Once the main body reaches the new position, the unit focuses all its efforts on rapidly attaining a minimum engagement capability. To accomplish this, unit personnel have specific emplacement tasks. Teamwork is the key to becoming mission capable as rapidly as possible. Security forces are the only personnel who do not have emplacement tasks.

POSITION IMPROVEMENT

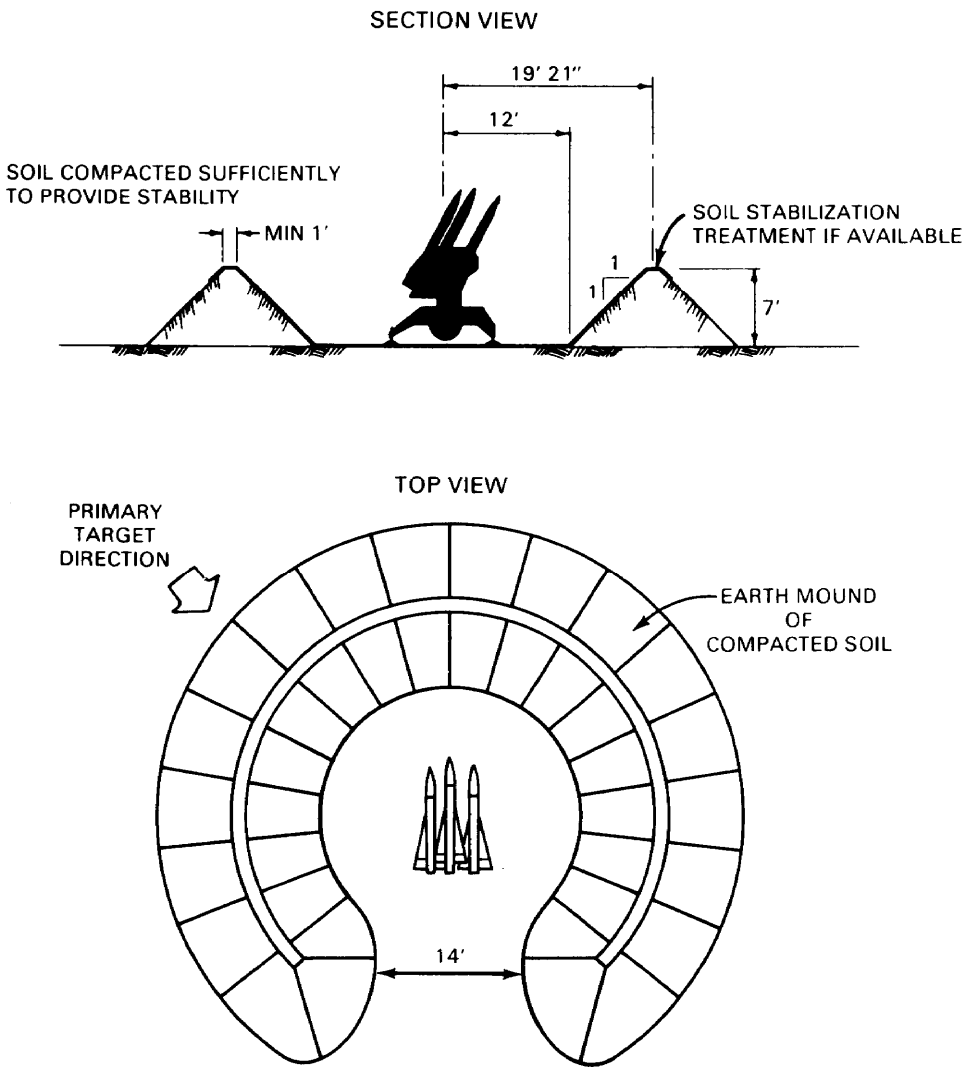
Position improvement begins only after the Hawk unit attains minimum engagement capability. Position improvement includes actions

ranging from erecting camouflage screens to constructing revetments. Position improvement continues as long as the unit remains in the position. Normally, positions are not occupied long enough to make the construction of revetments feasible, unless engineer equipment is readily available. The most important and effective means of improving positions is through camouflage and concealment of equipment and personnel to avoid detection. (See Chapter 5.) FM 5-20 provides a complete reference for all aspects of camouflage.

SURVIVABILITY

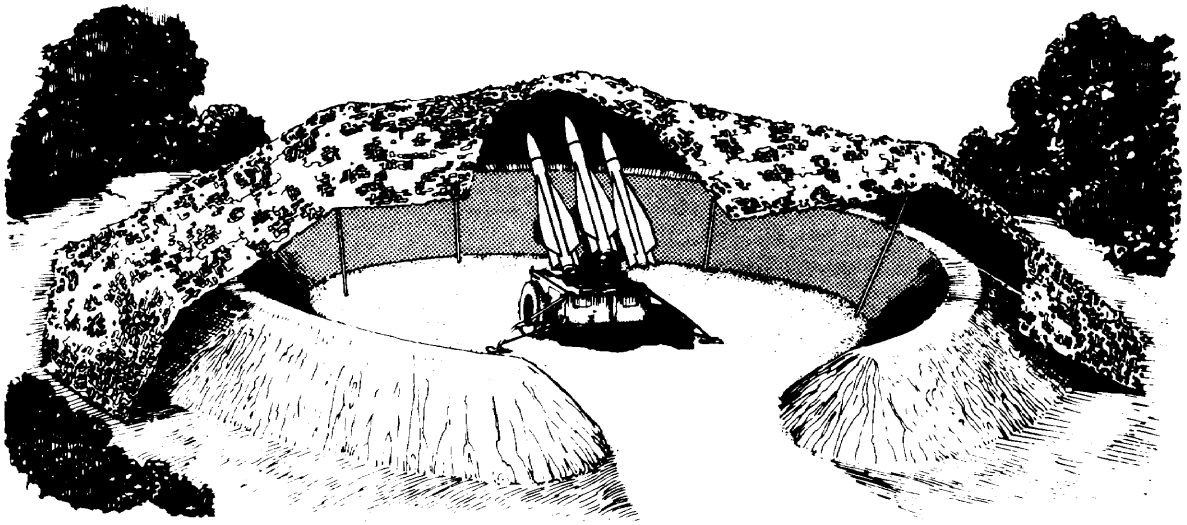
Conditions on the modern battlefield will expose Hawk equipment to small caliber rifle fire, bombs, ATGMs, and other weapons. Hawk units must protect radar systems, control systems, and firing systems. If time is available for their construction, parapets, walls, and dug-in positions will increase the survivability of the Hawk system. The illustration below (continued on the next page) is an example of a parapet constructed to protect a Hawk launcher.

PARAPET POSITION FOR HAWK LAUNCHER



PARAPET POSITION FOR HAWK LAUNCHER (continued)

EMPLACED LAUNCHER



Section II. Hawk Tactical Air Movement

MOVEMENT BY HELICOPTER

Hawk tactical air movement involves moving units from one area of the battlefield to another. Movement by helicopter can overcome —

- •Unfavorable terrain.
- •Lack of an adequate road network.
- •Natural or man-made barriers.

The Hawk unit commander must plan for and prepare the unit for movement by helicopter. The commander must know what Army aviation assets are available to support air movement. The corps commander must be aware that helicopter-movement of Hawk units is practical and could contribute significantly to the success of corps operations.

CONSIDERATIONS

Tactical air movement requires extensive coordinated support. Commanders must consider the factors discussed below before deciding to move a Hawk unit by air.

LIFT HELICOPTERS

Lift helicopters must be available to support and sustain the operation. Hawk air movement requires medium-lift helicopters such as the CH-47 Chinook. These are normally found in the transportation medium helicopter company in the corps aviation group. A Hawk AFP, the usual air movement unit, requires 15 lifts for mission-essential equipment. Units must move additional support equipment by vehicle to the new position or plan to resupply the unit by air. If the unit's prime movers are unable to reach the new position, the unit will require continued aviation support for subsequent moves. For detailed information on equipment weights and load planning, see FM 44-90-1.

THREAT

Elements moving by air risk destruction by enemy air and air defense forces. Friendly forces must have air superiority in the area of the tactical air move. Commanders must also consider the threat ground situation.

FRIENDLY FORCES

Air movement of a Hawk unit must not compromise the positions of nearby friendly units. Movement of the Hawk unit must not endanger the asset the unit is defending.

SUPPORT

The air movement unit must have logistic support and adequate security. The platoon's ground mobility and self-defense capabilities are very limited after occupation of the new position. Unless towing vehicles are made available, equipment must remain where it is unloaded. Additionally, a unit that moves by air usually requires support by air. Without subsequent air support the unit will usually be unable to sustain operations.

UNIT EXPERIENCE

The unit must be able to prepare for air movement in a reasonable amount of time. The time required depends directly on the training and experience the unit has had in air movements.

Air movement requires a great deal of training and practice to make the movement rapid and to prevent damage to equipment or injury to personnel. Air movement of an inexperienced unit under combat conditions could result in mission failure, personnel injury, and serious equipment damage.

AIR MOVEMENT PLANNING

A tactical air movement involves the efforts of several agencies at various command levels, The success of the operation depends on detailed planning and close coordination. A Hawk tactical air movement requires at least as much planning and coordination as any other tactical movement.

The objective in Hawk air movement planning is to have the unit ready to assume the AD mission at a specific position by a specific time. The backward planning sequence is used to accomplish this, Planning starts from the time the unit must be at battle stations and is planned backward to mission release time. Planning must include each of the following eight steps in the air movement sequence:

- •Selection and notification of unit.
- •Reconnaissance.
- •Marshalling.
- •Advance party insertion.
- •Loading.
- •Movement.
- •Unloading.
- •Occupation of position.

SELECTION AND NOTIFICATION

The battalion commander normally selects the AFP to move and notifies the battery commander. He requests aviation and pathfinder support from higher headquarters and prepares the OPORD.

RECONNAISSANCE

The S3 selects tentative positions for the AFP, and the RSOP leader selects equipment sites. The RSOP party usually moves to the new position by air (UH-1 or OH-58). To limit the reaction time of enemy forces as much as possible, the unit tries to conduct the RSOP no more than 90 minutes before the movement. When available, a pathfinder also goes on the reconnaissance to determine that aircraft can safely unload equipment within the LZ.

MARSHALLING

Marshaling is the initial preparation for air movement. Equipment is prepared for transport and the PZ is prepared for the arrival of aircraft. The unit designates AMCOs at the battalion (usually an assistant S3) and at the batteries. AMCO duties are listed in FM 44-90-1. The battery AMCO, usually the XO, assists the AFP in marshaling. The AMCO must be familiar with the aircraft characteristics. The AMCO assists the commander in air movement operations and training.

Pathfinder teams can assist the unit in marshaling. The pathfinder team has six

members: a team leader, an assistant team leader, two senior pathfinders, and two pathfinders. All members are trained in air movement operations. However, pathfinders are not always available to support the unit air movement, and units must be prepared to perform their functions. Pathfinders aid the unit by —

•Providing navigation aid and control of aircraft in and around the PZ and the LZ.

•Providing advice and some manpower to help prepare and position personnel and loads for movement.

•Selecting safe PZs and LZs.

•Approving drop-off spots. (Equipment siting is still the responsibility of the RSOP OIC.)

ADVANCE PARTY INSERTION

The advance party consists of selected unit personnel and equipment. It maybe the RSOP party with some augmentation of personnel and some changes in equipment. It leaves the PZ ahead of the main body. The advance party establishes a perimeter defense and prepares to receive the unit. The RSOP party selects and marks a site for each item of equipment as described for road movement earlier in this chapter.

LOADING

Loading of equipment begins when the lift helicopters arrive at the PZ. Unit personnel act as hookup teams, PZCs, and controllers. Major items of equipment are normally slung from aircraft as external loads.

Aircraft capabilities vary because of cargo weight, wind direction, wind velocity, temperature, site elevation, and employment techniques. The supporting aviation officer must be familiar with the true capabilities of the aircraft.

MOVEMENT

Movement time to the new location depends on distance and the number of aircraft available. The following illustration provides approximate movement times which can be used for planning the movement of a Hawk AFP.

UNLOADING

Unloading begins as soon as the aircraft arrive at the LZ. Unit personnel arriving with the main body help the advance party unload the aircraft.

OCCUPATION OF POSITION

All actions in this phase of the air movement are the same as those for occupation of position after a road movement. FM 44-90-1 provides a complete discussion of all phases of a Hawk tactical air movement.

APPROXIMATE AIR MOVEMENT TIMES

EVENT	APPROXIMATE TIME (IN MINUTES)
PREPARATION FOR MOVEMENT	75
MOVEMENT TO PZ	FUNCTION OF DISTANCE
LOADING	35
AIR MOVEMENT TO LZ	FUNCTION OF DISTANCE AND NUMBER OF AIRCRAFT
UNLOADING	35
PREPARATION FOR BATTLE STATIONS	45

Section III. Hawk Strategic Air Movement

PLANNING

Strategic air movement of Hawk units involves detailed planning in all aspects of control, coordination, preparation, and execution. Close control and interservice coordination are absolutely essential. This section describes planning for transport aircraft movement. A detailed description of the necessary air movement preparation and air movement execution is in FM 55-12.

CONTROL AND COORDINATION

Air movement operations require close control of all participating units. The Air Force exercises overall control of the airlift operation at the departure and arrival airfields. Airlift resources, at all times, remain under the operational control of the Air Force. The resources of the deploying unit are initially under the control of the unit commander. Control of resources passes to the DACG at the Army, Marine Corps, or Navy alert holding area, or the Air Force marshaling area. Finally, control of resources passes to the Air Force at the loading ramp area ready line. Control of the resources returns to the unit commander upon release by the AACG at the arrival airfield. The Air Force will establish AOCs at both the departure and arrival airfields. The AOC provides a means to control and supervise the operation. It provides a jointly manned facility for the exchange of information on the progress of the operation. All information affecting the loading and offloading operations will flow through the AOC. Each of the principal representatives in the ACO will have continuous communications with the activities of his organization. A description of the functions and responsibilities of the key elements necessary for Hawk strategic air movement follows.

DEPARTURE/ARRIVAL AIRFIELD CONTROL GROUPS

The mission of the DACG is to coordinate and control the outloading of units for deployment or redeployment. The DACG should be a provisional unit. Personnel and equipment resources for the DACG come from units or activities which will not accompany the transported force. The DACG must be manned for one-, two-, or three-shift (24-hour) operations, depending on the mission.

The mission of the AACG is essentially the same as that of the DACG, except that the AACG'S primary concern is the off-loading operation. If possible, the AACG is at the arrival airfield before the lead elements of the force; otherwise, it moves to the arrival airfield in the lead elements of the transported force.

The structure of the DACG and AACG must provide essential support for the transported force. As a minimum, each group consists of a command and operations element and other administrative and support personnel as determined by the size and scope of the operation. Commanders of units and installations who have or anticipate having a contingency mission involving an air movement operation should continuously identify, maintain, and train the personnel who will staff a DACG or AACG. The commanders of such units and installations must ensure that the units can fully carry out their air movement responsibilities on short notice. When practical, the DACG and AACG should conduct a survey of the marshalling and outload areas. The survey will provide current and accurate information on facilities available and support required.

All personnel responsible for supervision of the outloading must be thoroughly familiar with the loading procedures applicable to the types of aircraft employed. Personnel should have formal training in air movement operations. A formal training course, titled ***Strategic Mobility Planning Course,*** is available on a regular basis at the US Army Transportation Shool, Fort Eustis, Virginia; ***LFTC PAC Aircraft Load Planning Course ALP 35558*** is available at Coronado, California; and ***Military Airlift Command MAC Affiliation Program Airlift Planners Course*** is presented upon request by MAC combat support branches.

AIRLIFT CONTROL ELEMENT

The ALCE is part of the Air Force C^2 system. The mission of the ALCE is to plan airlift control operations for a given base, to survey the facilities of the base, and to control, coordinate, and report airlift operations at that base. The ALCE operates when required at departure airfields, while en route, and at arrival airfields used by the airlift units.

The ALCE maintains operational control over Air Force airlift units and all airlift aircraft participating in an operation at the ALCE site. The ALCE coordinates all Air Force operational aspects of the airlift mission. It is responsible for aircraft movement control, communications, technical supervision of loading and offloading operations, aeromedical evacuation, and marshaling of aircraft. It provides continuous liaison with all interested agencies to ensure that the airlift operation proceeds according to plan.

In situations where a complete ALCE is not required, an MST may perform the air movement coordinating activities of the ALCE. The MST is relatively small, but it is capable of performing aerial port maintenance and related support functions.

HOME STATION INSTALLATION

For Army and Air Force units, the home station installation, in coordination with the installation transportation office or traffic management office, is responsible for planning and executing the physical movement of its units. The installation ensures that each organizational element establishes a unit assembly or mobility processing area and provides liaison to the DACG well in advance of the unit's move. Plans should also provide for similar liaison to the AACG.

PLANNING FOR MOVEMENT BY TRANSPORT AIRCRAFT

There are three functional areas of planning. These areas are discussed in the following paragraphs.

MISSION GUIDANCE

The deploying unit commander and all supporting forces require the following information to prepare for an airlift operation:

- Mission.
- Forces (deploying and supporting).
- Location of departure airfield and arrival airfield.
- Departure date.
- Projected closure time of air movement.
- Liaison, including the names, locations, and telephone numbers of the deploying unit commander(s) and commanders of DACG, AACG, ALCE, and other support activities.
- Mutually agreed upon time and location for the joint planning conference. FM 57-1 contains planning guidance for airborne and airlift operations.

INITIAL PLANNING

Army actions necessary to prepare the deploying unit and support elements to participate in the joint planning conference are outlined below.

The deployment planner or deploying unit performs the following:

- Identifies the number of personnel and type and quantity of cargo and equipment to be moved.
- Establishes priorities for arrival.
- Establishes liaison with the supporting ALCE, DACG, AACG, and other support activities.
- Identifies cargo or equipment in its proposed shipping configuration which, because of its size, weight, or fragile or hazardous nature, may be denied loading aboard Air Force aircraft or will require special equipment or special handling.
- Identifies cargo or equipment that is hazardous or sensitive and requires special preparation (TM 38-250).
- Requests technical assistance for preparing equipment and training personnel from the MAC airlift wings and aerial port units or ALCEs.
- Plans and coordinates staff assistance in the areas of administrative support, unit

movement training, air movement planning, logistics, and maintenance support. Training of the deploying unit should include familiarization with the standard safety practices of operation in and around aircraft.

•Appoints a mobility or unit movement officer and ensures the movement folder is current.

•Develops a traffic plan for movement to the departure airfield.

•Ensures that trained load teams are prepared to carry out their responsibilities.

•Complies with US and foreign border clearance requirements and procedures, if applicable.

The DACG –

•Validates the number of personnel and type and quantity of cargo to be moved.

•Establishes the time frame during which outloading will be accomplished.

•Confirms locations of the departure airfield(s) and marshaling area(s) with the installation or base commander and the deploying unit.

•Determines that the departure airfield's logistical and administrative facilities are available to the DACG and outloading unit.

•Develops the organizational structure and staffing including specially skilled personnel, administrative requirements, load team personnel, and communications prior to the local joint planning conference.

•Determines user support equipment requirements (MHE, POL, maintenance contact teams, inspection area, lighting, weighing devices, pusher vehicles, and ADP facilities).

•Establishes liaison with deploying unit and other supporting activities.

•Coordinates with the ALCE to establish DACG training requirements.

•Coordinates US and foreign border clearance requirements and procedures.

The AACG –

•Coordinates with the ALCE prior to the arrival of inbound aircraft to determine support requirements.

•Ascertains the time frame in which offloading will be accomplished.

•Determines location of arrival airfield and release and holding areas.

•Determines logistical and administrative facilities available to the AACG and deployed units at the arrival airfield.

•Develops a tentative organizational structure and staffing including special personnel skills, administrative requirements, load team personnel, and communications before the joint planning conference.

•Establishes liaison with the supported unit, the ALCE, and other supporting activities.

•Coordinates with the ALCE to establish AACG training requirements.

JOINT PLANNING

A series of local joint conferences are required during the planning phase. The conferences are necessary for close coordination and to ensure a clear understanding of responsibilities. As a minimum, a joint planning conference will be held as soon as possible after receipt of the air movement order or directive. A final coordination conference will be held immediately before initiation of the move. Key personnel from all participating elements should attend these conferences. These personnel must be able to resolve problems and make decisions for their organizations, including interface requirements. The formal conferences do not rule out the need for continuous coordination throughout the planning cycle. Planners must integrate OPSEC and counterintelligence planning in all aspects and phases of the overall movement plan.

Either the deployment planner or the deploying unit —

•Verifies whether the destination installation or the deploying organization(s) will establish the AACG.

•Provides a consolidated listing of movement priorities by subordinate units (troop list).

•Provides a list of weights and dimensions of the equipment of each deploying unit. Planners use TB 55-46-1 as a planning reference when more precise information is not available.

Appropriate Army transportability guidance technical manuals and field manuals in the 55 series provide additional information concerning transport aboard US Air Force aircraft.

•Identifies items of equipment which are special transportability problems due to weight, size, unusual design, configuration, or modification, and hazardous or palletized cargo that may require waivers and special handling or loading procedures (TM 38-250).

•Determines requirements for type and source of materials used to restrain cargo in vehicles and trailers. Reviews inspection procedures and documentation requirements for hazardous cargo and organizational equipment which requires special handling (TM 38-250).

•Coordinates procedures for transporting individual weapons, ammunition, and equipment.

•Determines shoring requirements, ensures its availability prior to loading, and establishes disposition procedures.

•Coordinates US and foreign border clearante requirements and procedures.

The DACG –

•Determines any special requirements for personnel and equipment, including equipment weighing, pusher vehicles, security, and equipment washing stations.

•Confirms unit deployment schedule.

•Coordinates with the ALCE on the types and number of aircraft available.

•Validates shoring and floor protection requirements and ensures availability of dunnage.

•Coordinates the use of departure airfield facilities.

•Confirms coordination contacts and determines other liaison requirements.

•Obtains list of unit equipment and materiel with weight and dimensions of each item. Identifies problem items for load planning and coordination with ALCE.

•Finalizes DACG organization, including aircraft load teams and training requirements.

•Reviews with ALCE the US and foreign border clearance requirements and procedures.

The AACG –

•Determines special AACG requirements for personnel and equipment.

•Confirms arrival schedule.

•Confirms type and number of aircraft in the movement.

•Confirms size and type units.

•Confirms coordination contacts.

•Coordinates the use of arrival airfield facilities and release and holding areas.

•Obtains list of unit materiel to be off-loaded.

•Finalizes AACG organization, including aircraft load teams and training requirements.

•Reviews US and foreign border clearance requirements and procedures with ALCE.

•Coordinates the requirements for special training or load planning assistance for the DACG, the AACG, and deploying unit(s).

•Coordinates dates, times, and places for air movement training.

•Determines the requirements for MHE, weighing equipment, pallets, cargo nets, and other equipment as necessary.

•Determines the need for load team supervisors and load inspectors.

•Confirms coordination contacts.

•Provides a briefing on the tentative plan of operations, including a flow schedule, aircraft parking, communications plan, and safety requirements.

•Identifies other operational problems.

DEPLOYMENT UNDER WARTIME CONDITIONS

Deploying units and military airlift command must optimize the use of all MAC aircraft during peacetime training, exercises, and contangencies. During wartime deployments, the use of MAC airlift resources becomes critical. MAC will improve the use of its air fleet by increasing the productive use of all aircraft. The user must ensure that aircraft provided for movement are loaded to the maximum extent possible.

The SADIP has been developed to get the best possible use out of the weight- and volume-carrying capabilities of the aircraft. Principles of the SADIP are directly applicable to wartime deployments. A MAC declaration that wartime emergency rates are in effect will implement the following procedures:

•The DACG will coordinate with the ALCE to determine if the ACL for aircraft has been increased. The DACG will make every effort to attain the specified emergency ACL.

•Units will continue to load vehicles and equipment to assure aircraft safety in flight. Waiving the six-inch dimensional clearance between loads will allow compressed loading of the aircraft. This will permit loading of equipment such as two 1/4-ton, Ml51 trucks-abreast in the C-141 aircraft.

•Units will consolidate lighter equipment which can be stacked on top of other prime movers to compress loads; that is, a 1/4-ton trailer may ride on top of the rear of a 1/4-ton truck, provided it is shored and secured to the floor of the aircraft. The load must not exceed the floor-bearing capacity of the aircraft and must conform to size and shape limitations.

•Units will load cargo vehicles such as 1/4-ton and 5-ton trucks with unit equipment and cargo to the maximum highway (improved road) capacity of the vehicle. The major constraint is the same as stated above.

The primary objective of an emergency airlift deployment is to move ADA combat forces into an area of operations as rapidly as possible using the minimum number of aircraft. The requirement for detailed coordination between the deploying units/DACG and Air Force/MAC counterparts cannot be overemphasized. Deploying units must use available aircraft to their maximum capacity and capability.

CHAPTER 7

Communications

Reliable, effective, real-time communications provide the key to effective C^2 of the Hawk battalion. Several communications subsystems and nets provide the commander with the capability for C^2. The two basic categories of communications are voice and data. Voice communications are carried over UHF, FM, and AM radio, as well as over land line systems. Data communications nets pass real-time digital data between the AFP and the battalion FDC. The real-time data link uses UHF radios only.

Reliable communications enable the commander to effectively control the air battle and maintain contact with support forces. Communications also assist in maintaining command, administrative, and logistical links with higher, subordinate, and adjacent units.

EQUIPMENT AND CONFIGURATIONS

UHF, FM, and AM radios provide voice communications for the Hawk battalion. The Hawk battalion also uses wire communications, usually after a unit is emplaced. The paragraphs below describe these forms of communication.

ULTRAHIGH FREQUENCY

UHF radio is the primary medium for both internal and external communications for the Hawk battalion. The UHF radios provide high quality voice and data transmissions. UHF radios —

- Operate from point to point.
- Are highly directional.
- Have a multichannel capability.
- Can be made secure.

UHF nets connect the battalion to the AFP and to the ADA brigade. UHF communications assets available to the battalion consist of the following radio sets:

- AN/GRC-103. The AN/GRC-103 is mounted in the platoon command post and is used to establish direct communications between the PCP and the FDC.
- AN/TRC-145. The AN/TRC-145 is a terminal set consisting of two AN/GRC-103s. It is used to terminate the platoon-to-battalion FDC link at the FDC.
- AN/TRC-113. The AN/TRC-113 is a radio relay set used to relay signals when terrain precludes line of sight between the PCP and the FDC. The AN/TRC-113 relays are normally

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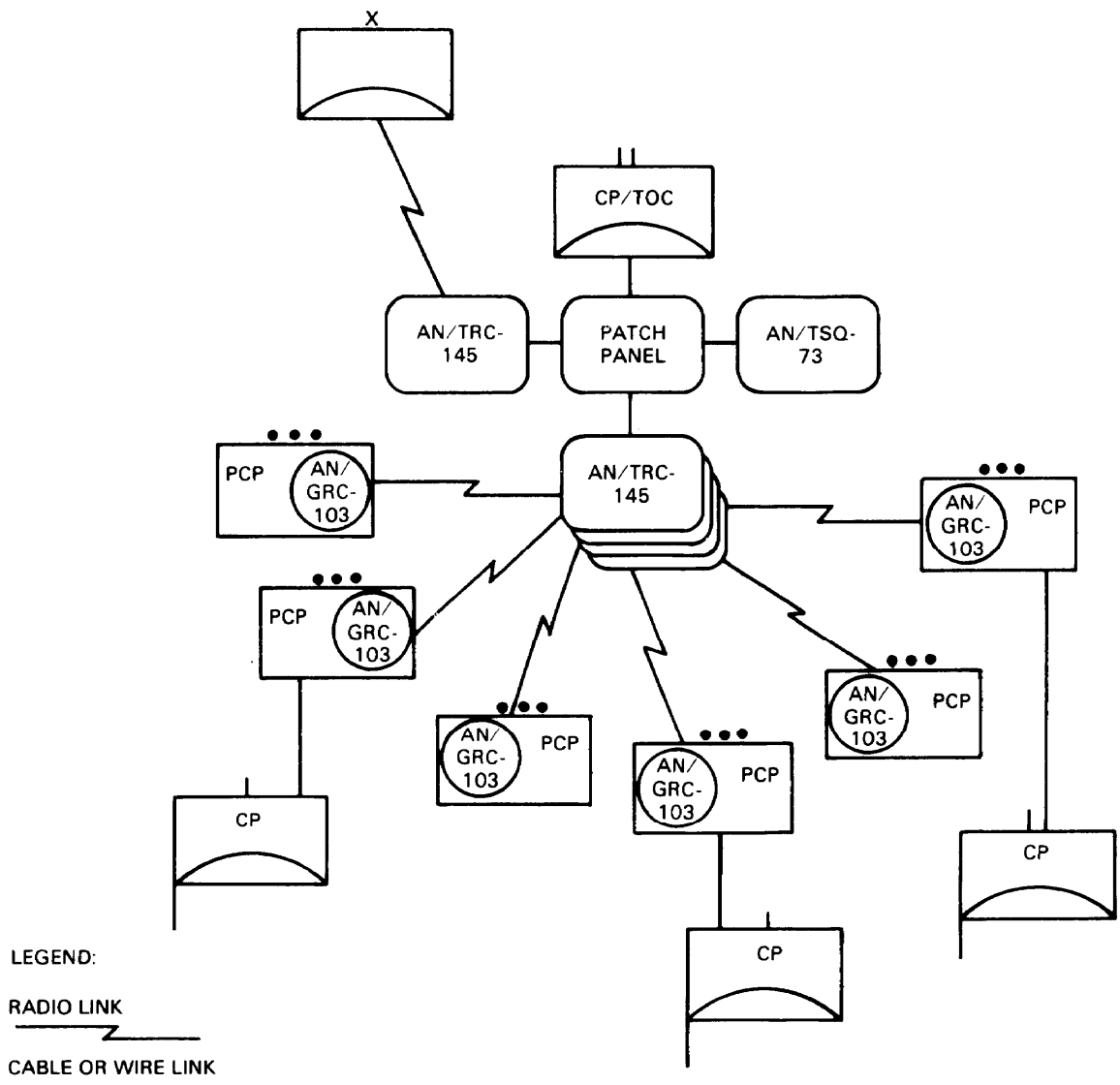
authorized by TOE for the battalion FDC at the rate of one per firing battery.

The battery CP ties into the UHF voice circuits through one of its two PCPs. The battalion CP/TOC does essentially the same thing, but it does so through the AN/TRC-145 via the patch panel as shown in the following illustration.

HAWK BATTALION UHF COMMUNICATIONS CONFIGURATION



FREQUENCY MODULATED RADIO

FM communications capabilities generally back up UHF voice nets. The battalion uses standard Army FM radios for secure voice communications at medium ranges. These radios operate in command nets at all echelons and in control nets when other means are not practical or operational. They are also used in administrative and logistical nets within the Hawk battalion.

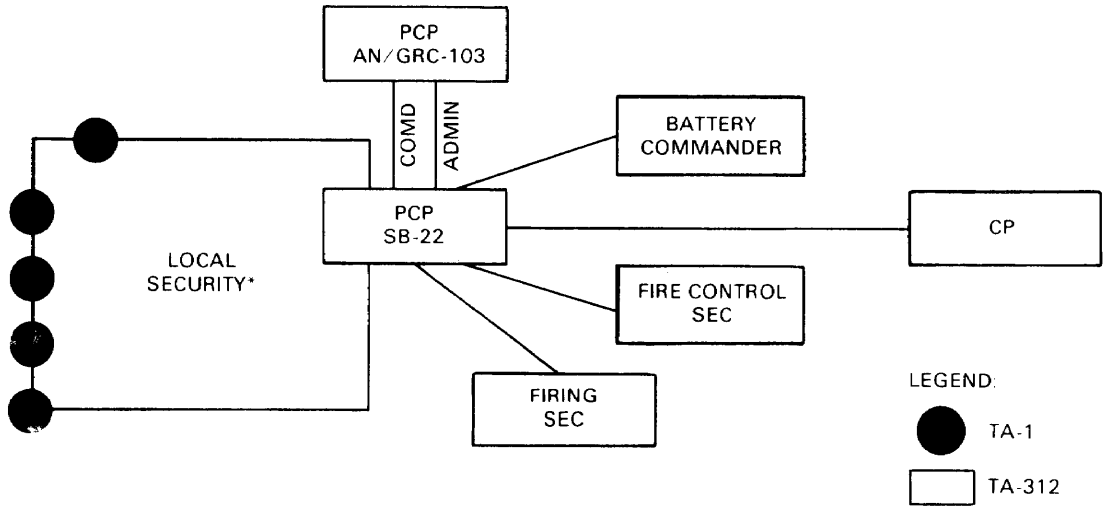
AMPLITUDE MODULATED RADIO

AM radio also backs up UHF voice nets. Standard Army AM radios are used for voice communications at medium to long range and for teletypewriter operations.

WIRE COMMUNICATIONS

Wire is the primary means of intrabattery communications after a unit is emplaced. Wire does not produce an RF signature, but users must be aware that wire is not secure. The illustration below depicts the configuration of the wire communications nets for an AFP which is collocated with the battery CP.

TYPICAL PLATOON WIRE NETS



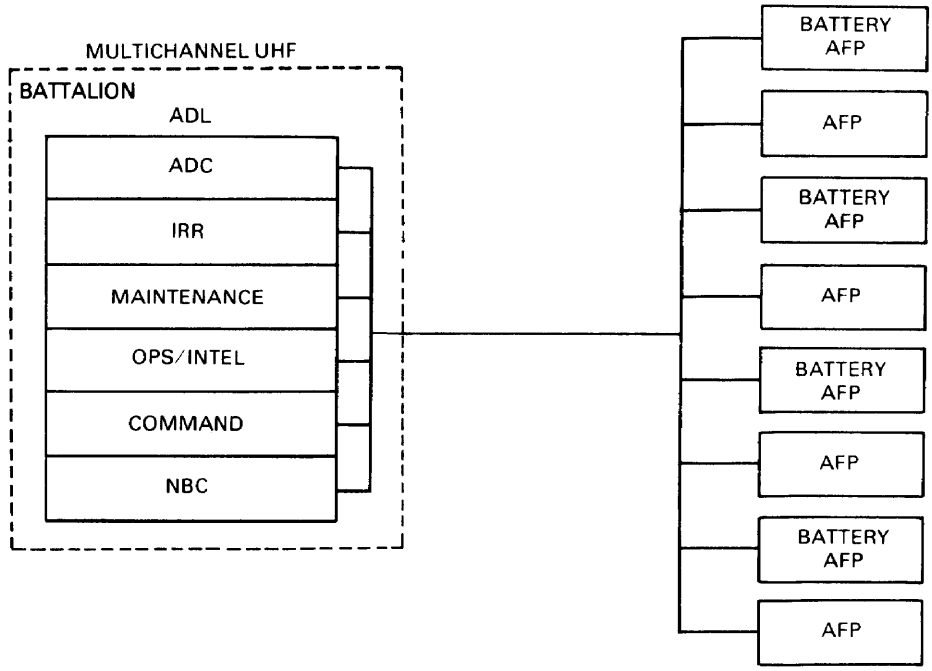
Note: Varying numbers as required.

MANAGING THE AIR BATTLE

The need for integration of air defense and aviation assets is critical for all airspace users. The airspace over the combat zone is used by all friendly forces taking part in an operation. Airspace management is essential to the effective and safe conduct of an operation. The primary objective of airspace management is to promote the safe, orderly, and expeditious use of airspace with maximum combat effectiveness and survivability. Close coordination is absolutely necessary in the combat operations of all airspace users: the Air Force, Army aviation, ADA, and indirect fire support elements. If ADA is to be effective, hostile criteria, ROE, and minimum risk procedures (for example, IFF and MRR) must be provided to aircraft, ADA, and field artillery fire units and must be closely monitored for necessary changes.

Multichannel UHF communications provide the means for integration of airspace use. The three primary air battle control circuits are the ADC net, the ADL, and the IRR net. All multichannel UHF circuits are normally secure. The usual configuration for these nets is shown in the Battalion UHF Nets illustration on page 7-3.

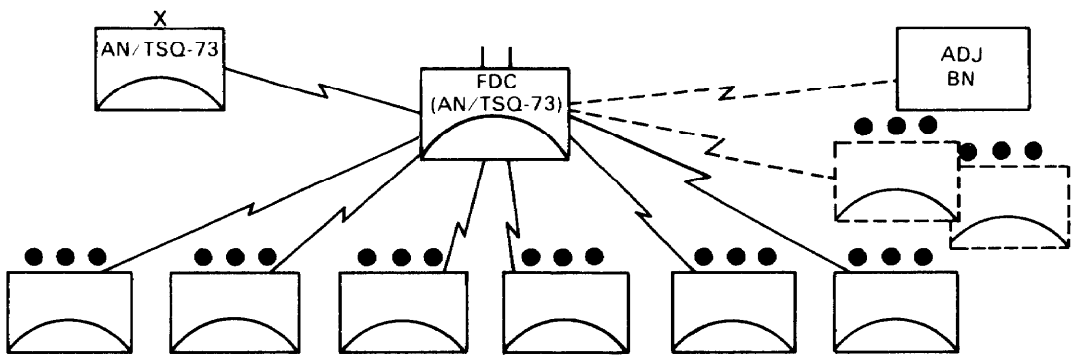
BATTALION UHF NETS



AIR DEFENSE CONTROL NET

The ADC net is the voice exchange net for tactical information not passed by ADL. It also becomes the primary circuit for control of the air battle when the ADL is not operational or when operating in the manual mode. An AM or FM net provides the backup, as shown below.

BATTALION AIR DEFENSE CONTROL NET AND BACKUP



LEGEND:
PRIMARY — UHF
BACKUP — AM OR FM
ADDITIONAL LINKS
ADDITIONAL AFPs
IN THEATER HAWK BN

Note: Relays placed where required by terrain.

Typical information earned on this net from the battalion to the AFP includes the following:

- Changes in DEFCON.
- Method of control or method of operation — centralized, decentralized, or autonomous.
- WCS — weapons hold, weapons tight, or weapons free.
- Changes in defense priorities.
- Changes in hostile criteria.
- Fire control orders — engage, cease fire.

Typical information carried in the ADC net from the AFP to the battalion includes the following:

- Acknowledgement of receipt of orders.
- Status of ongoing target engagements.
- Explanation of fire unit status.
- After action reports.

AUTOMATIC DATA LINK

The ADL passes real-time digital information concerning the conduct of the air battle among computers at higher level control facilities, the battalion FDC, and the firing batteries and platoons. Target position information, target identities, system status, missile count, and firing commands pass from higher to lower headquarters and vice versa on this net. The ADL net is functional only when the UHF is operational. FM and AM radios cannot carry the digital data. (See Chapter 4, FDC Operations, for a discussion of ADL.)

INTELLIGENCE RADAR REPORTING NET

The IRR net passes air defense intelligence information, primarily aircraft early warning, and changes in minimum risk procedures. An AM SSB net provides the backup. Its configuration is the same as that of the ADC net pictured on page 7-3.

ESTABLISHING THE COMMAND AND OTHER NETS

Long distance, communications are essential for Hawk battalion operations. The Hawk battalion may find it necessary to conduct operations over an extensive area (80 kilometers wide and 50 kilometers deep). Extended distances greatly complicate command, logistical, and administrative functions and place great reliance on effective communications. The multichannel UHF system is the primary system for all of the communications nets discussed below, with the exception of the NBC net and the SHORAD FM net. An illustration of the UHF system configuration is on page 7-1.

COMMAND NET

This net is a direct UHF link connecting the brigade commander, the battalion commander, the battery commanders, and the platoon leaders. It is used to pass command orders, to closely coordinate movement, to conduct reconstitution, and for damage control. The command FM net backs up this UHF net as well as the operations and intelligence UHF net. The illustrations on page 7-5 depict typical battalion and battery command net configurations.

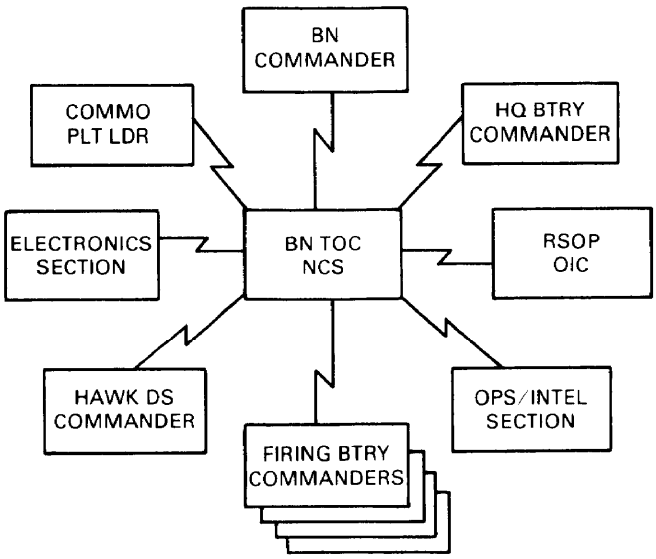
OPERATIONS AND INTELLIGENCE NET

This net serves the brigade and battalion S3 and S2 staffs and the battery commanders and platoon leaders. They may use this net to pass information such as movement instructions, changes in defended areas or points, intelligence, and SITREPs. An FM net backs up both this and the command net. The command and administrative radio teletype furnishes hard copies of various reports and requests that pass between the brigade and the battalion. This circuit is often called the MPL.

SHORAD NET

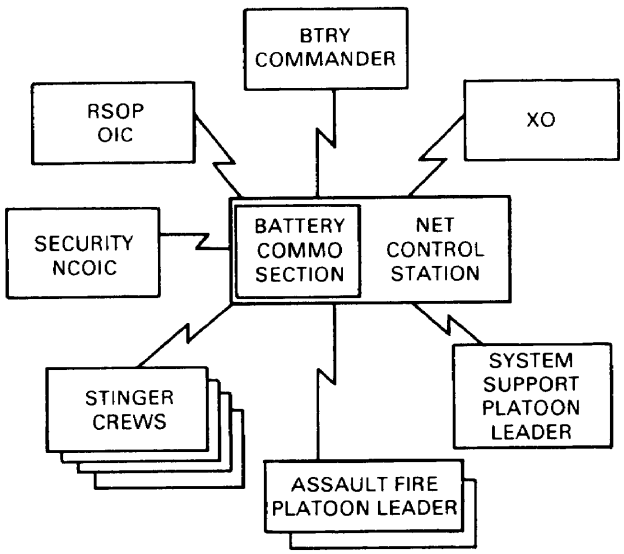
This is a battery FM net used to control the fire unit's organic Stinger crews. It is used to pass location information, early warning from the Hawk system, engagement results, and WCS between the PCP and the Stinger crews.

TYPICAL (UHF OR FM BACKUP) BATTALION COMMAND NET



Note: Relays placed where required by terrain.

TYPICAL (FM RADIO) BATTERY COMMAND NET



ADMINISTRATIVE AND LOGISTICAL NET

This net carries administrative and logistical traffic such as information on POL, conventional spare parts, ammunition, and personnel replacements. An FM net normally backs up the administrative and logistical net. The illustration below depicts a typical battalion net.

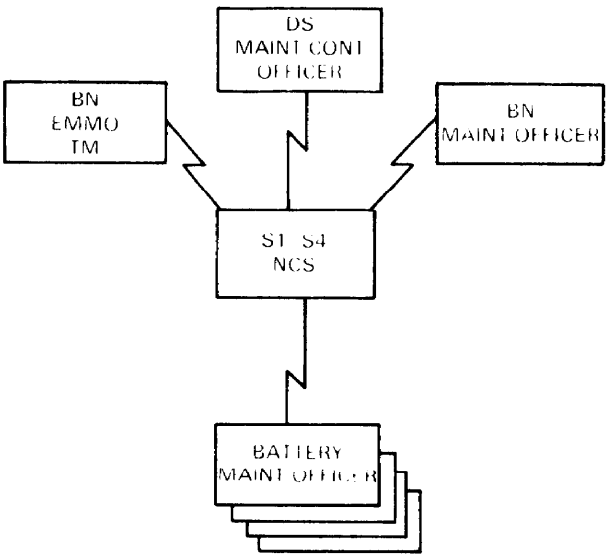
NUCLEAR, BIOLOGICAL, AND CHEMICAL NET

This circuit is used to exchange information concerning NBC related intelligence, nuclear detonations, and reports of chemical attacks. No dedicated backup is provided for this circuit.

MAINTENANCE NET

This net facilitates maintenance of the battalion's mission capability by connecting the DS unit and the AFPs to pass such information as requests for Hawk-peculiar repair parts, maintenance assistance, and consultation. There is no dedicated backup net for this circuit; however, the FM administrative and logistical net could be used.

TYPICAL BATTALION ADMINISTRATIVE AND LOGISTIC NET (FM RADIO)



Note: Relays placed where required by terrain.

MAINTAINING CONTACT WITH OTHER UNITS

An air defense liaison net provides communications with supported or supporting units. The ADFC officer uses an FM net to pass information such as WCS, maneuver unit position, and, more importantly, the disposition and intentions of both friendly and enemy troops. This net may also be used to request indirect fire support and to coordinate logistical and medical support with local maneuver units. See page 3-3 for the ADFC officer's functions and location.

CONTINUING OPERATIONS

If all communications between the AFP and the battalion fail during an air battle, the AFP assumes autonomous operations. Commanders and TCOs must vigorously pursue all efforts to reestablish communications, while at the same time prosecuting the air battle. TSOPs influence exactly how the air battle is fought in the absence of communications, but at no time should an operational AFP withdraw from the fight simply because it has lost communications.

Units should anticipate failure of communications between the ADA brigade and the battalion. Directives and SOPs must address actions to be taken in that event. The following are some of the options that are open to the battalion commander:

- Operate autonomously.
- If directed, assume the role of master battalion (if the loss of UHF communications was external to the battalion).
- Attempt to establish contact through local ground forces.
- Attempt to establish communications directly with the CRC or TAOC.
- Attempt to communicate over land lines.

The Hawk battalion cannot, however, expect to be as effective without communications as it is with them. The value of the employment guidelines and principles discussed in Chapter 5 depends in large measure upon the battalion's ability to command and control its fire units through reliable communications.

CHAPTER 8

Nuclear, Biological, and Chemical Warfare

This chapter implements STANAG 2103, Edition 5, Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas (ATP-45) and STANAG 2112, Edition 3, Radiological Survey.

Hawk commanders must fully integrate NBC defense techniques into all aspects of operational planning and execution. This chapter describes the NBC effects, defense measures, and decontamination techniques peculiar to Hawk operations.

Section 1. NBC Effects

NUCLEAR WEAPONS EFFECTS

Threat forces plan for the use of nuclear weapons in both offensive and defensive operations. Threat forces will combine nuclear attacks with conventional fires and air attacks and will use ground forces to rapidly exploit advantages. Threat forces will also use nuclear weapons with chemical and biological agents. Threat nuclear tactics in the offense and defense will complement conventional tactics.

Primary nuclear targets for threat attacks are —

- Nuclear delivery assets (air, artillery, missiles, and rockets).
- C^2 elements of divisions and higher echelons.
- Prepared defensive positions.
- Reserves and troop concentrations.

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Nuclear weapons provide much more destructive power than conventional weapons. The effects of nuclear weapons are blast, nuclear radiation, thermal radiation, fallout, and EMP. EMP has special significance for air defense units because it affects radars. FM 3-100 contains a detailed discussion of other nuclear effects which impact on all types of units.

EMP is a time-varying electromagnetic radiation which increases very rapidly to a peak and then decays somewhat more slowly. The radiation is made up of a broad spectrum of frequencies ranging from 60 hertz to 4 gigahertz. The electric field generated by an EMP can be strong enough to damage electrical and electronic components. For near-surface bursts at altitudes below two kilometers involving nuclear weapons of 3 to 40 kilotons, the EMP is not considered to be militarily significant beyond 15 kilometers from ground zero. The EMP from a burst above 40 kilometers is essentially a downward traveling plane wave. This wave covers an area extending thousands of miles from ground zero. The EMP itself is not harmful to living tissue. Only when it reacts with an electrical conductor does it unleash its tremendous power in the form of voltage and current surges. The effect is comparable to sunlight on paper. Unaided sunlight merely warms the paper; but a magnifying lens can focus the sunlight and concentrate its power to ignite the paper. Electrical wires, antennas, and other conductors focus EMP energy and can cause devastating results in sensitive electrical and electronic equipment to which they are connected.

EMP effects fall into two categories: functional damage and operational upset. Functional damage is a catastrophic, permanent failure, such as the burnout of a transistor. Operational upset is a temporary impairment or malfunction of a system such as the change of state in flip-flop computer memory circuits.

Semiconductor devices are very sensitive to EMP effects. Microminiature circuitry and integrated circuits are extremely sensitive to functional damage unless specifically protected — an extremely difficult task.

EMP effects on cables and wires are also significant. In signal cables, EMP can generate sheath currents with sufficient strength to rupture the cable insulation. Cables which are already stressed (antennas, transmission lines) can undergo melting or breakdown.

The EMP effect on individual components can be devastating. Interconnecting these components to form systems multiplies the complexity and effects of EMP. In a process termed the avalanche effect, a small amount of EMP-induced energy can release huge amounts of stored electrical energy by disrupting timing or protective circuits, destroying components, or jamming communications systems.

EMP effects vary from system to system, based on component technology. Designers and engineers have long recognized the fact that unprotected telephone systems could easily collect enough EMP energy to either temporarily or permanently knock out switching centers and long-line multiplexing equipment.

The computer's reliance on magnetic memory devices makes it vulnerable to EMP. Magnetic induction via head drives and transistorized core drives may be sufficient to erase or alter information stored on tapes, discs, and in ferrite cores.

The low-threshold voltages used in logic circuitry provide another vulnerability to EMP effects. EMP-induced transients in data busses and signaling lines can easily exceed low signal thresholds even when the EMP is so weak it poses no physical threat to even the most sensitive integrated circuit. The transients could produce false signals. The effects of these false signals are generally temporary. They may range from a minor upset, such as a parity error, to a serious calculation or control error, depending upon the processor's particular function and design. A processor error in a fire control calculation could seriously affect mission accomplishment.

The broad frequency range of the EMP makes almost all currently used unhardened and unprotected equipment subject to EMP interference or damage. The exception is microwave circuits operating in the region above four gigahertz where the EMP intensity diminishes quite rapidly.

Unhardened and unprotected communications equipment in the HF and VHF ranges is quite susceptible to EMP problems. Military single-channel radios currently in use are particularly sensitive to damage caused by high

voltages accidently applied to their sensitive amplifiers. EMP energy can also enter the radio set through power, microphone, and remote cables.

Tactical UHF multichannel radio systems are capable of collecting energy over a 200- to 500-megahertz band depending on the particular size antenna used. The combination of high gain and wide bandwidth makes any unhardened and unprotected radio receiver connected to an antenna extremely vulnerable to EMP.

BIOLOGICAL AGENTS EFFECTS

Biological agents are microorganisms that cause disease among personnel, animals, and plants. To a lesser extent, they can also cause deterioration of materiel. It is not necessary for biological agents to kill to be effective. Their purpose may only be to reduce the ability of forces to fight by incapacitating troops and causing food or supply shortages.

Potential antipersonnel biological agents consist of fungi, bacteria, rickettsiae, and viruses. The environment affects the individual microorganisms within these groups in different ways. Sunlight or other adverse environmental conditions destroy most of them within hours. However, the enemy can use aerosols to disseminate most of the biological agents he is likely to use. Wind currents can easily spread these agents before atmospheric conditions destroy them.

The effects of an antipersonnel biological agent are generally the same as for any known diseases with which the specific agent is associated, such as typhoid fever or influenza. The effects may vary from minor incapacitation to prolonged illness which may result in death. The severity of these effects depends on the characteristics of the specific agent, the dose received, the agent's route of entry into the body, what defenses the body may have against that specific agent, the speed and type of treatment, and the ability of the agent to break down body defenses and to interfere with normal body functions.

CHEMICAL WEAPONS EFFECTS

Warsaw Pact doctrine describes chemical agents as "weapons of mass destruction" and treats their use as a basic part of warfare. The threat is the best equipped, best trained, and most heavily armed force in the world in terms of chemical warfare. Threat forces can operate in contaminated areas and exploit their own use of chemical weapons.

Chemical agents are used to kill, injure, or incapacitate personnel and to deny an enemy the use of terrain and materiel. The effects produced by these agents are dose dependent. This means that increased doses produce a corresponding increase in the severity of effects. Chemical agents likely to be used by the threat fall into the following four classes:

- Nerve agents.
- Blister agents.
- Blood agents.
- Choking agents.

FM 3-9 explains the effects of these agents in detail.

Section Il. Unit NBC Defense

NBC DEFENSE TEAMS

NBC defense teams are organized at battalion and battery level. These teams are manned and equipped to provide each unit with the training and expertise to counter the NBC threat.

BATTALION NBC DEFENSE TEAM

The battalion commander relies primarily on a battalion NBC defense team to provide advice and recommendations on technical and nontechnical aspects of NBC operations. This team performs its duties under the supervision of an NBC officer who is normally from the S3 section of the battalion staff. An NBC operations NCO and up to four enlisted NBC trained specialists complete the team. Specific responsibilities include —

- Preparing unit NBC defense SOP.
- Supervising NBC training and defense preparation.
- Ensuring NBC equipment is available and in serviceable condition.
- Advising other staff members and battery commanders on aspects of operations in an NBC environment.
- Coordinating efforts of NBC defense assets within the battalion.

BATTERY NBC DEFENSE TEAMS

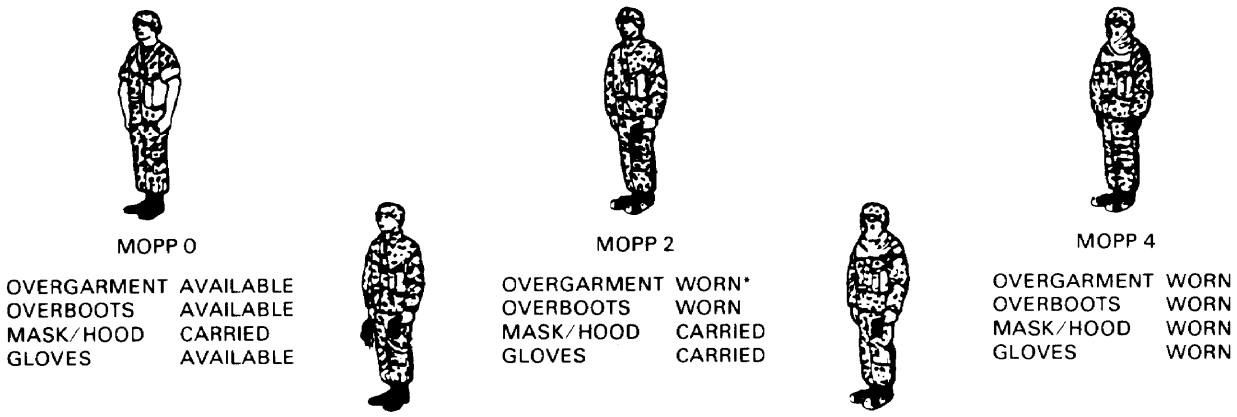
At battery level, several NBC defense teams exist. They are —

- The battery NBC team, consisting of an NBC officer, an NBC NCO, and an enlisted alternate.
- The battery radiological survey and monitoring team, consisting of two individuals per assigned radiac instrument.
- The battery chemical detection team, consisting of two individuals per chemical agent detector kit and automatic chemical agent alarm assigned.
- The battery decontamination team, consisting of one NCOIC and eight to ten individuals.

MISSION-ORIENTED PROTECTIVE POSTURE

Establishing a MOPP against chemical attacks for every combat situation is the unit commander's responsibility. The MOPP balances mission requirements against personnel protection requirements. The selection of a specific MOPP depends on the threat, terrain, mission, unit vulnerability, reaction time to chemical attack, weather, and task accomplishment degradation. The MOPP prescribes how and when soldiers will use protective clothing and equipment (as shown in the MOPP Clothing Requirements illustration).

MOPP CLOTHING REQUIREMENTS



MOPP 0

OVERGARMENT	AVAILABLE
OVERBOOTS	AVAILABLE
MASK/HOOD	CARRIED
GLOVES	AVAILABLE

MOPP 1

OVERGARMENT	WORN*
OVERBOOTS	CARRIED
MASK/HOOD	CARRIED
GLOVES	CARRIED

MOPP 2

OVERGARMENT	WORN*
OVERBOOTS	WORN
MASK/HOOD	CARRIED
GLOVES	CARRIED

MOPP 3

OVERGARMENT	WORN*
OVERBOOTS	WORN
MASK/HOOD	WORN
GLOVES	CARRIED

MOPP 4

OVERGARMENT	WORN
OVERBOOTS	WORN
MASK/HOOD	WORN
GLOVES	WORN

*OVERGARMENTS AND HOOD MAY BE WORN OPEN OR CLOSED ACCORDING TO TEMPERATURE IN MOPP LEVELS 1, 2, AND 3. IN MOPP LEVEL 4, THEY MUST BE WORN CLOSED.

At MOPP 0, soldiers carry the protective mask, skin decontamination kit, and detector paper on their persons. The soldier carries the overgarment, overboots, and gloves or stows them nearby (that is, within the work area, vehicle, or fighting position). The commander may order MOPP 0 when the enemy has an NBC employment capability but chemical warfare has not begun, or when troops are first deployed from outside the theater of operations.

On order of the theater commander, soldiers don their overgarments as the standard combat uniform (MOPP 1). The commander should give this order before the first use of chemical agents. When a chemical attack becomes imminent, soldiers don and close all protective clothing and equipment (MOPP 4).

If attack occurs without warning, clothing and equipment not already worn or closed are put on immediately in the following order: mask with hood (do not take the time to fasten the hood), gloves, overgarment, and finally, overboots.

MOPP 1 and 2 items give the greatest protection while minimizing task degradation problems. MOPP 2 and 3 are intermediate stages between minimum protection (MOPP 1) and maximum protection (MOPP 4). These two intermediate levels allow for task performance in situations where the chemical hazard is better defined, other protection is available, or mission requirements clearly dictate that the risk of selecting a lower level of protection is acceptable.

Adjusting the MOPP level to reduce fatigue will be essential if the protective clothing must be worn for extended periods of time. However, the MOPP level should never fall below the level prescribed by the commander.

The commander may direct "mask only." If so, soldiers wear the mask. In a contaminated environment where no blister agent vapors are present, soldiers need not wear protective overgarments or rubber gloves as long as they are protected from transfer hazards - direct skin exposure to liquid or solid contamination. Tanks, some kinds of vans, and buildings are examples of shelters that provide the kind of partial protection from contamination suitable for "mask only." Inside these shelters soldiers will be exposed to vapor hazards but not transfer hazards.

In "mask only," soldiers must cover all exposed skin with ordinary clothing. If the shelter is penetrated, these garments would provide brief protection from the transfer hazards of nerve agents. Ordinary garments will probably provide no protection from blister agent vapor. Commanders must balance the value of increased efficiency that "mask only" can give against the increased risk it presents. If at any time the shelter is penetrated by weapons fire or accident, the soldiers inside might be exposed to transfer hazard or blister vapors. Soldiers in "mask-only" posture must assume the current MOPP level before leaving their shelter. Soldiers entering a "mask-only" area must carefully avoid bringing liquid contamination into the shelter.

Section III. NBC Defense Measures

HAWK NBC EQUIPMENT

Fighting in an NBC environment is not an impossible task. Soldiers can take certain measures to ensure that they can fight and win on an integrated battlefield.

A number of special items are available within the Hawk battalion to protect personnel and equipment from the effects of NBC contaminants. Additional items are discussed in FM 3-100.

MODULAR COLLECTIVE PROTECTION EQUIPMENT

The MCPE is essentially an overpressure system (protective entrance) and an air

purifying device (filter unit). It provides filtered air for personnel working in the AN/TSQ-73. It also allows personnel to enter and leave the AN/TSQ-73 without admitting contaminated air. Personnel operating in the PCP use a five-man portable filter unit.

M12A1 POWER-DRIVEN DECONTAMINATING APPARATUS

The M12A1 decontaminating apparatus is a device for field use. The M12A1 will spray water-based decontaminants such as STB and soap or detergent solutions. It can also be used for pumping water-based solutions.

SPECIAL DECONTAMINATION PROCEDURES

The best method of decontamination for internal components of Hawk equipment is to use hot air. Since all of the Hawk radars contain heat-producing electrical devices, operating the equipment will generate hot dry air to hasten the breakdown of chemical and biological contaminants.

The next best decontamination method is aeration. If nuclear fallout settles in the chassis of the equipment more detailed decontamination procedures, such as brushing, vacuuming, or chassis replacement, may be necessary. Unit personnel must keep equipment doors, drawers, and cabinets closed during combat operations to minimize equipment contamination.

Unit personnel may decontaminate the metal exterior portions of radars, launchers, and vans with DS2. DS2 should not be used on nonmetal components. Troops may use a slurry mixture of STB or mud to decontaminate tires and other rubber components. Personnel may use hot, soapy water to decontaminate radar feedhorns but must be careful not to damage delicate electronic components. Troops must wear protective gear when decontaminating equipment.

Fire units should use contaminated missiles for engagements before using clean missiles. Fire units may decontaminate missiles, when necessary, using DS2 or hot soapy water. Personnel must ensure that the DS2 does not damage electronic equipment (side fuzing antennae and radome) and that they wash off the decontaminating solution within 30 minutes, before it can damage the protective paint. STB is not recommended for missile decontamination.

Planners must consider the time and manpower required for decontamination of equipment. The stress of combat conditions, the psychological effect of a chemical attack, the difficulty of operating in protective gear — all will have an effect on the efficiency of the unit's decontamination effort and the speed with which the unit can return its equipment to operation.

PROTECTION AGAINST ELECTROMAGNETIC PULSE

Defensive measures for reducing the effects of EMP fall into four categories:

- Isolation.
- Shielding.
- Grounding.
- Polarization.

ISOLATION

Unit commanders at all levels should hold some communications equipment in reserve on a backup status. Units should not connect this equipment to power and data cables or antennas. This means of protecting equipment applies equally to Hawk equipment. Units should place items of equipment and even entire fire units not absolutely needed to continue the air battle on standby status. As time permits, the unit should protect this equipment by measures ranging from isolating receiver circuitry to disconnecting power and data cables.

SHIELDING

Most sensitive equipment employs some shielding to prevent RF interference. This RF shielding does give limited EMP protection provided it is properly maintained. Operators must keep all doors, equipment drawers, and signal entrances closed and secured during normal operation to ensure shield integrity. Cable connections must be tight, and the RF gaskets in cable heads must be in good condition. Metal-to-metal mating surfaces must be spotlessly clean and dry. Units can provide

additional shielding for cables by sandbagging cable runs. Unused cable connectors should be closed securely with connector caps.

GROUNDING

Grounding is extremely critical to EMP protection. Inadequate grounding can make the best shield ineffective. The greater the surface area in contact with the ground, the greater the protection. Under dry conditions, pouring water around the area of the ground rod will increase its conductivity.

POLARIZATION

Polarization refers to the orientation, vertical or horizontal, of antennas. Polarization can affect two items: antennas and cables. Operators should orient the UHF feedhorn horizontally in areas forward of the division rear boundary and vertically in rear areas. Polarization is different because the expected EMP waveform is different. Cables can act as RF collectors if placed improperly. Troops should arrange cables in straight runs. Troops should arrange excess cabling in a figure eight, not in a coil.

KEY POINTS

The destructive capacity of NBC weapons and the psychological impact of their use will dramatically affect the control of forces. Higher headquarters command posts are prime targets for nuclear or chemical attack. C^2 within small units will also become difficult with the use of nuclear weapons. Soldiers and leaders who are wearing protective equipment will not be recognizable. Everyone must cope with the additional burden of wearing protective equipment while performing his duties. Only cohesive, disciplined, and well-trained units can function in an NBC environment. Units will survive by training for — and anticipating — NBC attacks and by taking the following measures:

•Maintain alertness. Commanders at all levels need to be continually aware of their vul nerabilities to NBC attack. They need to balance the risk to their units against the requirements of their mission.

•Instill discipline. The unit needs to survive the shock of an NBC attack and continue the mission. Troops should be physically and psychologically hardened by frequent training while wearing protective clothing.

•Avoid detection. Using active and passive measures to defeat the enemy's target acquisition capabilities is crucial. The commander of a unit that is a high-priority target must consider displacing whenever he suspects the enemy has located him.

•Take preventive action. Biological agents are the same germs, viruses, and parasites as those which cause the diseases that immunization procedures and standard field sanitation procedures are designed to combat. Strict adherence to preventive medicine practices and to individual and unit sanitation practices will provide the best protection against biological agents.

Despite precautionary measures to avoid becoming a target and measures to minimize the effects of an NBC attack, commanders must be prepared to continue the mission after such an attack. The commander who can reconstitute or replace lost units rapidly will have the advantage in continuing the battle. The keys to rapid reconstitution are prompt assessment of the situation following an enemy strike and early implementation of contingency plans made to cover the loss of friendly units.

CHAPTER 9

Combat Service Support

The CSS system develops and maintains combat power by sustaining combat forces. CSS may include administrative, chaplain, civil affairs, finance, food, legal, maintenance, medical, military police, supply, transportation, and other logistic services. This chapter focuses on CSS of the Hawk battalion.

MODERN LOGISTICS

The success of any combat operation is highly dependent upon CSS planning and timeliness, and the efficient use of available resources. The combat success of any ADA unit relies on the CSS system's ability to —

- Arm — Provide the proper type and quantity of equipment, arms, and ammunition, when and where the unit needs them.
- Fuel — Ensure the availability of fuel stocks at the right place and the right time.
- Fix — Provide maintenance support to return noncombat-ready and damaged equipment to the user with minimum delay.
- Man — Through effective use of a responsive personnel service support system, ensure that personnel who are fit to fight and properly trained are available to man units.

Commanders must plan tactics and logistics concurrently to ensure that the concept of the operation is logistically supportable. They must consider the constraints that CSS planners identify, and then they must modify unsupportable plans or accept the risks involved.

CONSIDERATIONS

To develop the support scheme and evaluate the CSS system's ability to support a particular operation, commanders should consider the following factors.

Availability

Are there sufficient CSS resources (trained soldiers, ammunition, repair parts, trucks, tools, and POL) to provide the support required? Will shortages require the establishment of priorities? If so, approximately when?

Supportability

If the resources are sufficient, is the CSS system capable of getting them where they are needed for the initial operation and for sustainability?

Risk

How much risk will CSS resources be subject to by the tactical scheme? When the CSS structure is austere, how will the loss of a few support personnel affect the maintenance effort?

FUTURE OPERATIONS

At the end of the current operation, the CSS system must be able to support contingencies or future operations.

All commanders and staff officers should know the capabilities of their CSS units, as well

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as the CSS assistance available from the next higher headquarters. To plan realistically and to anticipate problems and reduce their impact, commanders should also be aware of the status of their —

- Ammunition stocks.
- Fuel.
- Transportation system capacity.
- Maintenance capabilities (mechanics and spare parts).

Austerity

Future conflicts will be intense and consume resources rapidly. Austerity is the rule. CSS planning will be mandatory. Commanders must conserve CSS resources, especially ammunition, POL, and repair parts. When capabilities do not meet requirements, commanders will have to establish priorities for support.

Requirements

The CSS system must support weapon systems and the soldiers who man them. Those who direct the CSS effort must ensure that critical weapon systems, such as Hawk, have sufficient ammunition and fuel, that they are quickly repaired or replaced, and that soldiers are available to operate them. Combat equipment must be armed, fueled, fixed, and manned as close to the point of employment as possible. Supplies move to forward units according to the commander's priorities. Replacement personnel move forward to maintain the strength of frontline units. WSRO provide major weapon systems in a ready-to-fight condition.

CSS ORGANIZATION AND OPERATION

Each level of command has a CSS element to provide its support. From fire unit level through battalion level, CSS elements are built into the command's TOE to provide specified types and quantities of support.

LEVELS

Up to corps level, and above, the design and organization of CSS provide the amounts and types of support required by the force. Generally, to meet the CSS requirements for Hawk batteries, the system includes —

- Organizational operators and mechanics, POL specialists, and PLL and administrative clerks.
- The maintenance company intermediate (DS) Hawk for Hawk direct support.
- The maintenance company intermediate (GS) for general support.
- COSCOM units for other intermediate DS and GS.
- In a multicorps theater, TAACOMS and functional commands.

RESPONSIBILITIES OF CSS LEVELS

Each level of the logistics structure has certain responsibilities. The levels at which CSS responsibilities are identified are the organization, the intermediate (DS) maintenance company, the corps support command, and the theater army CSS.

Organizational Personnel

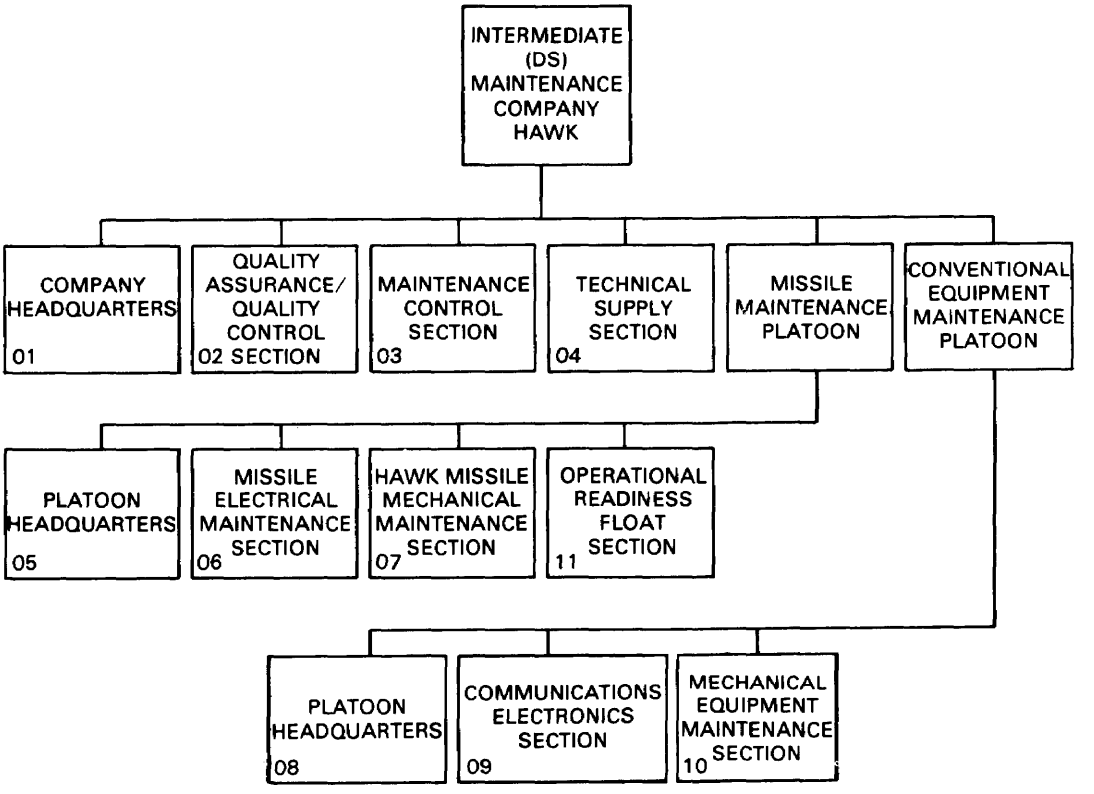
Organizational operators and mechanics are responsible for daily, weekly, monthly, and quarterly preventive maintenance checks. They also perform services and repair or replacement of components allocated to unit maintenance.

Maintenance Company Intermediate (DS) Hawk

This maintenance company is shown in the illustration on page 9-3. The company provides —

- Intermediate (DS) maintenance for items peculiar to the Hawk system, the power generation equipment, and the air conditioning equipment. The company also conducts 120-day and longer interval preventive maintenance checks and services.
- Maintenance of ORF equipment to replace damaged and nonoperational equipment.
- Receipt, storage, and issue of repair parts peculiar to the Hawk system, fire distribution system, and limited engineer, signal, and automotive items.

DIRECT SUPPORT MAINTENANCE COMPANY



Intermediate Maintenance Company

This maintenance company is shown in the illustration on page 9-4. The company provides—

- GS and GSSB for air defense weapons systems.
- Reparable exchange support for selected items.
- Supply support to DS companies.
- Quality assurance.
- Collection and classification of nonoperational systems.

Corps Support Command

COSCOM units provide corps-wide supply, intermediate (DS) maintenance, and field services to corps brigade Hawk battalions and other units located in the corps area. This support may include health services, personnel and administration, transportation, ammunition, and civil affairs.

Theater Army CSS

The TA provides CSS to units located in the COMMZ through two types of commands: functional commands and TAACOMs. Functional commands provide a specific type of service in support of the entire theater. Functional commands of the TA are the medical command, personnel command, transportation command, and engineer command. TAACOMs provide a variety of services within a designated area in the COMMZ. The TAACOM is responsible for rear area security and provides most supply and field services.

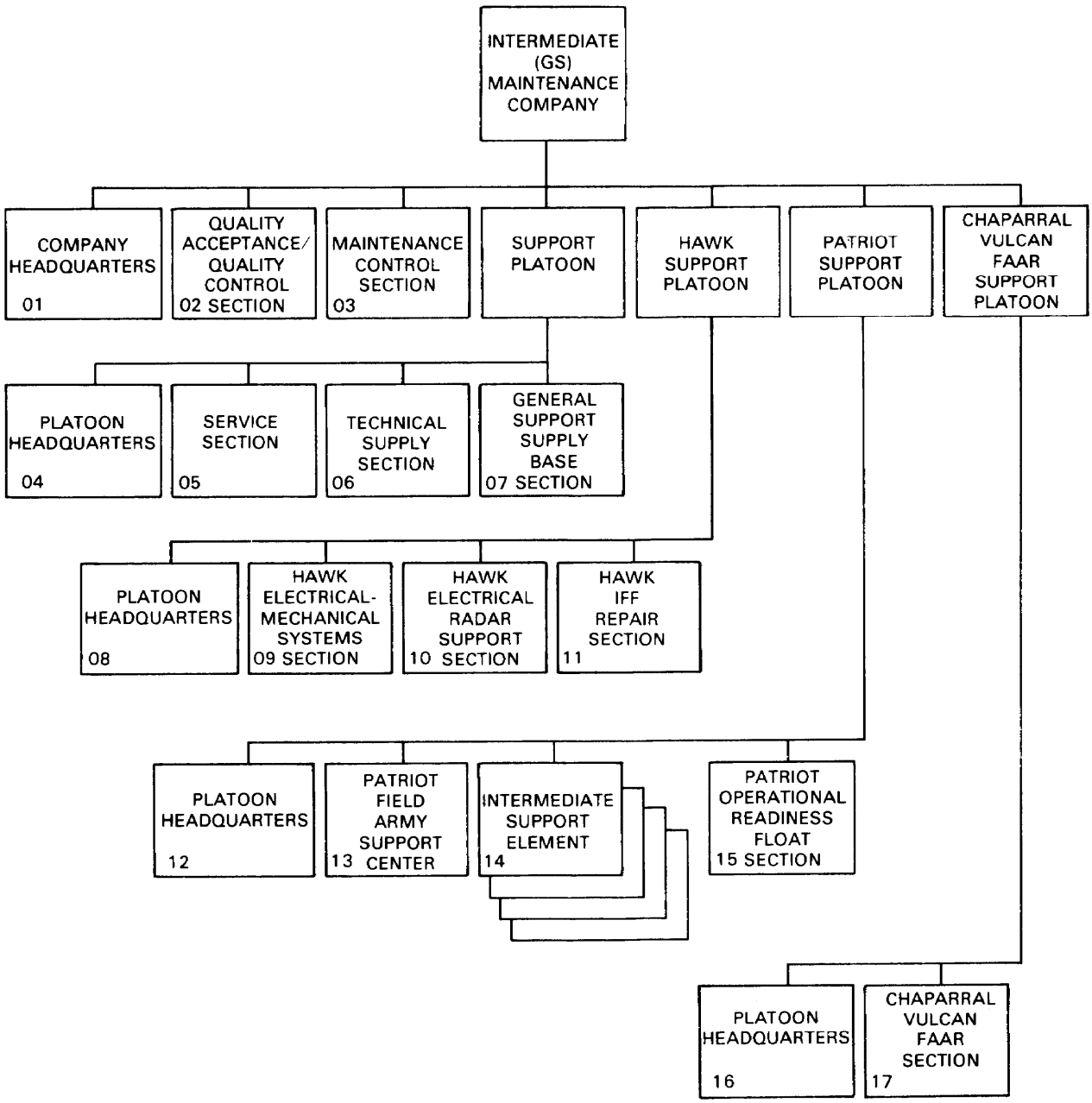
OPERATIONS

The CSS system operates throughout the theater. The CSS system performs specialized functions at all levels in a theater of operations.

Ammunition

The CSS system sustains combat capability. CSS provides unit basic loads of ammunition and ammunition resupply.

GENERAL SUPPORT MAINTENANCE COMPANY



Unit basic load. Units are authorized basic loads of ammunition, expressed in rounds per weapon system, to sustain them in combat until they can be resupplied. The theater commander normally establishes a unit's basic load based on —

- Its mission.
- The types and numbers of its weapon systems.
- Its transport capability.
- The time required to conduct resupply.

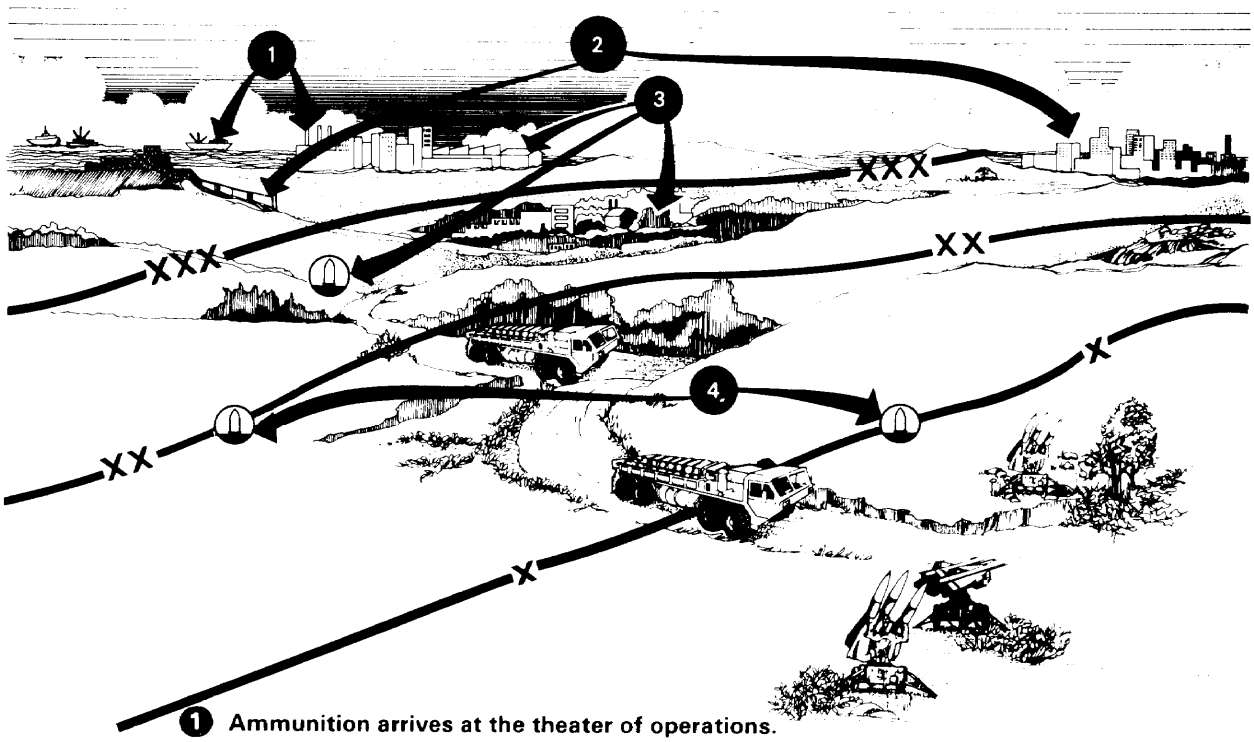
The unit carries its basic load into battle on its cargo vehicles and on the backs of its

individual soldiers. SOPs will prescribe distribution of the basic load.

Basic resupply. To determine the requirements for a specific operation or time period, Hawk units develop an RSR for each type of ammunition. Expressed as rounds per weapon per day, the RSR may derive from experience or from reference manuals. The operations officer (S3) prepares the RSR for the commander during the planning stages of the operation. Requests are consolidated at each level until they reach the highest Army headquarters in the theater (corps, TA). At that level, the G3, G4, and commander review the requirements and availability of ammunition. Based on this review, the force commander establishes a CSR, the actual resupply rate. The CSR is expressed as rounds per weapon per day by ammunition item. The OPLAN or OPORD will normally identify those ammunition items for which the CSR is less than the RSR. After consulting with their operations and logistics staff officers, commanders will normally establish priorities for the allocation of ammunition.

Timely resupply of ammunition is critical. Basically, it occurs in the four-step sequence shown in the following illustration.

AMMUNITION SUPPLY PROCEDURE



1. Ammunition arrives at the theater of operations.
2. In the theater, it moves through fixed ports or over the shore.
3. Once ashore, it moves to one of several destinations depending on theater needs. Whenever possible, ammunition resupply bypasses intermediate supply facilities to reduce standing ammunition storage. Ammunition goes directly to the TSA in the communications zone, the CSA in the corps rear area, and the ASP located near the division rear. An ATP is located in each brigade support area and another is located in the division rear area. The DAO locates and supervises the transfer point. The bulk of storage for replenishing the ATP is shipped from the CSA.
4. Tactical units engaged in battle draw most of the high-tonnage, high-demand resupply ammunition items from the ATP and pick up all other ammunition at the ASP.

Class V support structure. The supply of Hawk missiles is a responsibility of the special ammunition ordnance brigade (see the illustration below). The logistic actions needed to supply missile ammunition for combat users include those basic functions common to all types of ammunition.

The theater special ammunition ordnance brigade, through its nuclear ammunition battalion and missile support battalion, plans and manages large, low-density missiles and nuclear ammunition CSS in the theater. The missile materiel ordnance company supplies the complete missile round for Hawk and Patriot and for nonnuclear Lance.

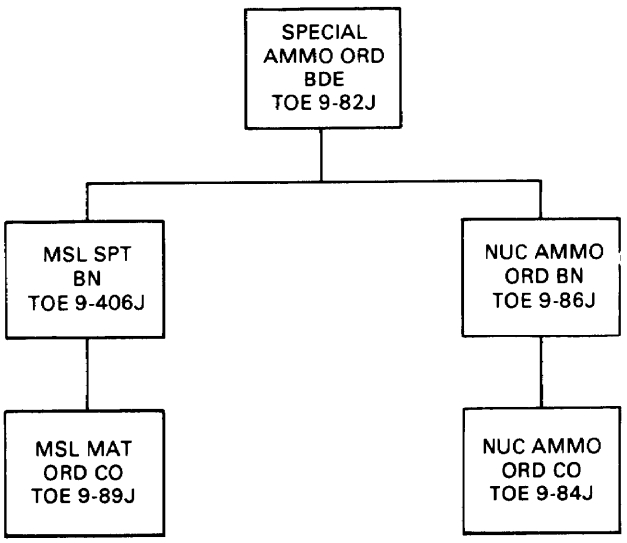
Class V support concept for Hawk. Hawk missiles arrive at the theater of operations from CONUS through the same channels as conventional ammunition. From port areas, missiles move directly to the units that store, maintain, and issue them. Delivery of high cost, low-density missiles such as Hawk is by theater transportation assets directly to the Hawk battalion from the theater storage area. The battalion accepts delivery in or near the battalion area. If the Hawk battalion is near the COSCOM, it may coordinate missiles through the corps.

Units submit requests for resupply of Hawk missiles through TA command channels for approval. The CSA receives, stores, and issues Hawk missiles as special project stock.

Class V Hawk missiles maintenance support. The same elements that store and issue the materiel provide Class V missile support at storage sites. These elements provide missile maintenance support by sending maintenance support teams to firing units. Missile maintenance support operations are detailed in FM 9-59.

Missile resupply in the battalion. Current Hawk TOEs establish a missile resupply section under the supervision of the battalion S4. This section includes the personnel and equipment necessary to operate two missile assembly teams. The missile resupply section operates a centralized facility to provide the AFPs with ready-to-fire missiles. The centralized missile resupply concept requires that pallet trucks from the AFPs go to the battalion missile resupply point to pick up ready missiles. The pallet truck operator delivers the load of ready missiles to an AFP designated by the battalion S3. The decision to provide the missiles to a particular AFP must be based on the tactical situation and mission requirements.

LARGE, LOW-DENSITY MISSILE CLASS V SUPPORT STRUCTURE



Petroleum, Oils, and Lubricants

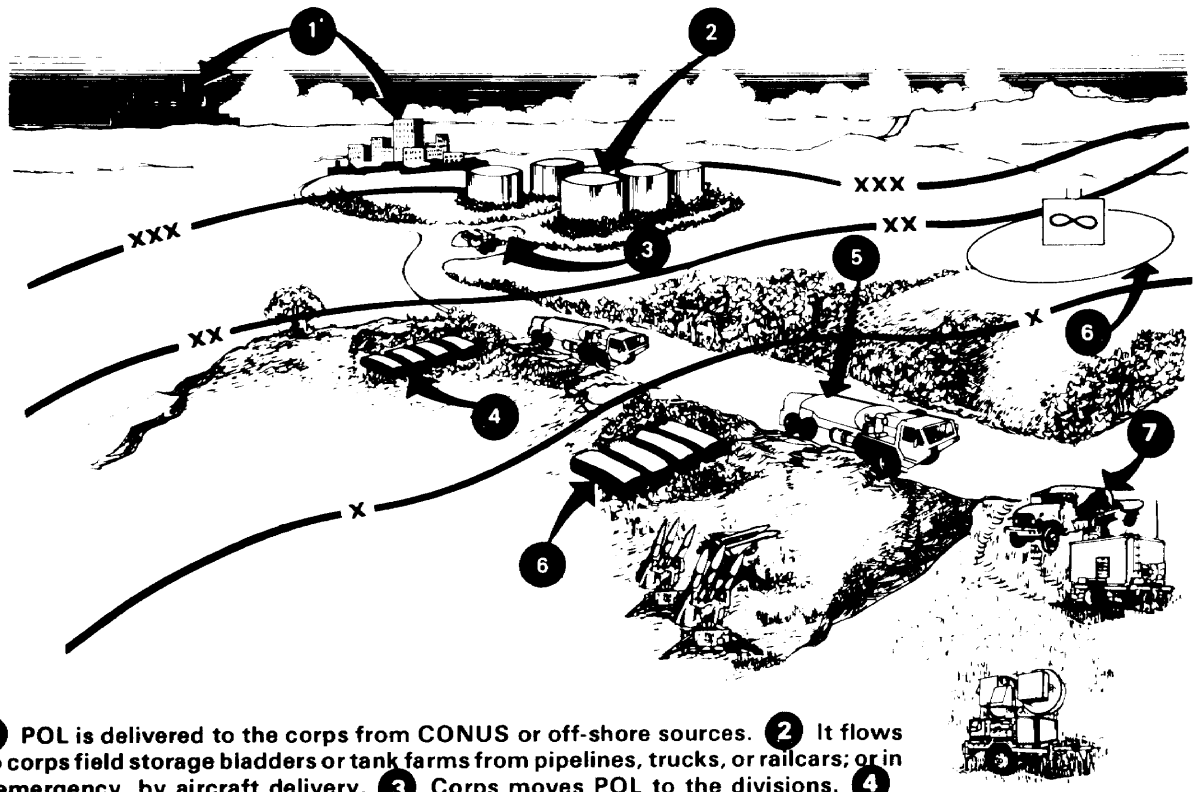
The CSS system maintains combat capability by providing bulk fuel to units. The CSS system provides fuel supply and resupply.

Bulk fuel. A dedicated supply system manages, transports in special containers, and issues the supply of bulk petroleum products. As long as fuel is available, it moves on demand to refill storage containers of subordinate units. The initial allocation is derived from estimates that using units project based on experience or standard planning data in FM 101-10-1. Such estimates should consider special factors, including terrain, weather, and the type of mission. The brigade refines and consolidates forecasts and then forwards them to the corps MMC. Established requirements, when compared to force capabilities, may make prioritizing necessary. The limited storage and distribution capabilities using fuel tankers, tank and pump units, and trailer-mounted pods in Hawk battalions must be considered in planning.

Existing, permanently installed pipelines will be used when available and may be extended by using US Army pipelines and hoselines. When possible, bulk petroleum is delivered by pipeline directly to GS petroleum supply points in the corps area. Petroleum will be pumped forward from shore storage tanks in the base terminal. Intermediate terminals along the pipeline will support large troop concentrations, pump directly to established airfields (USAF), and provide flexibility in meeting daily storage and distribution requirements.

Resupply to unit. Resupply of POL is a seven-step process. The process is shown in the following illustration.

POL RESUPPLY



1 POL is delivered to the corps from CONUS or off-shore sources. **2** It flows into corps field storage bladders or tank farms from pipelines, trucks, or railcars; or in an emergency, by aircraft delivery. **3** Corps moves POL to the divisions. **4** Divisions normally store POL in bladders or in tank trucks. **5** Divisions deliver POL to their brigades and other major units. **6** Major units store and dispense POL. **7** Tactical refueling forward of brigade trains is by battalion tankers.

Other Supplies

The CSS system maintains combat capability by providing —

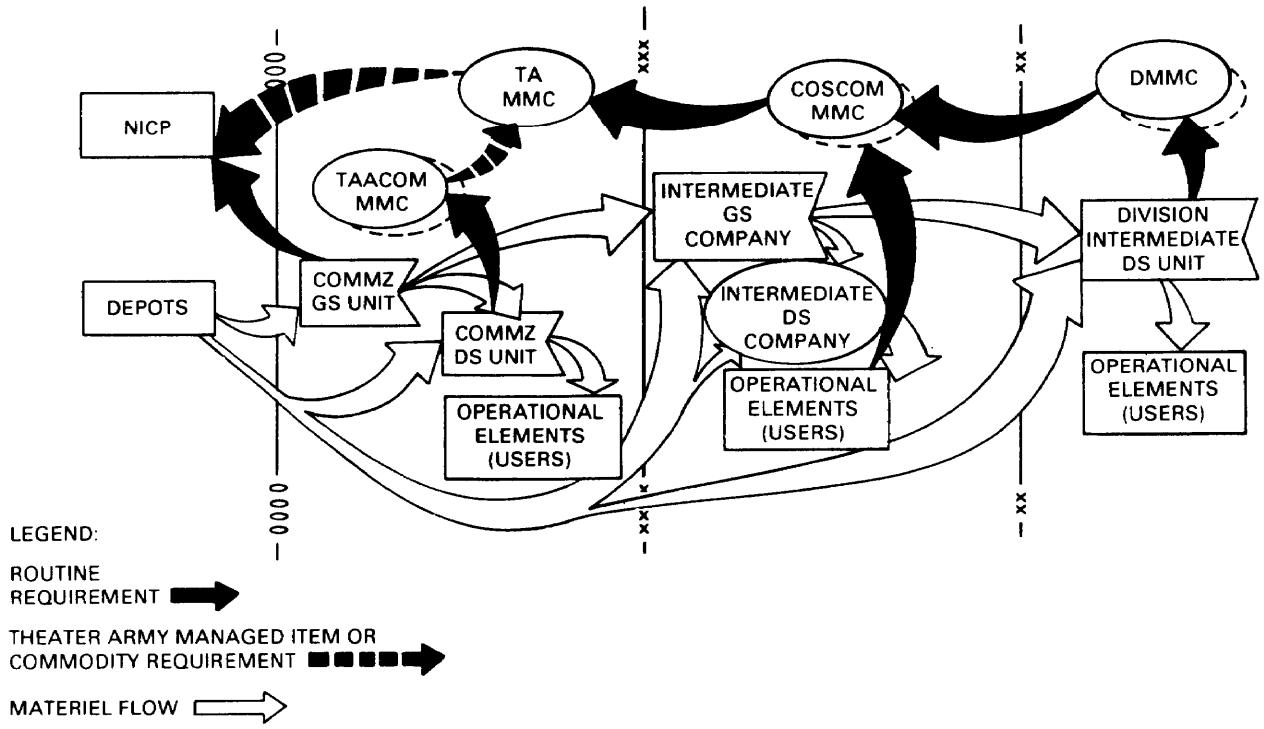
- Rations.
- Water.
- Clothing.
- Personal-demand items.
- Individual and unit equipment.
- Fortification and barrier materials.
- Major end items of equipment.
- Repair parts.
- Items intended to support nonmilitary programs.

Because of the intensive nature of Hawk maintenance, the availability of repair parts is critical. Requisitions for repair parts for nonoperational equipment go to the intermediate maintenance company (DS) where they are filled if the item is available. If the item is unavailable, the company passes the requisition number and part number to the brigade support element, which queries other maintenance companies within the brigade. Simultaneously, the Hawk battalion LRC queries the remaining batteries within the battalion. If the battalion LRC is unable to locate the part, the LRC passes the requisition to the brigade LRC which, in turn, queries all Hawk units in the brigade. Requisitions which cannot be filled from within the brigade are passed to the COSCOM or TAMMC. Units operating in the COMMZ will normally pass requisitions directly to the TAMMC.

For other than Hawk repair parts, requisitions follow the usual pattern for repair parts for nondivisional units. Medical supplies and equipment come through normal medical channels.

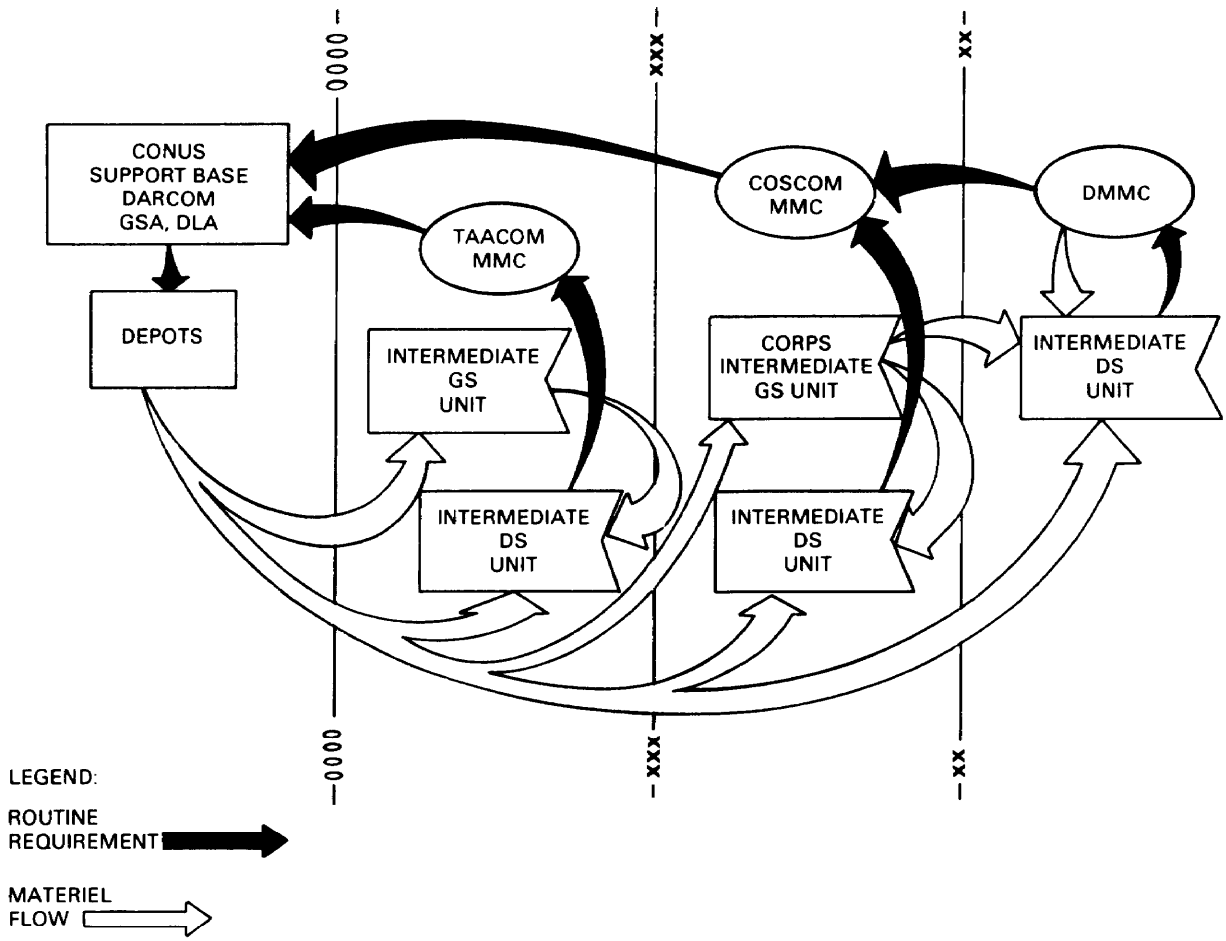
Normally, the wartime supply system for materiel using surface movement in a fully developed theater of operations follows an established sequence. A typical sequence is shown in the following illustration.

MATERIEL SUPPLY BY SURFACE MOVEMENT



The wartime supply system for items provided by air lines of communication in an established theater also follows a regular sequence as shown in the Supply by Air Lines of Communication illustration. In a contingency operation, the highest Army headquarters deals directly with the CONUS support base. All materiel ordinarily moves by surface transportation from the intermediate maintenance (DS) company to the using unit.

SUPPLY BY AIR LINES OF COMMUNICATION



Maintenance

The CSS system maintains combat capability by providing forward support, recovery and evacuation, repair parts supply and reparables management, and battlefield controlled exchange and cannibalization. Unit maintenance for conventional items (trucks, radios, et cetera) in Hawk units is especially important so that units can move and communicate.

Forward support. Unit maintenance teams assess equipment damage. They determine the appropriate disposition based on the extent of damage and the combat situation. To reduce the time required to return equipment to battle, intermediate (DS) maintenance support teams using mobile team shops repair it as far forward as possible. The team maintains radio

communications with the supported battalion on the administrative/logistics net. This is the essence of the forward support maintenance concept. Under this concept, maintenance support teams from the intermediate (DS) maintenance company assist the organic Hawk battery mechanics. Teams consider controlled exchange of parts or components prior to evacuation, but they do not remove parts from systems which can be repaired quickly, nor do they use parts from operational items to troubleshoot nonoperational items.

Recovery and evacuation. Recovery operations remove materiel from forward units to nearby safe locations for immediate repair or, if forward repair is not practical, to the unit's trains. Each unit is responsible for recovering its own damaged equipment. Using wreckers and other available recovery systems, the unit moves equipment that cannot be repaired on site to collection points along designated routes. Items which cannot be moved remain in place until supporting maintenance units can recover them.

Repair parts supply and reparable management. Intermediate (DS) maintenance units supply repair parts. Units can exchange selected recoverable and reparable components for serviceable items. Intermediate (DS) maintenance units requisition repair parts through supply channels.

Battlefield controlled exchange and cannibalization. Forward maintenance support also involves battlefield controlled exchange and cannibalization. In controlled exchange, maintenance units remove serviceable parts from unserviceable but economically repairable equipment, using the parts to repair like equipment so that it can be returned to combat immediately. Unserviceable parts should stay with the equipment from which the serviceable parts were taken. Controlled exchange decisions should be made as close as possible to the point where the equipment was damaged or disabled, preferably by using unit maintenance personnel. Both using and support units will practice controlled exchange extensively on the battlefield. To cannibalize is to remove parts from irreparable equipment for stockage or immediate use. Guidelines for cannibalization and controlled exchange are established at corps or echelons above corps headquarters.

Personnel

Personnel support operations maintain unit strength. These operations provide morale and welfare services to the individual soldier.

Personnel services. Personnel services include the critical functions of strength accounting, replacement operations, and casualty reporting. Other personnel services include management actions and record keeping.

Finance and comptroller services. Finance services are tailored to the needs of commanders and soldiers as these needs are shaped by the circumstances of combat. Normally finance services include providing staff finance advice, disbursing cash, providing military pay services, and reimbursing imprest funds.

Morale support activities. Morale support activities include library services and games provided for soldiers' entertainment. Athletic and recreation activities using components of the athletic and recreation kit are part of morale support activities.

Chaplain activities. The chaplain heads a special staff section which advises the commander on matters of religion, morals, ethics, and, to some extent, morale. Chaplain services include coordinating with other chaplains to make religious observations of all major faith groups available to the command. The chaplain makes his services available to those in the command who wish to participate in them. The chaplain's service is a ministry of presence.

Legal services. Legal services include advice and assistance in matters involving military, domestic, foreign, and international law and regulations. The command provides legal services within its capabilities to the commander and to the members of the command.

Postal services. In a conflict, delivery of personal mail is the only postal service to authorized users of the military postal system. When the situation permits, the postal service may provide additional services.

Public affairs. Public affairs personnel organic to the unit headquarters provide information support. Public affairs officers provide advice and services to the command on all matters of soldier and media interest.

General purpose automatic data processing support. Personnel operations provide ADP support for automatic record keeping and data base development. This support protects files, programs, and documentation.

Personnel and administrative support. Personnel and administrative support includes records management and publications supply. Administrative support provides printing and reproduction services and message distribution.

Troop Replacement

The theater replacement system requires centralized planning and decentralized execution. HQDA coordinates and directs the flow of replacements. Timely individual and unit replacements keep combat units effective.

Initial replacement. Without waiting for theater requisitions, HQDA assigns personnel replacements for the first 60 days of a conflict. It does so based on the strength of the deployed force and on estimated battle losses.

Replacement flow. Using requisitions and casualty reports from the theater, HQDA reevaluates and updates its replacement flow to meet the needs of combat units. Commanders may find it necessary, at times, to adjust strength between units to maintain combat effectiveness.

Requisitioning and casualty reporting. Within the theater, each level of command validates and adjusts its requirements and establishes priorities for critical military specialties. Casualty reporting influences the distribution of replacement personnel. Casualty reporting and its interaction with replacement operations is shown in the illustration on page 9-12.

Health Services

In all wars involving US troops, more soldiers have been hospitalized because of disease and noncombat injuries than because of enemy action. The ratio has run as high as three to one. The health service mission is to conserve fighting strength by promoting and maintaining the general health of all soldiers in the theater. Health service support functions include —

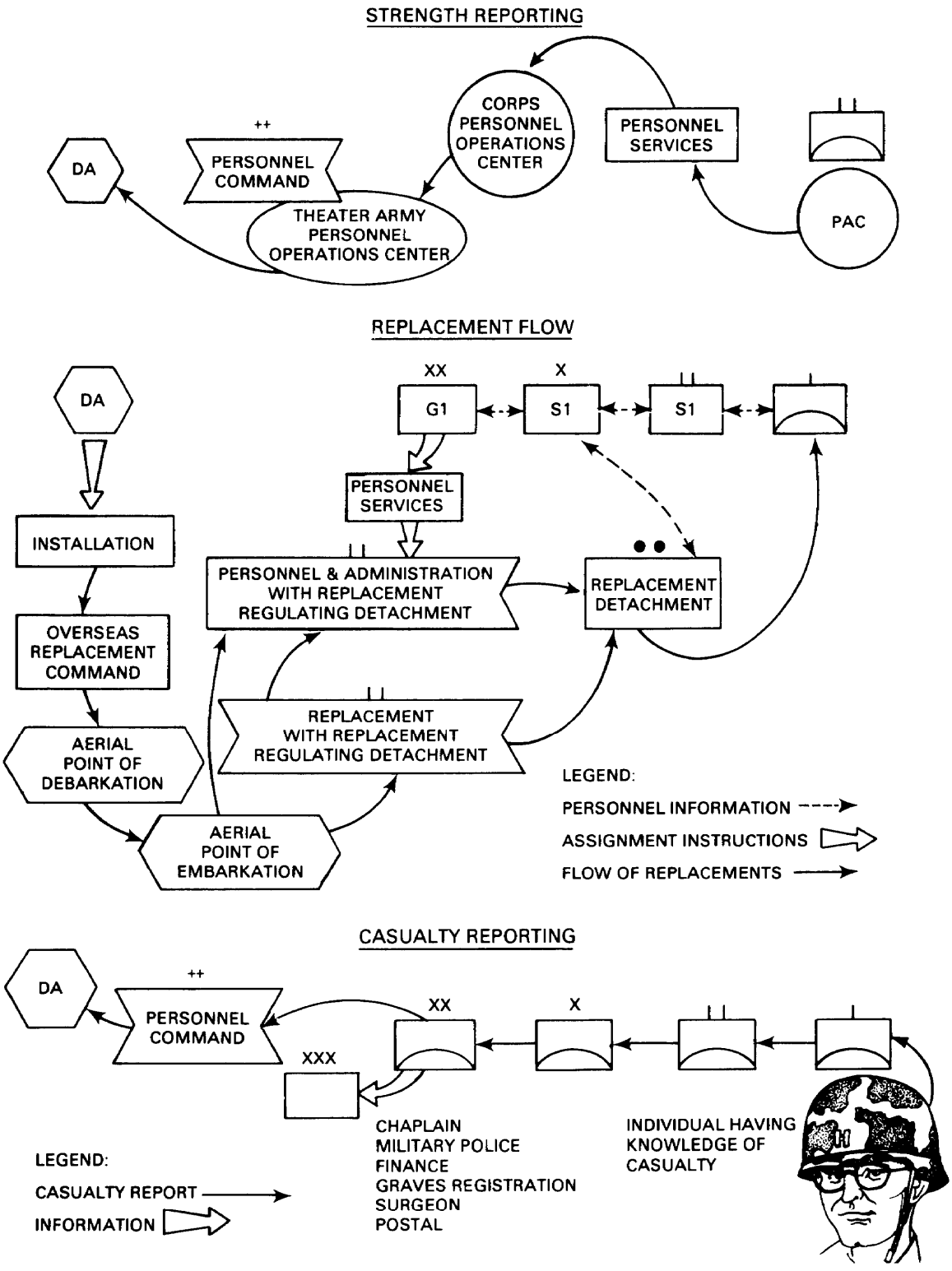
- Medical treatment and hospitalization.
- Intratheater medical evacuation.
- Medical regulating.
- Blood bank services.
- Medical materiel supply and maintenance.
- Dental services.
- Veterinary services.
- Preventive medicine.
- Medical consultation.

Health service support within a theater of operations is organized into levels: unit, division, corps, and COMMZ.

A system of increasingly sophisticated treatment organizations, beginning with the unit aidman, provides medical treatment and hospitalization. In general, each level of health service support has treatment capabilities similar to the levels just below it, as well as additional, more sophisticated capabilities. Each level of medical support has air or ground medical evacuation assets. The preferred method for evacuation is by air. Use of air evacuation, however, depends on availability, the treatment required, the locations of adequate treatment facilities, tactical situations, and weather. Patients are evacuated no farther than required for treatment. A system of medical regulating elements located at the medical command and control headquarters controls the flow of patients.

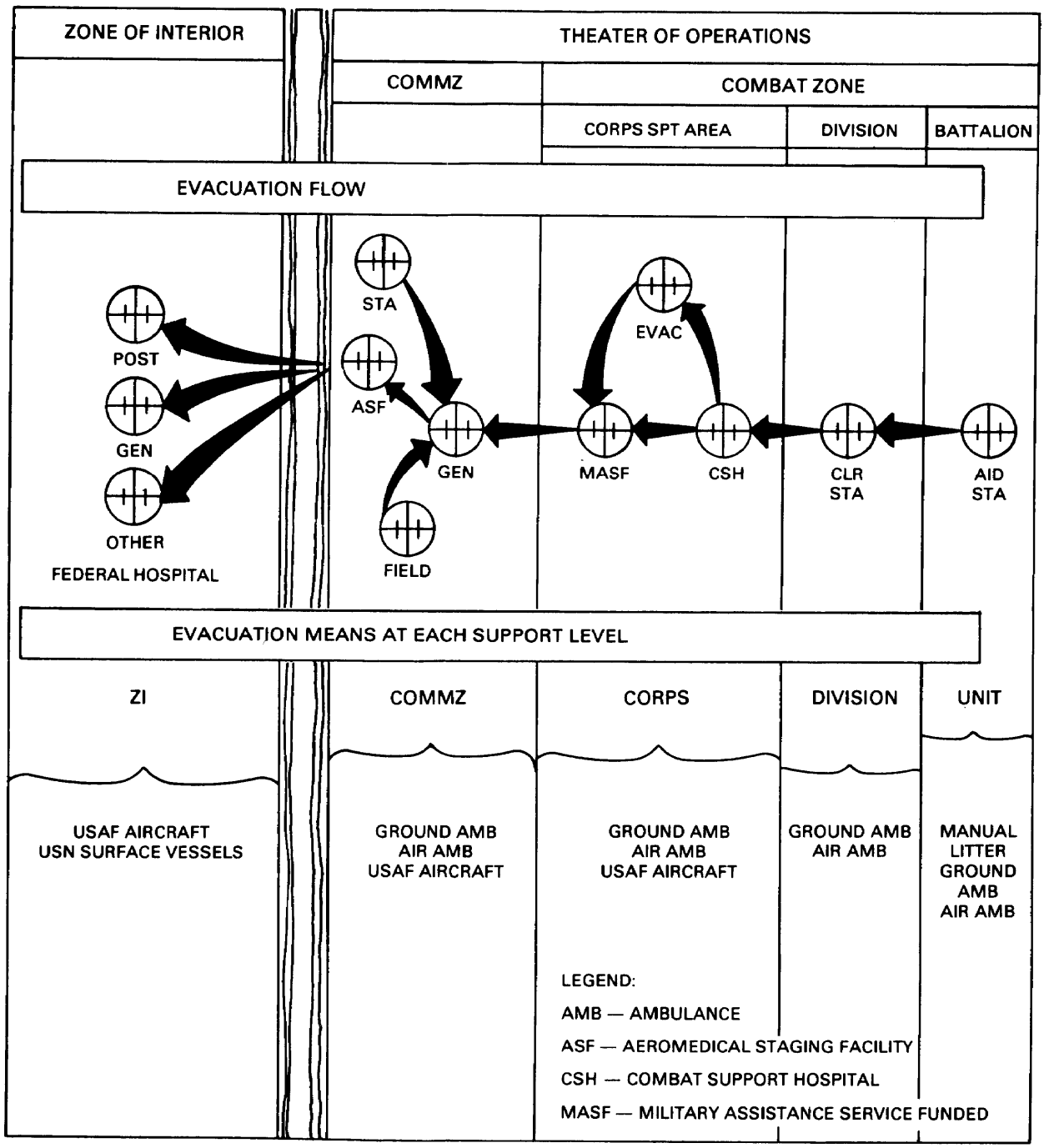
Medical support for Hawk units comes from the battalion medical section supported by division or corps medical elements on an area basis. Forward of the division rear boundary, casualties are evacuated to the nearest division clearing station. Evacuation is normally the responsibility of the division medical personnel; however, Hawk unit commanders must plan to evacuate their own casualties since demands on the division medical elements will likely be heavy. In the corps rear area, Hawk unit commanders will evacuate their casualties to the nearest combat support hospital.

PERSONNEL REPORTING AND REPLACEMENT



To ensure that soldiers are physically able to fight, commanders must establish comprehensive programs of health preservation and restoration. The theater-wide health services system provides four levels of facilities formedical support, evacuation, and treatment as shown in the following illustration.

HEALTH SERVICES SUPPORT



Field Services

Field services generally include —

- Laundry.
- Bath.
- Clothing exchange.
- Bakery.
- Textile renovation.
- Salvage.
- Decontamination.
- Graves registration.
- Clothing renovation.
- Post exchange sales.
- Provision of general duty labor.

In the division area, the supply and transportation battalion is responsible for providing water. Elements of the COSCOM provide water in the corps rear area.

In peacetime, most support units do not have graves registration or clothing exchange and bath capabilities. During wartime, augmentation units provide these capabilities.

If graves registration platoons are not available during the early stages of combat, it may be necessary to train unit personnel in recovery, identification, care, and disposition of remains. Units evacuate remains to collection points in the division support area and from there to a corps collection point.

COSCOM field service companies provide laundry service. COSCOM detachments also provide post exchange facilities, when available. The supply and service company, when augmented with a clothing exchange and bath platoon, provides clothing exchange and bath services.

The supply and service company salvages damaged and irreparable equipment. The company operates salvage collection points. These points are normally collocated with the maintenance battalion's maintenance collection points. It also operates salvage collection points in support of units in the corps rear area.

Transportation

As the connecting link between other logistic functions, transportation moves personnel and materiel. It moves repaired equipment from maintenance units to storage areas or using units and moves supplies, including repair parts, where they are needed. It also moves personnel replacements from reception areas to combat units.

The transportation elements within a theater perform three functions: modal operations, terminal operations, and movement management. Modal operations move personnel or materiel in any conveyance by one of four modes: air, rail, road, or water. Terminal operations shift cargo from one mode of transportation to another or from one type of transport within a mode to a different type. Only echelons above the division have terminal operations capability. Movement management involves the staff planning and coordination necessary for the transportation system's effectiveness.

ADSCOM, LOGISTICS SUPPORT FOR THE AADCOM

The AADCOM logistics structure and procedures described below are doctrine for the AADCOM currently operating within NATO. That doctrine, however, is not universal and is not to be applied automatically should other AADCOMs be mobilized. In that case, the logistics structure would be tailored to meet the contangencies and circumstances at the time. This paragraph describes the support provided to Hawk battalions by the ADSCOM.

LOGISTICS MISSION

The logistics mission of the ADSCOM is to provide sources of logistics management and operations as follows:

•Supply and maintenance management for Class II (maintenance-related), III (packaged), IV, VII, and IX supplies.

•Receipt, storage, and issue of all Class IX supplies by ADSCOM maintenance support units.

•Provision for general support missile maintenance to include operation of theater reconstitution points for theater air defense weapon systems.

•Management of the GSSB assets needed to support air defense missile systems.

•Provision of intermediate (DS) missile maintenance.

•Provision of intermediate (DS) maintenance services for system support equipment and other nonmissile-peculiar items as needed to maintain mobility and self-defense capabilities.

•Operation of reparable management supply support for selected equipment in the command.

•Management of TA air defense command property records in accordance with current regulations, directives, and automated procedures.

•Peacetime management, commitment, and obligation of funds needed to administer the AADCOM.

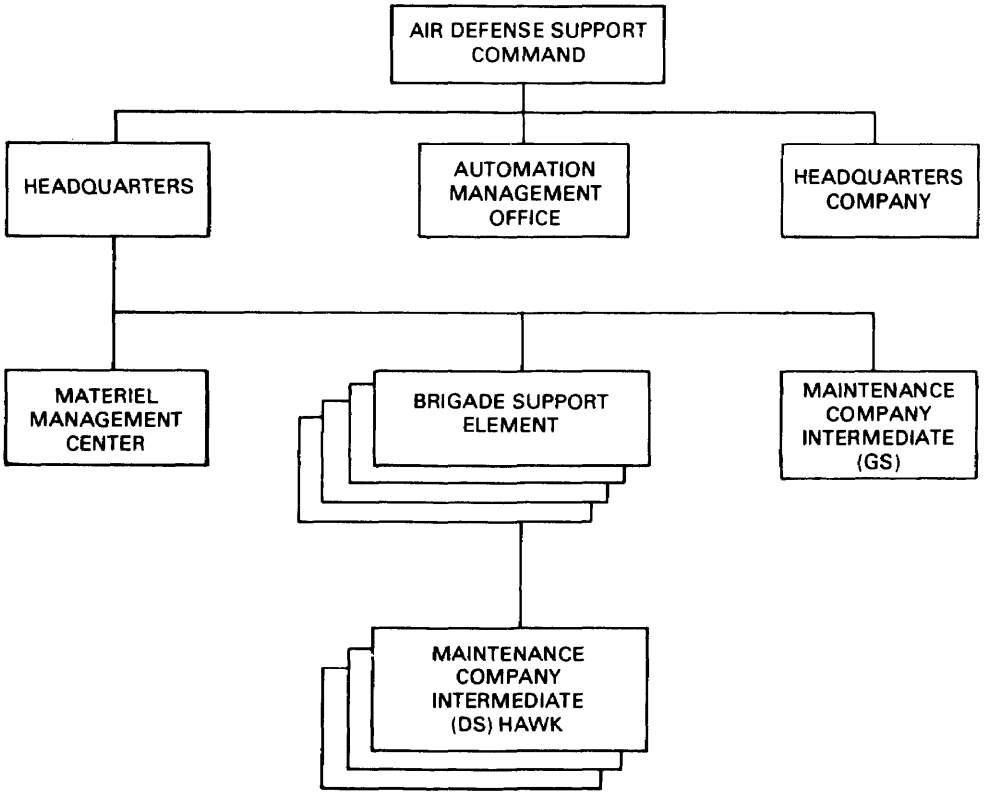
•Management of modification work orders, PIPs, and other similar equipment improvement programs.

•Coordination of command transportation requirements (both air and ground).

LOGISTICS SUPPORT ORGANIZATION

The creation of an ADSCOM establishes a technical chain of command from the maintenance support company commander through the ADSCOM commander to the AADCOM deputy commander for support. The deputy commander for support directs the logistics effort in the AADCOM. The ADSCOM organization incorporates innovative features of command and control for its 11 to 15 intermediate maintenance DS units, an MMC, intermediate DS and GS maintenance, and a GSSB. This results in a support structure for the AADCOM somewhat similar to the support structure for a division. The activation of the AADCOM MMC provides centralized management of materiel assets as well as autonomous operation by the ADSCOM intermediate DS and GS maintenance companies in emergencies. The complete structure of this organization is depicted in the following illustration.

AIR DEFENSE SUPPORT COMMAND



Intermediate (GS) Maintenance Company

The ADSCOM also includes a missile maintenance and supply GS company. This company has the mission of providing missile system intermediate (GS) maintenance and backup intermediate (DS) maintenance for selected air defense systems as required. This company provides —

- Intermediate (GS) maintenance and GSSB for air defense weapon systems.
- Supply support to intermediate (DS) maintenance companies.
- Reparables management for selected items.
- Quality assurance and quality control inspection for supported systems.
- Collection and classification of nonoperational systems.
- Unit maintenance for all organic equipment.

The organization of the intermediate (GS) maintenance company is shown in the illustration on page 9-4.

Intermediate (DS) Maintenance Company Hawk

The base of the ADSCOM is an intermediate (DS) maintenance company for each Hawk, Patriot, and nondivisional Chaparral/Vulcan battalion. Each maintenance company performs its own unit administration, unit supply, unit mess, and unit maintenance functions. The Hawk intermediate (DS) maintenance support company provides the Hawk battalion with —

- One-stop intermediate (DS) maintenance for Hawk-peculiar equipment.
- Limited intermediate (DS) maintenance for conventional automotive equipment.
- Intermediate (DS) maintenance for engineer, signal, and air-conditioning equipment.
- Requisition, receipt, storage, and issue of 5,000 lines of repair parts for both Hawk and conventional items on ASL.
- Maintenance support teams to supported units as needed.
- Reparables management supply support for selected items.
- Maintenance of ORF equipment.
- Unit and limited intermediate (DS) maintenance and supply support for its own organic equipment.
- Data transmission services to the MMC for parts requisition and cross-level queries for parts.

Intermediate (DS) Maintenance Company Hawk Organization

The intermediate (DS) maintenance company Hawk consists of a company headquarters and control and maintenance personnel. The company includes three separate sections for control and supply and two maintenance platoons.

Headquarters section. The headquarters section coordinates, supervises, and supports the maintenance activities of the maintenance support company. The headquarters section also has organic food service capabilities.

Quality assurance and quality control section. The QA/QC section works directly for the maintenance company commander. The QA/QC section provides inspection and control which is independent of the separate maintenance sections.

Missile maintenance platoon. The missile maintenance platoon is resourced to provide electrical and electronic as well as mechanical repairs to Hawk system equipment. The missile maintenance platoon also has the necessary resources to provide unit and intermediate (DS) maintenance for ORF equipment for a Hawk battalion.

Conventional equipment maintenance platoon. The conventional equipment maintenance platoon has the resources necessary to support maintenance of communications and electronics equipment. This platoon also supports maintenance of vehicles, power generators, and air conditioners.

Maintenance control section. The maintenance control section manages the company's maintenance workload. This section controls the flow of intermediate (DS) maintenance work through the maintenance company.

Technical supply section. The technical supply section manages the flow of repair parts. This section stocks and dispenses repair parts used by the supported units.

The organization of the intermediate (DS) maintenance company, Hawk, is shown in the illustration on page 9-3.

LOGISTICS CONCEPT OF OPERATIONS

The primary logistics coordinator in the AADCOM is the ADSCOM commander. He is responsible for logistics in the command in accordance with the priorities established by the AADCOM commander.

Brigade Support Element

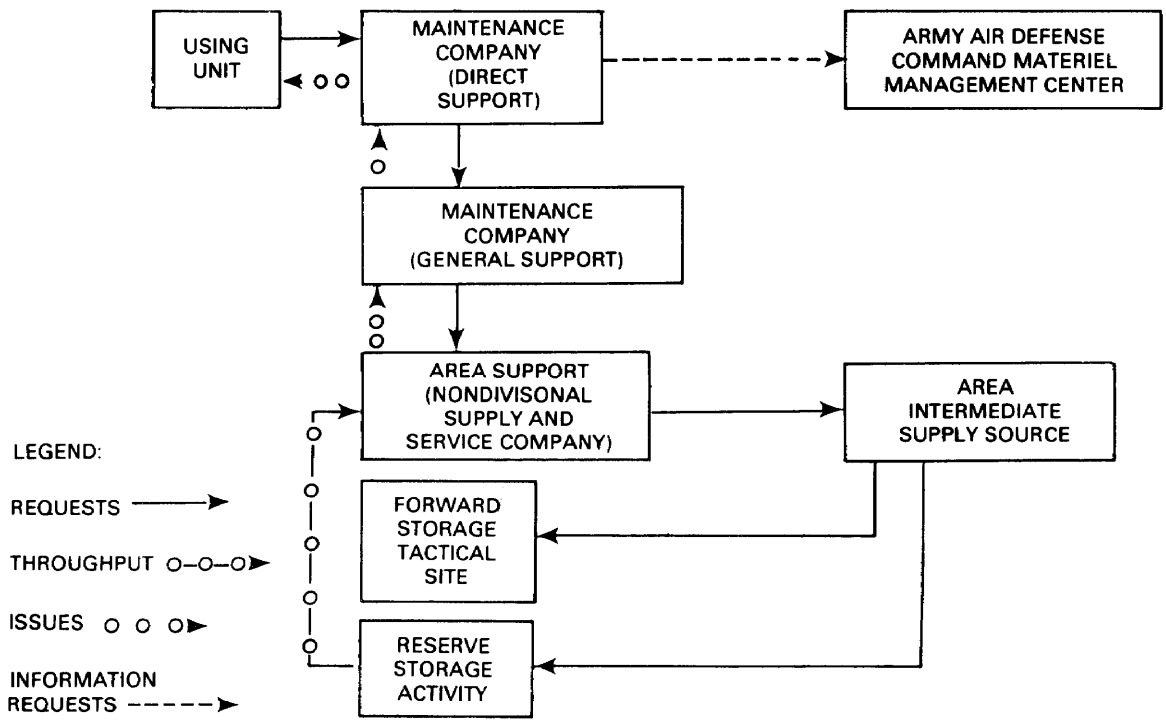
The ADSCOM provides an intermediate command and control organization, the BSE, which functions at the ADA brigade level. The BSE monitors the performance of subordinate maintenance support companies and provides a technical chain of command for the maintenance support company commander. The BSE commander is the logistics coordinator for the ADA brigade. As such, he establishes the priority of logistical support in accordance with the ADA brigade commander's priorities. The BSE monitors the use of ORF in the intermediate maintenance companies, coordinates the efforts of the intermediate maintenance companies and, when necessary, directs lateral transfer of ORF equipment to meet operational needs.

Supported Units

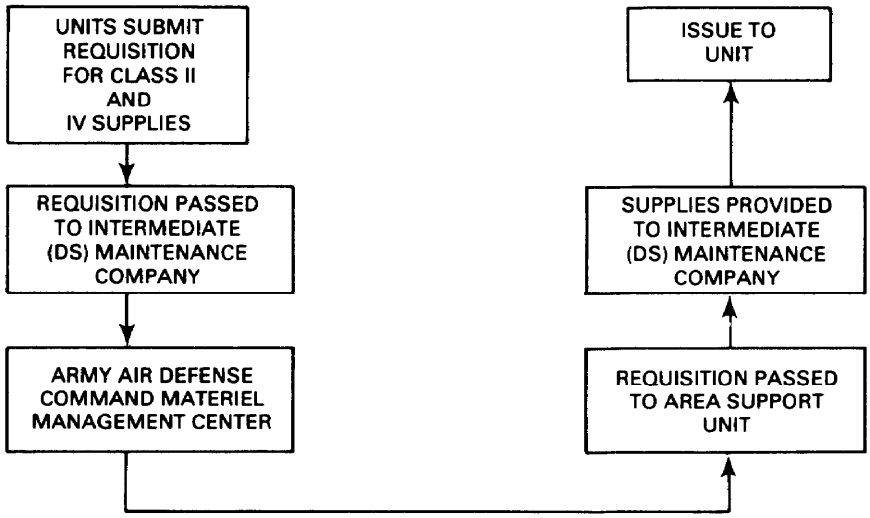
Supported units evacuate all equipment needing DS repair to the intermediate (DS) maintenance company. Items not within the repair capability of the intermediate (DS) maintenance company are transported to an appropriate general support unit by the intermediate (DS) maintenance company. This results in a single logistics point of contact for ADA customers. All requisitions for Class II, III (packaged), IV, and IX items needed by the Hawk battalion go through the intermediate (DS) maintenance company to the MMC. Unit commanders requisition major end items (Class VII) from managers of the MMC. Subsequently, the major end item will be provided to the unit through support channels via the GSSB, or through an ADSCOM maintenance company.

The illustrations on this page and the next three pages show the difference between the support provided by COSCOM and TAACOM units and the support provided by the ADSCOM.

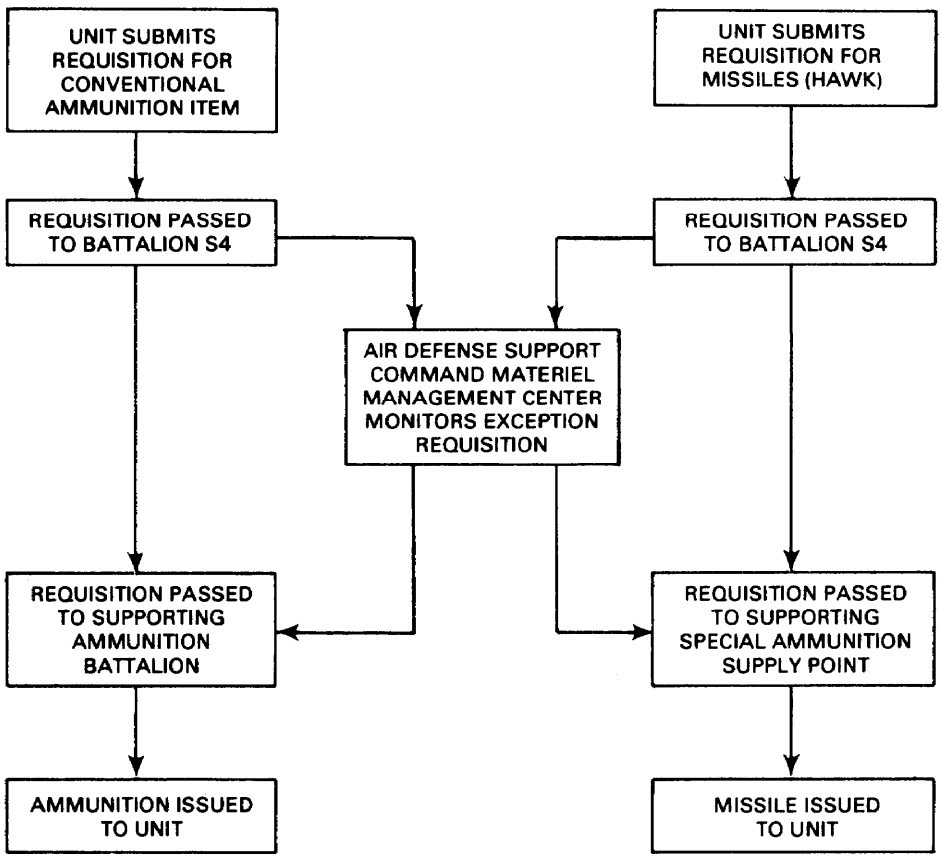
AIR DEFENSE SUPPORT COMMAND CLASS III (PACKAGE) REQUISITION/MATERIEL RELEASE ORDER/ISSUE



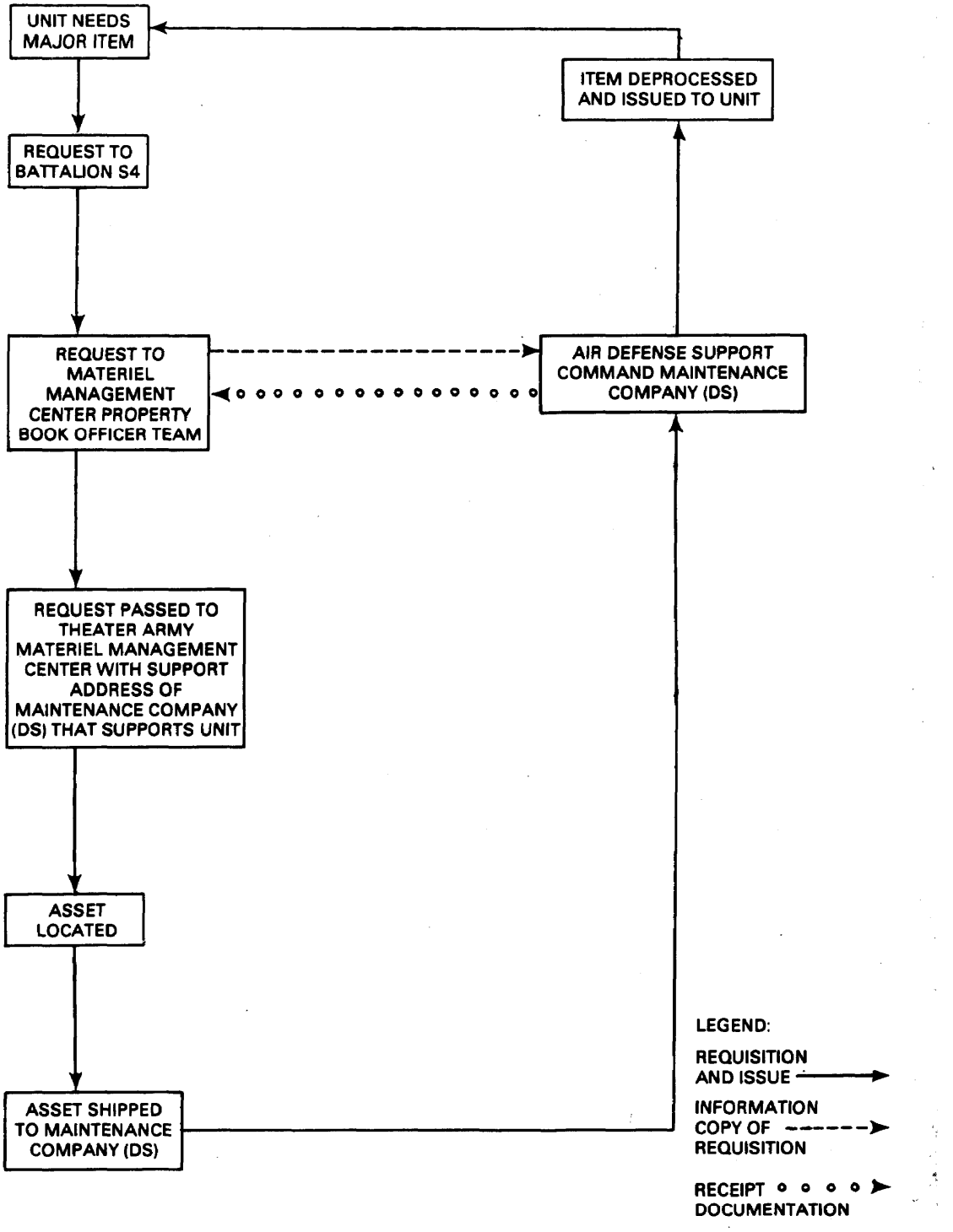
AIR DEFENSE SUPPORT COMMAND CLASS II, IV REQUISITION/MATERIEL RELEASE ORDER/ISSUE



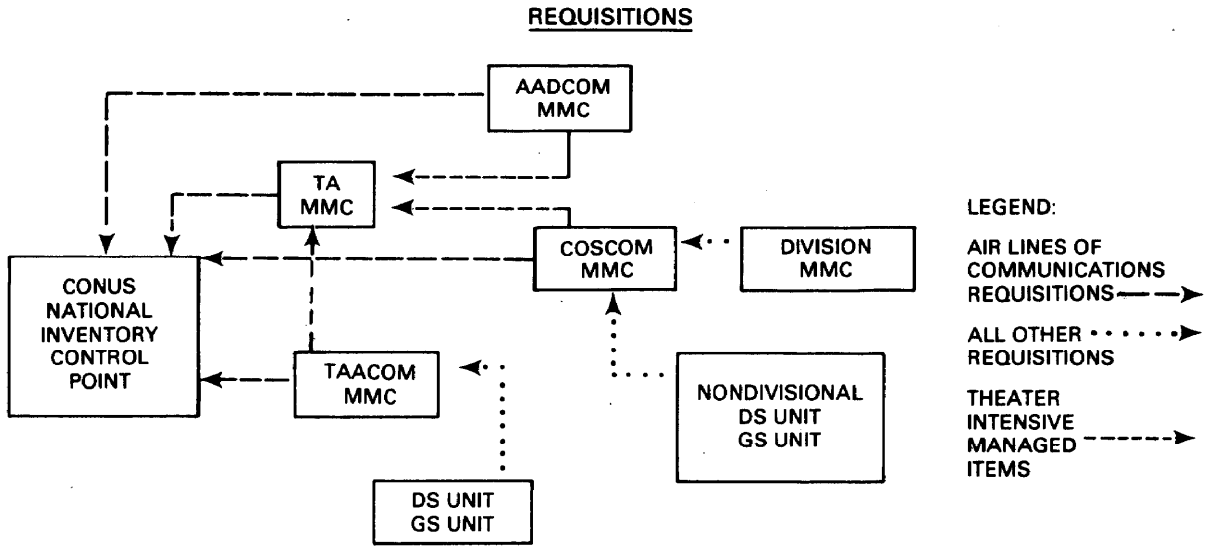
CLASS V CONVENTIONAL AMMUNITION AND MISSILE REQUISITION — ISSUE

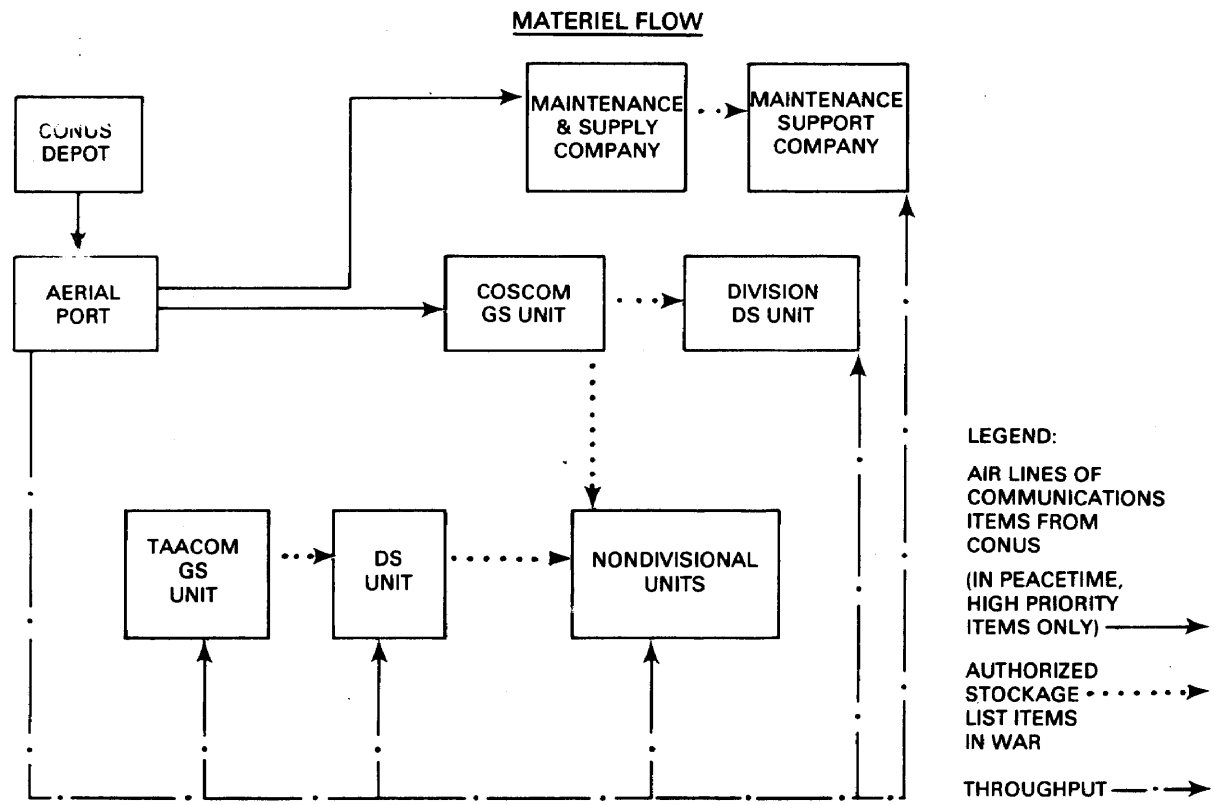


AIR DEFENSE SUPPORT COMMAND CLASS VII REQUISITION/ISSUE



AIR LINES OF COMMUNICATIONS CLASS IX AND MAINTENANCE RELATED CLASS II FLOW





Communications and ADP Support

Communications and ADP support are essential elements of the ADSCOM operation. Continuous support is mandatory if the system is to function. Each maintenance support company must be able to communicate with the AADCOM MMC, and the MMC must have access to ADP service and the command logistics base. The MMC must have its organic mobile computer system to enable it to interface with ADSCOM DS and GS intermediate maintenance units. The ADSCOM Communications illustration shows the required communications nets.

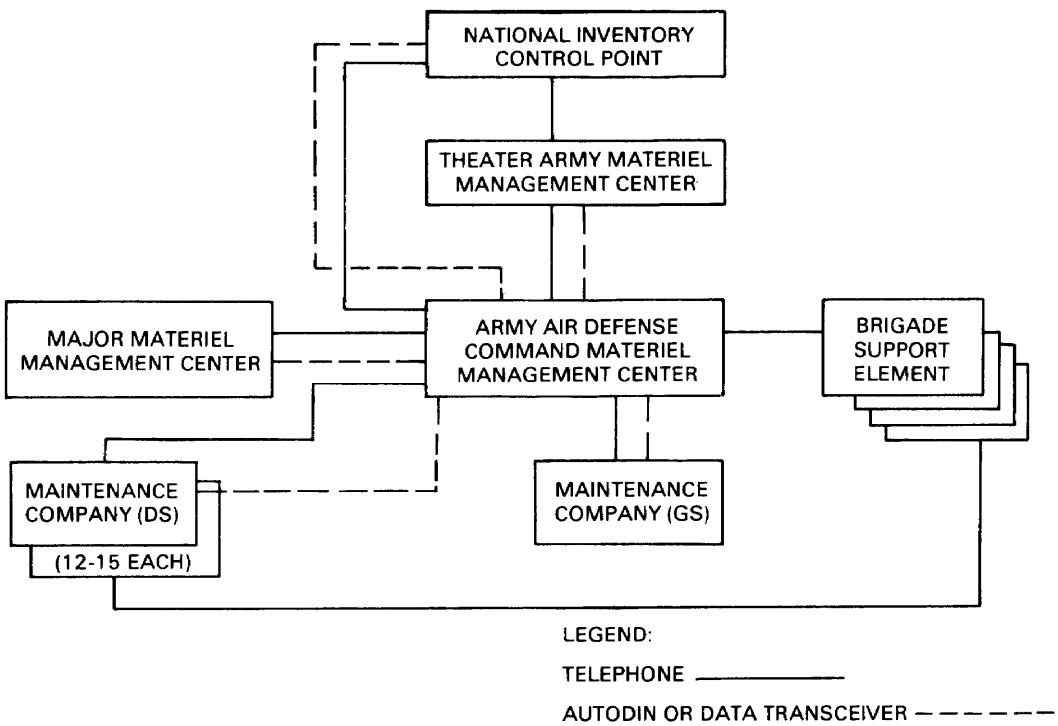
Separate Brigade Support

When an ADA brigade force deploys separately, the normally assigned intermediate maintenance companies support the ADA battalions. A BSE is attached to the ADA brigade for integration of logistics support activities within the brigade. If necessary, the BSE may be augmented by materiel management personnel from external sources to provide the brigade with the required management capability.

Separate Battalion Support

When an ADA battalion deploys separately in support of a force, it must have maintenance support. The maintenance company assigned to support the Hawk battalion will normally deploy with it.

ADSCOM COMMUNICATIONS



RECONSTITUTION

The increasing capabilities and lethality of modern weapons systems greatly increase the chances of high losses of troops and equipment over short periods of time. Commanders at all levels are becoming aware of the tremendous destructive power of enemy aircraft and are taking a strong interest in the proper employment of air defense systems in support of maneuver

elements and fixed assets. Chapter 2 describes in detail two phases of the air battle. The success or failure of Hawk units during the two-phase air attack depends in large measure upon their ability to reconstitute their combat power. The quality of prior planning will determine how quickly Hawk units will be able to reenter the air battle.

RECONSTITUTION PRINCIPLES

Reconstitution consists of nonroutine actions taken to restore damaged units to a specific level of combat readiness. These nonroutine actions are based on priorities established by the unit commander and result in the receipt of specified available resources to accomplish the reconstitution mission.

Commanders have two reconstitution options available for returning a unit to a specified level of combat capability. Those two options are reorganization and regeneration. The commander can execute them separately, but most often will execute them in combination depending on current and anticipated situations, command priorities, resources, and time available.

Reorganization is accomplished within the unit. Reorganization consists of cross-leveling of assets to form composite teams, sections, platoons, or higher level units. Since reorganization is conducted internally, it is the most expedient means of maintaining combat power in the early stages of a conflict and in forward units throughout the duration of the conflict. It is the option most often executed by commanders.

Regeneration requires outside support. Regeneration consists of rebuilding a unit by infusing new personnel, equipment, and supplies into a unit and then conducting the necessary training to develop combat effectiveness. Regeneration is the more difficult of the two available reconstitution options. It requires a great deal of outside assistance and a great deal of time for training. Commanders may choose regeneration as the method of reconstitution because regeneration can preserve the cohesion, trust, and confidence of the unit by infusing new personnel into existing squads and sections.

Reconstitution Level

Hawk units should attempt to reconstitute at the lowest level possible based on the following considerations:

- Enemy situation.
- Size of the attrited unit.
- Availability of ground or air transportation to move resources to the unit or vice versa.
- Future deployment plans for the reconstituted unit.

Reconstitution Responsibility

The responsibility for reconstitution rests with the commander one level higher than the damaged unit. The flow of reconstitution efforts is as follows:

- Platoon leader.
- Battery commander/XO.
- Battalion commander/XO/S4/IDSM commander.
- Brigade commander/DCO/S4/BSE.
- Major air defense commander/support commander.
- Corps commander/air defense liaison.
- Theater commander.

Reconstitution During Phase One

During phase one of the air battle, reconstitution efforts are decentralized from brigade level down to lower echelons, Reorganization is the primary option for the brigade. As a result, the formulation of detailed, unit-level reconstitution plans is critical. In addition, a command-wide equipment and personnel status report is vital to the effective transmission of current combat capability data to higher headquarters. Since the reported information is time-sensitive, the format must be simple yet complete.

Reconstitution During Phase Two

During phase two of the air battle, reconstitution efforts are centralized at the major air defense command level. The regeneration of weapons systems at predetermined rear combat zone reconstitution points and the redistribution of air defense assets among brigades may take place during phase two of the air battle.

RESPONSIBILITIES AT AFP AND BATTERY LEVEL

The platoon leader and the battery commander reestablish the air defense capability of the damaged unit. A key ingredient to return of unit command and control is initiation of damage assessment leading to subsequent

reconstitution efforts. Unit SOPs must address in detail the unit reconstitution points, the predetermined chain of command, decontamination procedures, and the requirements for determination of equipment operability following enemy attack. SOPs must also address specific priorities for reconstitution. Prioritization should always be oriented toward reestablishing the combat power of the unit. The following is a ***sample*** prioritization of five mission-critical areas:

•Personnel priorities — replace 14D, 16E, 16D, 223B, 24 Series, 31M, and 6313 as first priority. All other MOSS are second priority.

•Hawk system repair priorities — repair (in order of priority) HIPIR, PCP, acquisition radar, loader transporter, and launchers.

•Conventional equipment repair priorities — priority of repair should go to Hawk generators, Hawk system prime movers, unit recovery vehicle, communications systems, and fuel and PLL trucks. Other repairs to conventional equipment should be considered secondary.

•Logistic support priorities — support (in order of priority) Class IX (Hawk), Class 111 (diesel), Class V (Hawk), Class I, Class IX (conventional), and Class V (conventional).

•Communications priorities — reestablish (in order) ADC net, ADL net, operations and intelligence net, and administrative and logistics net. Priorities for communications type, in order, are UHF, FM, and AM.

Medical Support Procedures

Medical support procedures are carried out as the unit attempts to reestablish C^2 within the unit and to higher headquarters. Soldiers perform buddy aid on wounded personnel; unit teams initiate rescue, collection, triage, separation of contaminated casualties, identification, and evacuation procedures. Predesignated field ambulances evacuate the critically injured to the battalion aid station.

Commander's Assessment

The battery commander and key personnel determine the losses in soldiers and equipment. The commander assesses the capability of the unit to function in the air battle, and the unit forwards the information to the battalion utilizing a standardized weapons system status report. The battle damage assessment includes —

•Decontamination needs which are beyond unit capability.

•C^2 capability within the unit. This includes key positions that require replacements and the percentage of communications equipment lost.

•Personnel, crews, and excess available.

•Equipment available separated into conventional equipment and weapons. Conventional equipment includes vehicles (system, CP, and service-support), trailers, and NBC assets. Weapons include individual weapons, crew-served weapons, and Hawk end items.

•Supply status, including Classes I, II, III, V (conventional and Hawk), VIII, and IX.

•Training status for collective and individual tasks in light of casualties incurred.

Battle Damage Control

The battle damage control team saves as much equipment as possible and estimates the requirement for further assistance. The damage control team forwards the estimate as part of the unit report.

Decontamination

In the presence of NBC agents, the unit conducts decontamination as soon as possible. The decision to do hasty or deliberate decontamination will depend on the situation, the extent of contamination, decontamination resources, and the mission. Only that which is necessary to accomplish the mission is decontaminated. Decontamination takes the following order of priority:

•Skin.

•Personal equipment.

•Vehicles and weapons systems.

•Hasty decontamination including MOPP gear exchange and vehicle washdown.

•Detailed troop and equipment decontamination as approved by higher headquarters within available resources.

Personnel should decontaminate Hawk system equipment in the following order. Hawk crews should first decontaminate the HIPIR, then the PCP, acquisition radars, LSCB, unloaded launchers, and, finally, missiles on pallets. Missiles on launchers need not be decontaminated if they are to be fired.

Vehicles should also be decontaminated in order. First decontaminate Hawk prime movers, then loader transporters, and then other vehicles. Deciding whether to decontaminate weapon system equipment or vehicles first will depend on the situation and the mission.

Support Unit Reconstitution

The same basic reconstitution procedures apply to the DS unit. The BSE manages the reconstitution of the intermediate (DS) maintenance unit. The scarcity of Hawk assets and ORFs makes reconstitution of the intermediate (DS) maintenance unit a critical priority.

Site Determination

The battery and battalion commanders determine the best location for the reconstitution effort, whether it be on-site, at a jump location, at the battalion reconstitution point, the brigade reconstitution point, or the major air defense command or support command reconstitution point. For ground security purposes, the lowest level of reconstitution should be at the battalion. If reconstitution at battalion level is not feasible, the unit jump location should be near a main supply route, or should possess a landing site for C-130 aircraft or medium-lift helicopters.

RESPONSIBILITIES AT BATTALION LEVEL

The responsibility for Hawk battery reconstitution rests with the battalion commander or the S3. It is, however, primarily a staff activity, and the battalion XO is the manager of the reconstitution effort. He manages (based upon priorities set by the S3 and the commander) and coordinates the activities of the S1, S2, CESO, the headquarters battery commander, and the DS unit commander. When the battalion receives the status report from the battery, the XO and the staff determine the severity of the situation and the XO dispatches a battalion control and assessment team if he deems it necessary. The XO briefs the battalion commander on the essential elements of the status report and on staff recommendations. See the Staff Responsibilities illustration below.

STAFF RESPONSIBILITIES

S1

Determines availability of replacements.

Coordinates personnel replacements.

Fills slots based on priorities set by S3.

Coordinates medical support.

S2

Provides threat assessments for rear area reconstitution sites.

Advises S3 on the threat situation.

S3

Recommends priorities for reconstitution to commander.

Identifies critical shortfalls.

Redesigns air defense based on available firepower.

Sets communications priorities.

Sets priorities for decontamination.

S3 (continued)

Sets priorities for resupply of Classes III and V (missile) by unit.

Monitors Hawk system for repair actions.

Sets priorities for personnel replacements by MOS and unit.

Coordinates locations for hasty and deliberate decontamination.

S4

Recommends allocation of critical supply items.

Coordinates resupply of critical items (Class I, III, V, IX) in accordance with priorities.

Coordinates host nation support.

Coordinates movement requirements to support reconstitution.

Coordinates delivery of operational readiness float equipment with the DS unit.

Staff Coordination

The success of the reconstitution effort depends on how much prior coordination the staff officers have accomplished with their counterparts from division, corps, and theater level. Each staff officer is responsible for knowing what is available in the area of operations. The staff must know —

- What is available to provide the proper type and quantity of equipment, arms, and ammunition.
- What is available to provide fuel resources.
- What is available to provide maintenance support for the repair or replacement of damaged conventional and Hawk equipment.
- What is available to provide fit and trained replacements for personnel wounded or killed in battle.

Resource Availability

Once the staff determines the availability of the resources in the area of operations, each staff officer concentrates on when the resources are available and where the resources will be. The S4 determines the transportation requirements through his lateral and higher headquarters counterparts. The S2 and S3 determine the risk involved in the transportation scheme. Finally, all staff elements prepare estimates on the availability and feasibility of future support to meet the anticipated tactical situation.

Mission Requirements

The S3 reviews the mission requirements as cross-leveling procedures are initiated across the battalion. The EMMO team is dispatched as part of the control and assessment team if deemed necessary. Support teams from the DS unit meet with battery maintenance personnel to conduct Hawk and conventional equipment assessment as follows:

- Category 1 — repairable on site within 8 hours.
- Category 2 — repairable within 8-24 hours following arrival — evacuate to DS unit.
- Category 3 — repair time exceeds 24 hours ***or*** repairs require a higher level of maintenance than the DS unit can provide.
- Category 4 — repair time exceeds 48 hours ***or*** the equipment is destroyed. Controlled substitution may be authorized by battalion.

Support Responsibilities

The DS unit commander is responsible for familiarity with divisional, corps, and area DS and GS groups. The S4 coordinates with the DS unit commander on all aspects of the attrited unit's supply and maintenance requirements. The S4 and the DS unit commander also determine transportation requirements and pool their resources. The S3 requests assets from the corps transportation movement officer and the divisional movement control center, if required. Host nation support assets are unlikely to be available unless the unit is undergoing reconstitution in the rear combat zone.

Wartime Procedures

The S1, using wartime SIDPERS and accounting and casualty procedures, determines the number of MOS-specific replacements needed from the battery's status report. The S1 forwards personnel requests to the brigade.

RESPONSIBILITIES AT BRIGADE LEVEL

The DCO is the Hawk system manager for the reconstitution effort at the brigade level. The DCO and the staff elements review the battalion status reports and initiate any required assistance. The redistribution of equipment through the brigade is organized with the assistance of the BSE. The DCO also decides on the necessity of dispatching the brigade control and assessment team to the damaged battery. The mission of the brigade assessment team is basically the same as that of the battalion team with the additional responsibility of providing training resources to assist the attrited unit to return to the air battle.

MAJOR AIR DEFENSE COMMAND, SUPPORT COMMAND, OR THEATER COMMAND

Liaison teams are provided to the theater personnel command at the proper alert. The air defense command also provides a processing and receiving station and usually two reconstitution points in the theater area.

Command Battle Staff

The air defense command battle staff determines what actions are necessary to reconstitute the maximum number of fire units. The

support command coordinates with the staff to analyze the status reports and determines the best method to employ available resources in light of the tactical situation. The Hawk system manager, assigned by the SUPCOM commander, keeps track of —

- New replacements (personnel and equipment).
- Equipment returned from maintenance.
- Personnel returned to duty status.
- Imbalances of personnel and equipment in subordinate units.

Logistical Link-Up Points

The G4 coordinates with the Hawk system manager on the activation of pre-planned logistical link-up points. The G4 then transmits information on these points to subordinate units. He also coordinates with the theater movement coordination center for delivery of Hawk end items, critical parts, and conventional assets.

Replacements

The G1 integrates the air defense command replacement flow with the theater army replacement system. The replacements arrive at ports of debarkation and the theater army personnel operations center assigns the replacements to the air defense personnel liaison team. The replacements then move to the replacement regulating detachment located at the air defense command reconstitution point.

Pre-planned Reinforcements

The theater command and the air defense command determine the usage of TPFDL units. The TPFDL units fill the pre-planned reinforcement mission or may be used as unit, battery, platoon, squad, or crew replacements. Under normal circumstances, TPFDL units will be used as individual replacements. Hospital returnees and excess common or SHORAD MOS personnel will be diverted as individual replacements by air defense liaison teams at the corps personnel operations center.

Reconstitution Points

The air defense command reconstitution points are the final staging areas for the reconstitution of Hawk units. The G1 operates the replacement regulating detachment. The G3 runs the tactical evaluation training team. The G4 provides the maintenance instruction team for both Hawk and conventional equipment support personnel.

PLANNING AND TRAINING FOR RECONSTITUTION

The coordination between the air defense chain of command and the division/corps/theater chain of command is critical. Standardization of procedures during exercises should be emphasized. Staff training in reconstitution procedures at all levels is usually a low priority since it is viewed by some as a defeatist attitude toward wartime operations. In reality, reconstitution is a necessary component of sustainment in a wartime environment. Since Hawk resources are finite, “push-packs” under a program such as the preconfigured unit load program could reduce the transportation requirements for critical Hawk components in a corps area. The criteria and layout of reconstitution points should be addressed in detail in battalion and brigade OPLANs. This is because of the sheer number of activities which must occur.

APPENDIX A

Firepower Analysis

The following procedures represent a practical means of evaluating the effectiveness of Hawk defenses. The accuracy of this analysis depends on the amount of time available, the effort applied, and the accuracy of intelligence. Hawk defenses are evaluated for their ability to deliver sufficient firepower against an assumed threat.

DEFENSE FIREPOWER REQUIREMENTS

Defenses are evaluated based on their ability to deliver effective fires. The defense commander will specify the degree of protection for each defense in terms of EE. EE is the average kill capability of the defense, expressed as a percentage, against the ***most likely*** threat. For example, the commander who specifies an EE of 90 percent actually is directing that the defense be capable of destroying 90 percent of the threat. Although the natural tendency is to demand a 100 percent effective defense, this is not consistent with air-land battle doctrine which predicts friendly air superiority will only exist for limited periods in limited areas. A 90-percent EE would be a realistic value for a high priority asset.

After the commander specifies the EE for the entire defense, the defense designer assigns each unit a percentage of the EE. Normally, in a composite point defense consisting of a Hawk battalion and a SHORAD battery, the Hawk battalion is allocated 70 to 80 percent of the total EE while the SHORAD battery is responsible for the remaining 10 to 30 percent. This means that the Hawk battalion is responsible for destroying 63 to 81 percent of the total threat and the SHORAD battery is responsible for destroying 9 to 27 percent of the total threat.

Once the defense designer establishes the Hawk battalion EE (63 to 81 percent in this example), he determines the total number of attempted missile launches required to achieve the specified EE. The designer does this by determining the number of launches required per target. The number of launches required per target multiplied by the total number of targets yields the total number of missile launches.

The chart at the top of page A-2 indicates the number of launches required per target to attain a specified EE. The variable factor in the chart is the SE of Hawk. SE is the probability, expressed as a percentage, that a fire unit will acquire a single target within system design capability, deliver a single round that will burst within system design accuracy, and achieve the desired degree of target destruction. Current values of Hawk SE are contained in (S) FM 44-1A. If the Hawk SE is 70 percent, the unit must launch two missiles to attain an EE of at least 91 percent. If the required EE were 70 percent or less, only one launch would be needed.

CONTENTS

ENGAGEMENT EFFECTIVENESS EXPRESSED AS A PERCENTAGE

ATTEMPTED MISSILE LAUNCHES REQUIRED PER TARGET

SYSTEM EFFECTIVENESS (PERCENTAGE)

MSLS	1	2	3	4	5	6	7	8	9	10	11	12	13
99	99	99	99	99	99	99	99	99	99	99	99	99	99
95	95	99	99	99	99	99	99	99	99	99	99	99	99
90	90	99	99	99	99	99	99	99	99	99	99	99	99
85	85	97	99	99	99	99	99	99	99	99	99	99	99
80	80	96	99	99	99	99	99	99	99	99	99	99	99
75	75	93	98	99	99	99	99	99	99	99	99	99	99
70	70	91	97	99	99	99	99	99	99	99	99	99	99
65	65	87	95	98	99	99	99	99	99	99	99	99	99
60	60	84	93	97	99	99	99	99	99	99	99	99	99
55	55	79	90	95	98	99	99	99	99	99	99	99	99
50	50	75	87	93	96	98	99	99	99	99	99	99	99
45	45	69	83	90	94	97	98	99	99	99	99	99	99
40	40	64	78	87	92	95	97	98	99	99	99	99	99
35	35	57	72	82	88	92	95	96	97	98	99	99	99
30	30	51	65	76	83	88	91	94	96	97	98	99	99
25	25	43	57	68	76	82	86	89	92	94	95	96	97
20	20	36	48	59	67	73	79	83	86	89	91	93	94
15	15	27	38	47	55	62	67	72	76	80	83	85	87
10	10	19	27	34	40	46	52	57	61	65	68	71	74

If the most likely threat raid size were 50 aircraft. an EE of 91 percent would require 100 missiles. This calculation gives the standard against which to evaluate the defense. The remainder of the evaluation centers on determining how many missiles the defense can launch and how many will intercept the targets before those targets reach the point of evaluation.

Burst locators are used to determine the number of intercepts. A point of evaluation is the last point where an intercept can occur to success fully accomplish the ADA mission Points of evaluation vary depending on the type of defense and attack technique. The following illustration summarizes points of evaluation for different defenses and different threat profiles.

POINTS OF EVALUATION

POINT DEFENSEt

B R L

GRAVITY BOMBING
LABS
POPUP

EDGE OF CRITICAL ASSET

LAYDOWN
ASM

AREA DEFENSE

AREA BOUNDARIES

BELT DEFENSE

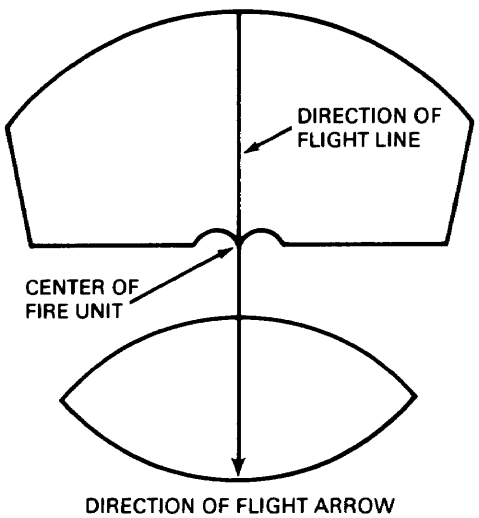
REAR BOUNDRY
OF BELT

BURST LOCATOR CONSTRUCTION

The Hawk burst locator is a graphic device constructed to a given representative fraction for a specified target speed and target size (radar cross-section). The burst locator measures the engagement capability of a fire unit or battery. The burst locator is used on a map or defense overlay to give a direct reading of the engagement capability of the fire unit before the threat reaches the point of evaluation.It is necessary to prepare a burst locator for the most likely conditions to be encountered. The burst locator is an effectiveness template contoured to reflect where each successive intercept will occur.

The Hawk Effectiveness Template illustration graphically portrays the areas in which a Hawk fire unit can accomplish a successful intercept. Effectiveness templates are based on assumed characteristics of the threat (speed, altitude, and target size) and may be found in (S)FM 44-1A. The effectiveness template consists of two effectiveness zones. The forward effectiveness zone depicts the area in which a fire unit can effectively intercept an approaching aircraft. The rear effectiveness zone depicts the area in which a fire unit can effectively intercept a receding aircraft. The area between the forward effectiveness zone and the rear effectiveness zone is a dead zone caused by a loss of tracking capability. As the target approaches the fire unit, there is a point where its closing velocity will decrease below the minimum required for tracking. Both the CWAR and the HIPIR will lose track. This position will determine the rear edge of the forward effectiveness zone and will vary with the speed of the aircraft. When a slow aircraft has passed the fire unit, the receding velocity will exceed the minimum and both radars will again be able to track. The front edge of the rear effectiveness zone indicates the location where the first intercept is possible against a receding aircraft. The configuration of the template will vary depending on the speed and altitude of the aircraft. For the purpose of evaluating defenses, the rear effectiveness zone is not considered.

HAWK EFFECTIVENESS TEMPLATE



ASSUMPTIONS

To construct and use a burst locator, the defense designer must make the following assumptions:

- ***Target speed and altitude*** will remain constant.
- ***Target course*** is straight and level.
- ***Reaction time*** will remain constant. See (S) FM 44-1A.
- ***Reliability*** is 100 percent. The number of intercepts measured by the burst locator is assumed to be a true capability. SE, applied in the effectiveness formula, compensates for the less than 100 percent effective missile system.
- ***Initial burst*** will occur at maximum effective horizontal range of the missile system against a specific threat unless otherwise indicated by firing doctrine.
- ***Method of fire*** used in construction will be the method tactically used. The three methods of fire are shoot-look-shoot, ripple, and shoot-new target-shoot. The shoot-look-shoot method is used to launch a missile from one fire unit and assess target damage before firing another missile from that unit. The ripple method is used to fire two or more missiles from one fire unit at **a** specified time interval. The shoot-new target-shoot method is used to assign a new target for engagement after warhead detonation is detected. Target damage is not assessed.

SCALES

Scales presenting the time-distance relationship between the missile and the aircraft

are required to determine the number of bursts. These scales are normally constructed on acetate in advance.

Target Flight Scale

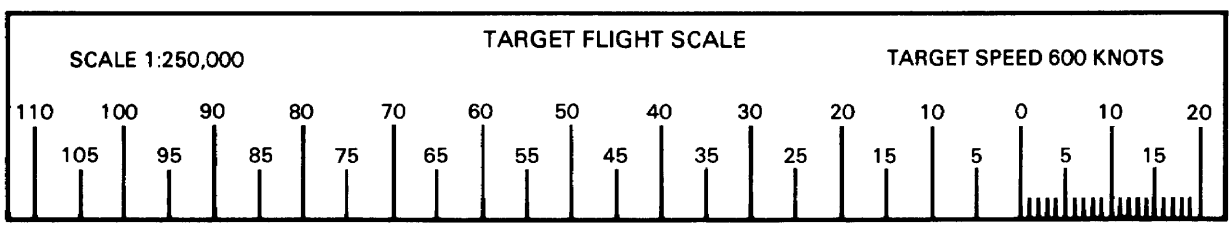
The target flight scale (see illustration below), based on target speed and constructed to a particular map scale, shows the distance that the target will travel during the maximum time of flight of the missile, as shown in the time-along trajectory graph on page A-5. The target flight scale is linear and is valid for any altitude.

Target speed. An aircraft traveling at a speed of 600 knots (600 nautical miles per hour) travels approximately 3.1 kilometers in 10 seconds. Threat speed in knots (600) multiplied by a conversion factor of .005143 gives threat speed in kilometers per 10 seconds (3.08). To the nearest tenth of a kilometer, this is 3.1 kilometers per 10 seconds.

Map scale. This distance is shown graphically on a scale (clear acetate is convenient for this scale) corresponding to the scale of the particular map or overlay in use. The time depicted must be at least the maximum time of flight of the Hawk missile.

System dead time. The portion of the scale to the right of the index mark (zero point) must be subdivided into intervals of one second. This portion of the scale is used to account for system dead time. System dead time is that time that the target will fly during response time (the time from acquisition to the launch of the first missile) and reaction time (the time from the burst of one missile to the launch of the next from the same fire unit).

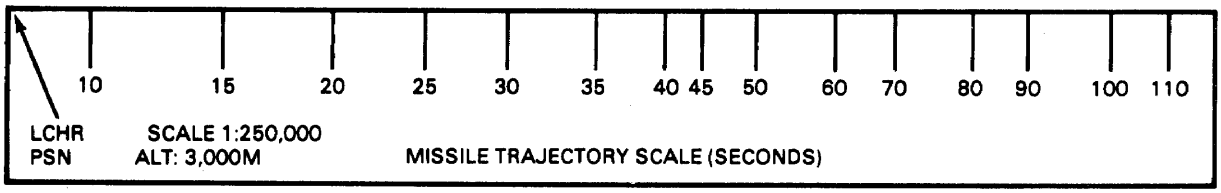
PREPARED TARGET FLIGHT SCALE



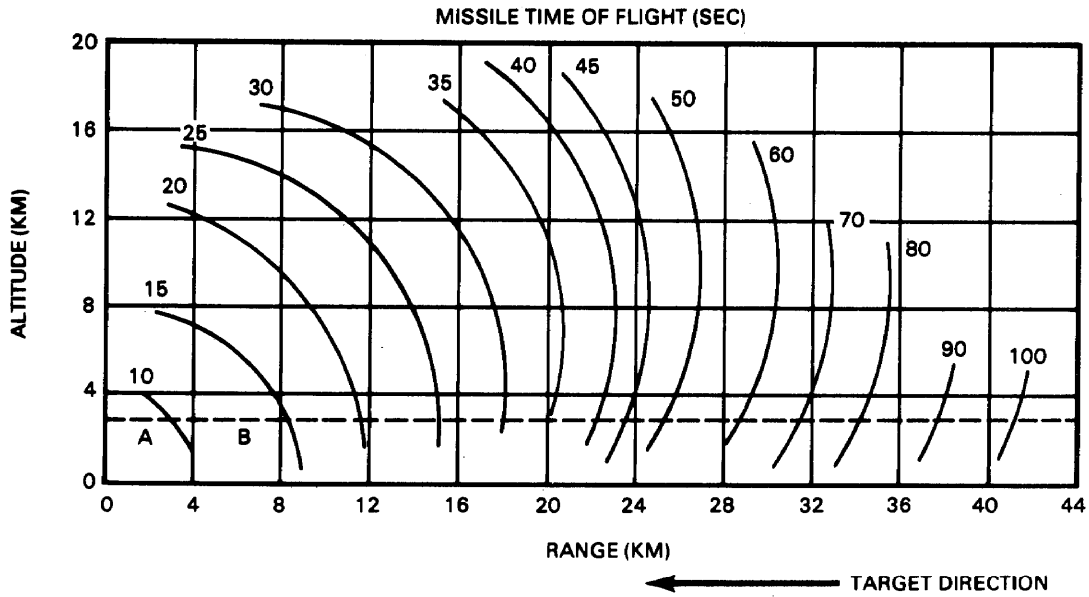
Missile Trajectory Scale

The missile trajectory scale shows the horizontal distance that the missile will travel in a given period of time. It is constructed by entering the time-along-trajectory chart in (S)FM 44-1A at the assumed threat altitude. The time lines on the time-along-trajectory chart represent some combination of altitude and downrange distance. Given a threat altitude of 3,000 meters and a Hawk time-along-trajectory chart, the horizontal distance that the missile will travel downrange corresponding to every 10 seconds time of flight is determined by constructing a line perpendicular to the horizontal range scale. For example, intercept 3,000 meters in altitude (A) after approximately 10 seconds time of flight will occur approximately three kilometers downrange (see the Hawk Time Along Trajectory Graph illustration). Similarly, after 15 seconds time of flight (B) the missile will have traveled approximately eight kilometers downrange. On the missile trajectory scale (see illustration) the launcher position is at the left end of the scale. Times of flight out to the time of flight of the missile are indicated at the equivalent horizontal range. The intervals on the scale are measured from a particular map scale (representative fraction) and must correspond to the maps or overlays in use. The time-distance relationship on the missile trajectory scale is nonlinear. This corresponds to the changes in missile velocity and the trajectory of the missile itself.

HAWK MISSILE TRAJECTORY SCALE



HAWK TIME ALONG TRAJECTORY GRAPH

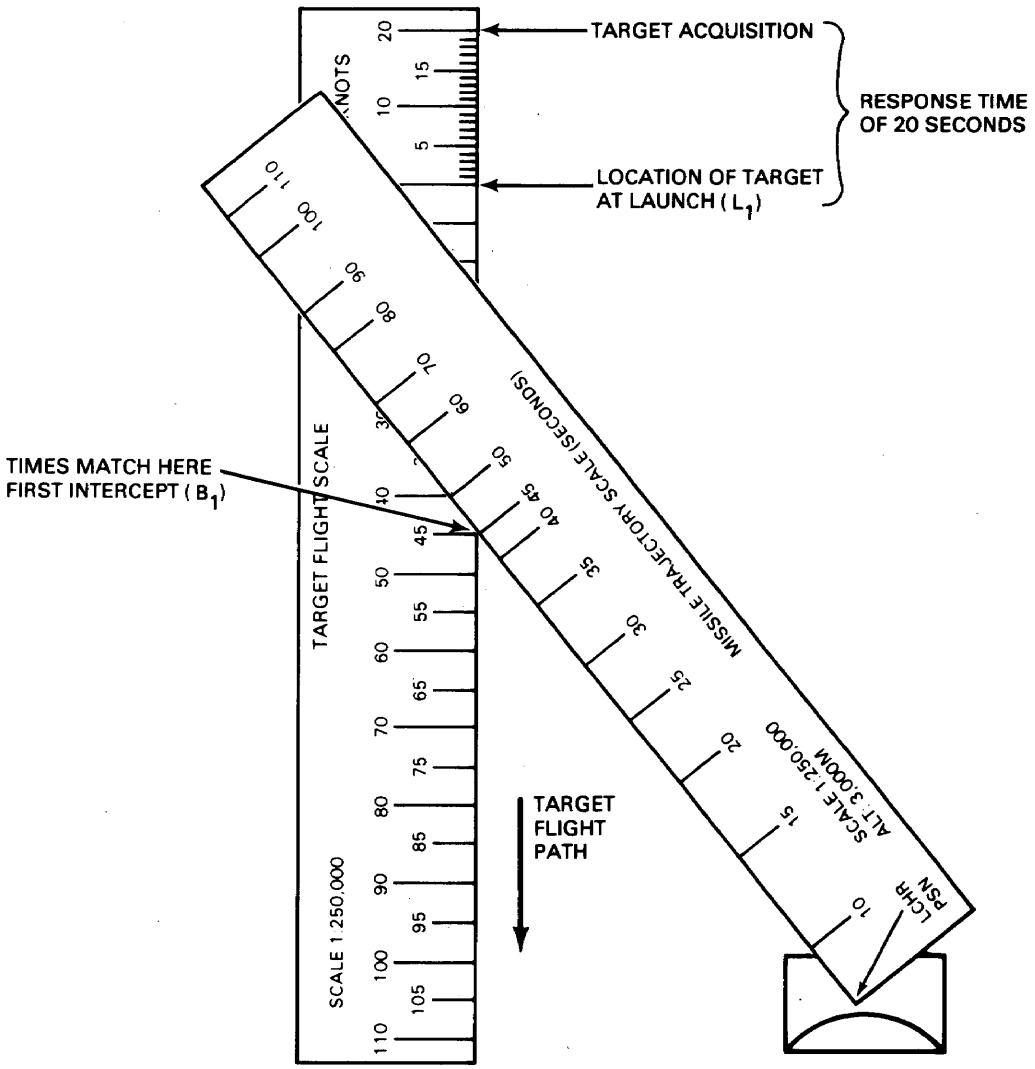


Use of Scales

The target flight and missile trajectory scales (shown on page A-6) are used to match the time of flight of the target with that of the missile. When times match, the missile will intercept the target. At this point the defense designer plots a burst. The designer orients the missile trajectory scale with the launcher position over the location of the fire unit. He then orients the target flight scale along the direction-of-attack line. Response time (see (S)FM 44-1A), the time delay from the point at which afire unit initially detects the target until launch of the first missile, is represented to the right of the zero mark on the target flight scale. The response time specified in (S) FM 44-1A is placed over the point at which acquisition will occur. The "O" on the target flight scale then represents the location of the target at first missile launch (L_1). The defense designer orients and rotates the missile trajectory scale until he obtains a time match with the target flight scale. This will beat the first burst (B_1). To plot

the location of succeeding bursts, the defense designer repeats the process, except that he sets off reaction time on the target flight scale rather than response time from the point of each previous missile burst. Reaction time is the time from the burst of one missile to the launch of the next from the same fire unit.

TARGET FLIGHT AND MISSILE TRAJECTORY SCALES



BURST CONTOURS

On the effectiveness templates, draw arbitrary direction-of-attack lines 10 kilometers apart. Because of the assumption that the first burst will occur at maximum effective system range (the front edge of the forward effectiveness zone), this will be the first burst contour. To determine the location of the second burst, set off reaction time on the target flight scale at the

location of the first burst and again match times; the point where times match is the position of the second burst. Use this procedure on all direction-of-attack lines drawn to determine the succeeding burst contours.

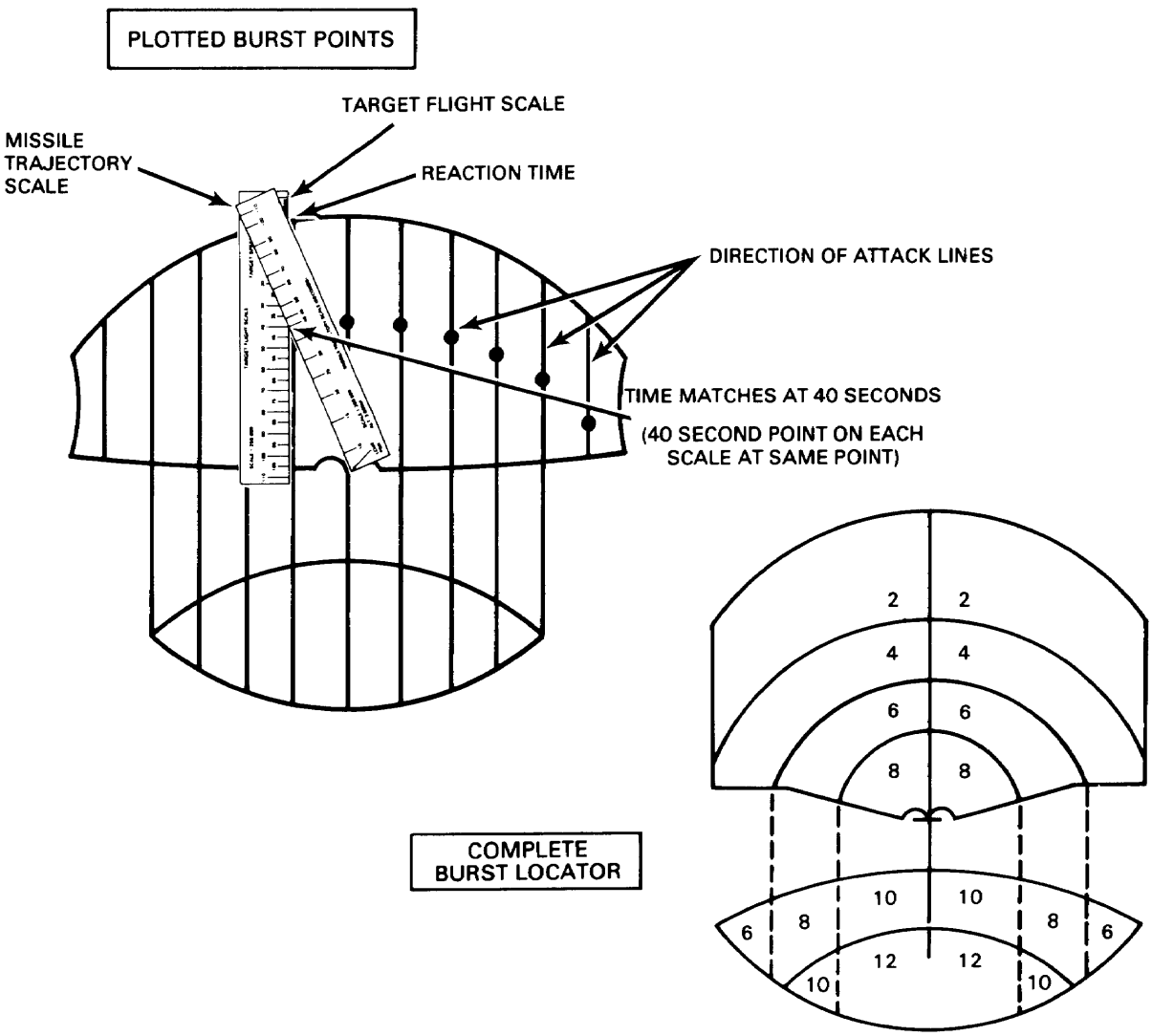
BURST LOCATOR USE

The center point on the burst locator (see illustration below) represents the fire unit. The direction-of-attack line and arrow indicate the course of the threat. The burst contour lines connect points of like numbered missile bursts (plotted burst points). The contour interval (distance between burst contour lines) represents the distance that the target will travel during reaction time and missile time of flight.

ORIENTATION OF BURST LOCATOR

When using a burst locator to measure the possible number of intercepts, there is a specific manner in which it must be oriented. Place the center point over the fire unit location. Orient the direction-of-attack line on the defense overlay.

BURST LOCATOR



APPLICATION OF BURST LOCATOR

The burst locator may be used to evaluate the capabilities of both point and belt defenses.

Hawk Point Defense

Place the burst locator with the center point (representing the threat) on the point of evaluation (see illustration). Orient the direction-of-attack line with the aircraft's course.

Read the engagement capability for each fire unit. This is the number of intercepts which can be accomplished before the target reaches the point of evaluation. Then the intercepts are totaled for the defense.

Hawk Belt Defense

To evaluate the capabilities of a belt defense, the point of evaluation is the rear boundary of the belt. Draw the direction-of-attack lines 10 kilometers apart, perpendicular to the rear boundary.

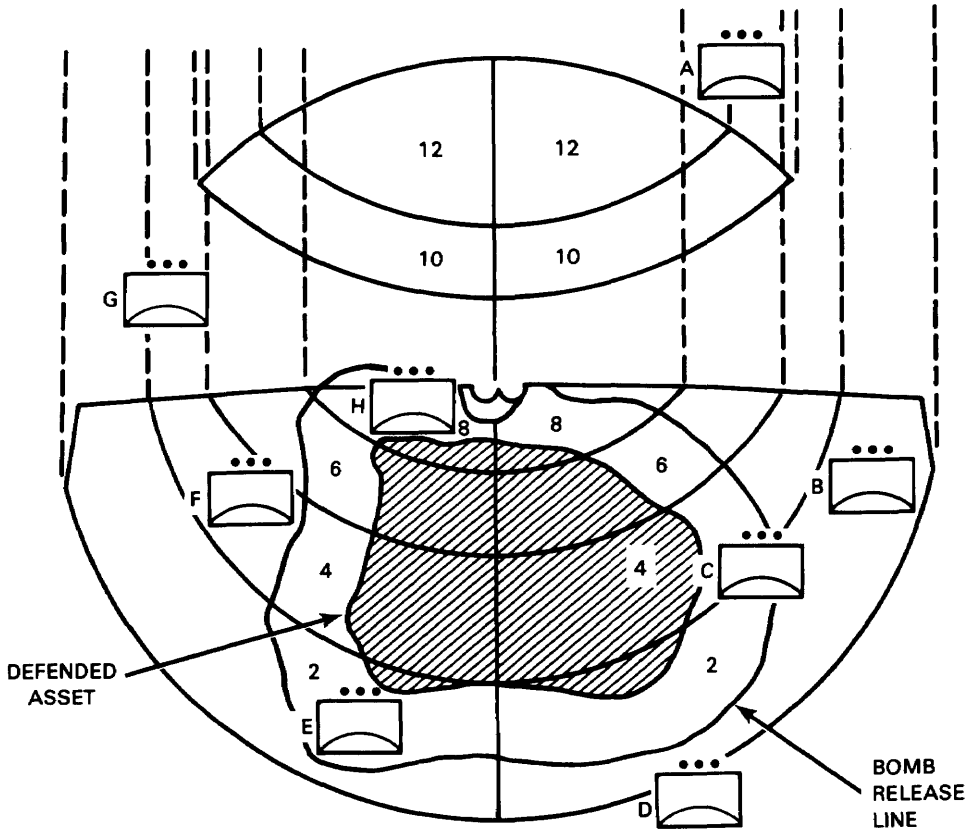
Place the burst locator over each fire unit along the direction-of-attack line. Read the engagement value for each fire unit on each direction of attack. Total the intercepts for the entire defense.

DEFENSE EFFECTIVENESS

By determining the maximum number of missiles that a defense can launch against a threat before it reaches the point of evaluation or fire unit dead zone, the defense designer evaluates the effectiveness of the unit's defense.

Now determine the maximum raid size against which the defense has the specified EE.

HAWK BURST LOCATOR EVALUATION OF POINT DEFENSE



Using the effectiveness formula:

$$n_c = \frac{M_t}{m}$$

wherein:

n_c = The maximum raid size against which the defense has the specified EE, expressed as a whole number (all fractions are dropped).

M_t = The number of missiles that a defense can launch along a given direction of attack (route of approach) before the target reaches the point of evaluation.

m = Number of missile launches required to obtain the specified probability of killing one target.

The quantity n_c must be greater at all points around the defense than the single raid size capability credited to the enemy in the initial threat estimate. If analysis reveals that n_c is less than the expected raid size along any likely avenue of approach, the defense planner must increase the number of missile launches per target or return to an application of the principles, guidelines, and requirements discussed in Chapter 5. This analysis and redesign process must continue until the time available limits further analysis or until the defense planner has achieved the best possible defense given METT-T. Any weaknesses in the defense must be brought to the commander's attention. It is the commander's prerogative to allocate additional fire units or accept those weaknesses.

BURST LOCATOR VARIATIONS

One of the prime assumptions made in the design of a burst locator is that the initial burst occurs at the maximum effective horizontal range of the missile system. However, the characteristics of the threat or the missile system may be such that this assumption is not valid for a particular missile defense. Specifically, a target of extremely small radar cross section (such as an ASM), a target at low altitude masked by terrain, or a target masked by electronic countermeasures could prevent afire unit from achieving initial burst at maximum effective range by decreasing initial detection range.

To be valid, the burst locator must meet all the assumptions listed on page A-3. Since the Hawk missile system was designed for a low-altitude threat, earth curvature and terrain masking will have a decisive effect on acquisition and on the range to the initial burst. If the system cannot acquire a target at a distance that will permit first burst to occur at maximum effective missile range, the defense planner must reconstruct the burst locator using target flight scales and missile trajectory scales.

APPENDIX B

Emergency Warning Signals

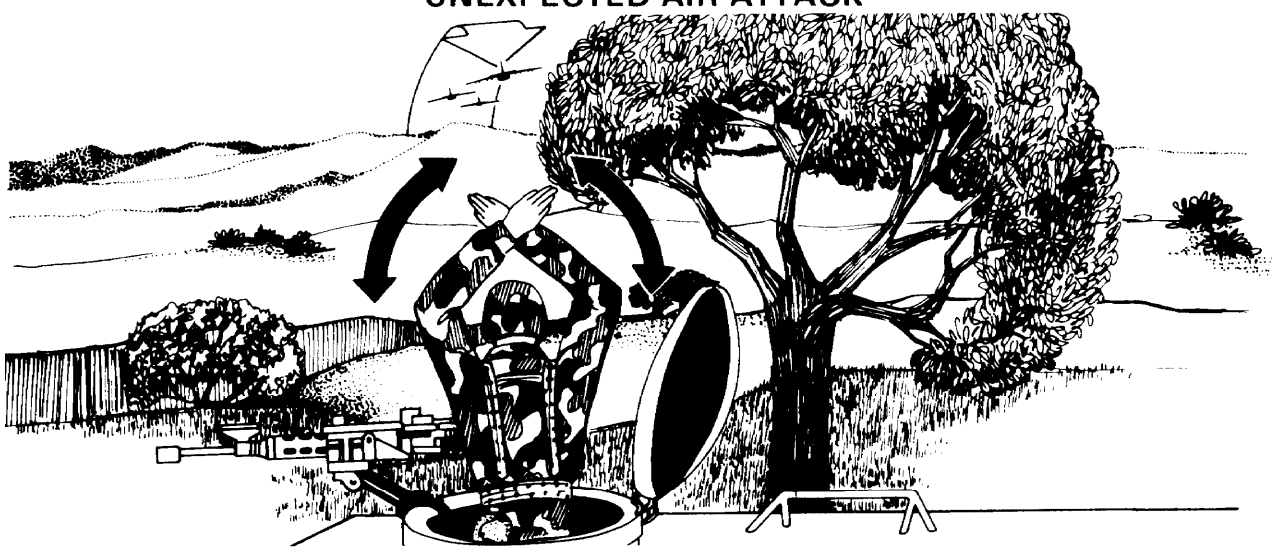
This appendix implements STANAG 2047, Edition 6, Emergency Alarms of Hazard or Attack (NBC and Air Attack Only).

Air attacks will be swift and often unexpected. Therefore, early warning of a probable attack is necessary to give troops a chance to take cover. This warning may be passed through normal command channels or given by local OPs, Stinger crews, or air sentries. All OPs should include air watch in their duties, and all observers should be alert for enemy aircraft. Observers will not always have a good view of the air around them. If this is the case, a special air guard must be detailed. Every vehicle should have an air guard on duty.

SURPRISE ATTACK

Hostile, low-flying aircraft may appear suddenly from behind low hills, belts of trees, or haze. To gain surprise, they will try to attack with the sun behind them (see illustration).

UNEXPECTED AIR ATTACK



Note: Rapidly cross and uncross arms fully extended above the head and shout "Air Attack! Air Attack!"

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The alarm must be given immediately if troops working in the open are to have any chance of taking cover. This warning is the responsibility of every soldier in the area. Soldier's pass the alarm by whistle, voice, radio, or any other method. All troops except those in close contact with the enemy must immediately take cover when they receive the alarm. If possible, troops take cover below ground level and remain there until the all-clear is given.

Evasive maneuver is the initial reaction of mounted units under air attack. Each vehicle turns away from the attacking aircraft's axis of attack and seeks cover and concealment. They then fire at attacking aircraft as appropriate. Stinger personnel must understand all warning signals as prescribed in the unit SOP.

STANDARD WARNINGS

To provide a standard method of disseminating emergency warnings within NATO forces operating on land, the United States Armed Forces have concurred in the provisions of STANAG 2047, Emergency Alarms of Hazard or Attack (NBC and Air Attack Only). Pertinent extracts from STANAG 2047 suitable for use by Hawk personnel are listed in the Emergency Alarms and Warning Signals illustration.

EMERGENCY ALARMS AND WARNING SIGNALS

TYPES OF HAZARDS	VISUAL WARNING SIGN	AUDIBLE ALARM SIGNAL
IMMINENT AIR ATTACK.	RED. PREFERABLY SQUARE IN SHAPE.	UNBROKEN WARBLING SIREN FOR 1 MINUTE.
		SUCCESSION OF LONG BLASTS ON VEHICLE HORNS, WHISTLES, BUGLES, OR OTHER WIND INSTRUMENTS IN A RATIO OF 3:1; APPROXIMATELY 3 SECONDS ON AND 1 SECOND OFF.
		VOCAL "AIR ATTACK," OR CORRESPONDING NATIONAL TERM WHERE ONLY ONE NATION IS INVOLVED.
IMMINENT ARRIVAL OF, OR PRESENCE OF CHEMICAL OR BIOLOGICAL AGENTS, OR RADIOLOGICAL HAZARDS.	BLACK. PREFERABLY TRIANGULAR IN SHAPE.	INTERRUPTED WARBLING SOUND ON A SIREN.
	DONNING MASKS AND TAKING PROTECTIVE ACTION FOLLOWED BY SUCH HAND SIGNALS AS MAY BE PRESCRIBED IN LOCAL SOP. (SEE NOTES 1, 2, AND 3.)	SUCCESSION OF SHORT SIGNALS ON VEHICLE OR OTHER HORNS OR BY BEATING METAL OBJECTS IN A RATIO OF 1:1; APPROXIMATELY 1 SECOND ON AND ONE SECOND OFF.
		VOCAL "GAS, GAS, GAS" OR CORRESPONDING NATIONAL TERM WHERE ONLY ONE NATION IS INVOLVED.
		VOCAL "FALLOUT, FALLOUT, FALLOUT" OR CORRESPONDING NATIONAL TERM WHERE ONLY ONE NATION IS INVOLVED.

EMERGENCY ALARMS AND WARNING SIGNALS (continued)

TYPES OF HAZARDS	VISUAL WARNING SIGN	AUDIBLE ALARM SIGNAL
ALL CLEAR.	REMOVAL OF APPROPRIATE WARNING SIGN.	VOCAL "ALL CLEAR (SPECIFY TYPE OF ATTACK)" OR CORRESPONDING NATIONAL TERM WHERE ONLY ONE NATION IS INVOLVED. STEADY SIREN NOTE FOR ONE MINUTE OR SUSTAINED BLAST ON A VEHICLE HORN, WHISTLE, BUGLE, OR OTHER WIND INSTRUMENT TO INDICATE ABSENCE OF ALL NBC AND AIR ATTACK HAZARDS.

Notes:

1. Automatic alarms for the early and rapid detection of biological and chemical agents and radiological hazards may complement the devices referred to previously.
2. A special audiovisual pyrotechnic signal producing a whistle sound and a yellow, red, yellow display of lights may be used. The combination of colors should be produced as near simultaneously as possible.
3. Wearing masks in the presence of radiological hazards is not mandatory but will be decided by the local commander.

APPENDIX C

AWACS Voice-Tell Early Warning Procedures

Early warning information is normally passed to Army ADA and maneuver elements through the Air Force TACS. In contingency operations when TACS elements are not available, AWACS can provide very limited airborne early warning and surveillance information directly to Army units, provided AWACS is not already task saturated. Hawk units should use these procedures only when established data link procedures cannot be maintained and when no established TACS exists. Because of their inherent limitations, these procedures do not provide the early warning information normally available through automated interfaces. They are only an austere means of providing limited early warning information and may not meet the full requirements of the Hawk commander.

Hawk battalions require timely early warning of air threats and timely coordination of friendly air activity. Currently, in an established theater of operations, digital and voice data passes from AWACS to a USAF CRC or CRP and then out to Hawk and Patriot battalions via multichannel radio. A liaison team which collocates with a Hawk battalion FDC or PCP broadcasts early warning to SHORAD units.

Early in contingency operations when there is no established CRC/CRP or no Hawk battalion deployed, the joint force commander has no procedure available to provide early warning to SHORAD battalions or other maneuver units. The long term solution for a direct data link between AWACS and all Army ADA units requires the JTIDS or the ASIT. However, until these hardware systems are in place or until required

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forces and equipment are deployed to a contingency theater of operations, effective backup requires voice procedures intended for use with AWACS. These procedures are a simple, interim solution using HF/AM or VHF\FM radio until normal elements of USAF TACS can provide direct digital data link or voice-tell to the Army. They are limited in scope and capability to providing the necessary early warning information required by the Hawk commander and may not fulfill total requirements for early warning. Due to the priority of other AWACS taskings, Hawk units cannot be certain of continuous early warning information via this direct voice link.

These procedures are not intended to replace digital early warning nor to bypass the established control chain. Rather, the procedures are designed to provide an alternate voice-update system of early warning information to the Hawk units when the required data cannot be provided by a CRC/CRP system.

OPERATIONS

AWACS responsibilities are tasked by the senior Air Force commander in the ATO to conduct surveillance of a specified area, detect and track aircraft within that area, control offensive and defensive mission aircraft, and perform other missions within the capabilities of the aircraft and scope of the operation. When tasked in the ATO, the AWACS can provide the Army with early warning of potentially hostile aircraft, information for deconfliction and safe passage of friendly aircraft, and dissemination of other priority information on air and maritime surface activity. The area of Army interest for early warning is defined by the senior Army commander and provided to the senior Air Force commander for inclusion in the ATO. AWACS orbit, radar capability, threat, and other tasking may constrain this area.

EARLY WARNING LINE

An EWL designates the maximum range at which AWACS will voice-tell radar tracks to Army units. The EWL is coordinated by the senior Army and Air Force commanders and provided to the AWACS in GEOREF coordinates. From this EWL to the rear boundary of the Army area of operations is the senior Army commander's area of interest for early warning. AWACS will voice-tell to Army units hostile or unknown tracks crossing the EWL or appearing within the area of interest.

EARLY WARNING PHASE LINES

The AWACS mission crew establishes EWPLs for periodic updates of track information. The crew draws EWPLs at no smaller than 25 nautical mile intervals between the EWL and the Army area of operations rear boundary. As tracks of interest cross EWPLs, the mission crew passes updated track information to the Army. The EWPL system determines the frequency of track updates while providing a graphic means of determining priority tracks and when to pass them. Many circumstances may prohibit the EWL and each EWPL from being drawn completely with one straight line, particularly beyond lateral boundaries. The size and shape of the area of operations must be considered along with other factors such as air threat from the flanks or rear. Many other methods are possible, depending upon the situation, to properly define the early warning area of interest and to provide clear guidance for AWACS personnel. It is imperative that Hawk units understand the capabilities and limitations of AWACS.

TRACK CLASSIFICATIONS

Normally only hostile or unknown tracks are told to the Army. However, friendly tracks which are known to be unable to respond with a valid IFF/SIF return or unable to comply with safe passage procedures are told to the Army. Other specific tracks requested by the Army will be told when possible.

TRACK REPORTING

Formats used to report, update, and drop air tracks, and requests to cease tell, will meet the requirements of JINTACCS Appendix 1, Voice Message Formatting and Transmission Rules. The following reports will be used:

- ***Track report*** — Used to report a new hostile, unknown, or friendly track that has been detected crossing the EWL or within the early warning area of interest.
- ***Update report*** — Used when tracks of interest cross EWPLs.
- ***Drop track report*** — Initiated by the AWACS to terminate updates on a track or when the track is lost due to system limitations.

INSTRUCTIONS

Special instructions exist for completing the voice message templates for the call. The call may be abbreviated whenever two or more messages are transmitted in sequence or whenever all parties clearly understand the abbreviated call (see illustration).

ABBREVIATED CALL

LINE NO.	DESCRIPTION	ACTION
LINE 1	(ID/CLASSIFICATION)	ENTER THE TRACK IDENTIFICATION; FOR EXAMPLE, FRIEND, UNKNOWN, OR HOSTILE.
LINE 2	**(POSITION)**	**ENTER THE POSITION OF THE TRACK USING GEOREF: LAST TWO LETTERS AND FOUR NUMBERS.**
LINE 3	(HEADING)	ENTER THE TRACK'S DIRECTION OF TRAVEL, IN 8 POINTS OF THE COMPASS; FOR EXAMPLE, NORTHWEST, EAST, ETC.
LINE 4	**(SPEED)**	**ENTER THE SPEED OF MOVEMENT OF THE TRACKS IN KNOTS.**
LINE 5	(ALTITUDE)	ENTER THE TRACK'S ALTITUDE IN THOUSANDS OF FEET.
LINE 6	**(ENGAGED)**	**ENTER WHETHER TRACK IS ENGAGED — YES/NO. USE ONLY FOR UNKNOWNS, PENDINGS, AND HOSTILES.**
LINE 7	(NUMBER AND TYPE)	ENTER THE NUMBER AND TYPE OF AIRCRAFT REPRESENTED BY THE TRACK NUMBER; FOR EXAMPLE, TWO MIG-21.
LINE 8	**(SQUAWK)**	**ENTER THE IFF/SIF MODE AND CODE OF THE TRACK.**
LINE 9	(MODE FOUR)	ENTER THE MODE FOUR INDICATION; FOR EXAMPLE, CONFIRMED FRIEND, NO RESPONSE, OR NOT INTERROGATED.
LINE 10	**(CATEGORY)**	**ENTER THE TRACK CATEGORY (TRACK TYPE): AIR OR LAND.**
LINE 11	(TIME)	ENTER THE EFFECTIVE TIME (HOUR, MINUTE, AND TIME ZONE) OF THE REPORT IF THE REPORT IS RELAYED OR IS FOR A NONREAL-TIME TRACK.

ABBREVIATED CALL (continued)

LINE NO.	DESCRIPTION	ACTION
LINE 12	(NARRATIVE)	ENTER ANY ADDITIONAL INFORMATION ABOUT THE TRACK OR POINT.
LINE 13	(TIME)	ENTER THE HOUR, MINUTE, AND TIME ZONE DESIGNATION FOR THE MESSAGE TIME OF ORIGIN.
LINE 14	(AUTHENTICATION)	ENTER THE APPROPRIATE AUTHENTICATION CODE(S) FOR THIS MESSAGE IF AUTHENTICATION IS REQUIRED. AUTHENTICATION WILL BE IN ACCORDANCE WITH JOINT TASK FORCE PROCEDURES.

PRIORITY INFORMATION

Priority information can be passed over the early warning net to the Army using the JINTACCS track report format. Normally lines 8 and 13 will be used to pass any additional track information such as number and type of aircraft, apparent airborne or air assault force, et cetera. Classified information will be safeguarded using established COMSEC and OPSEC procedures.

COMMUNICATIONS

Presently there exists no compatible secure communications between the AWACS and appropriate Army units; hence, voice-tell of early warning and other priority information to Army commanders is passed primarily over a single, nonsecure, HF radio net. VHF/FM nonsecure radios will be used as a backup, range and terrain permitting.

AIRBORNE EARLY WARNING NET

The net used for passing voice early warning information is the "airborne early warning net." The structure of the airborne early warning net is dynamic and will change as more elements of Army command are introduced into the area of operations.

Communications Data

Communications information will be published in the OPDAT by the AADC. Information will include net designation, primary and alternate frequencies, upper or lower side-band selection for HF/AM radio, and call signs. The AADC will publish appropriate data for backup communications (VHF/FM).

Encryption References

The OPDAT will also include encryption references such as operational codes and authentication tables. In a contingency operation, units will use codes and tables from the intertheater C^3 COMSEC package for interservice communication rather than service-unique COMSEC material.

Interfacing Units

All participating and reporting units in the JTAO interface as well as operations sections at the joint and subordinate headquarters normally receive the OPDAT. Units such as corps, divisions, ADA brigades, et cetera should extract appropriate data. Corps and division spectrum managers (corps C-E radio officer and assistant division C-E radio officer) should also extract data from the OPDAT. The senior Army commander is responsible for forwarding the net participants' call signs to the AADC for publication in the OPDAT. Source documents for call signs are identified in Army OPORDs.

NET CONTROL STATION

When a corps is deployed, the NCS normally is the corps A^2C^2 element at the ADA brigade TOC. When only a division is deployed, the NCS should be the divisional SHORAD battalion TOC. The SHORAD battalion TOC is also the NCS for the divisional EWBN which is

a VHF/FM one-way net. Therefore, the SHORAD battalion TOC will consolidate early warning from all sources and broadcast to SHORAD elements and other divisional units who can tune to the EWBN frequency (FM 44-3). Net discipline will be enforced by the NCS. The net will operate one way from the AWACS except for necessary information from the Army NCS and for emergency track update requests. Initial contact with the NCS will be made by the AWACS on the HF or VHF frequency published in the OPDAT.

NET STRUCTURE

In a contingency operation, the airborne early warning net structure may require periodic modification to accommodate the introduction of Army units in the theater and the needs of the senior Army commander. Two basic situations, or levels of operation — division deployed and corps deployed — are described here to provide general guidelines. Smaller units such as a divisional or separate brigade could be deployed. In this case, considering the relatively small area of operations and current lack of HF/AM radios at lower Army echelons, the net should broadcast using VHF/FM radio to the brigade TOC, ADA units in support, and any other unit with the need for the information and capability to receive it.

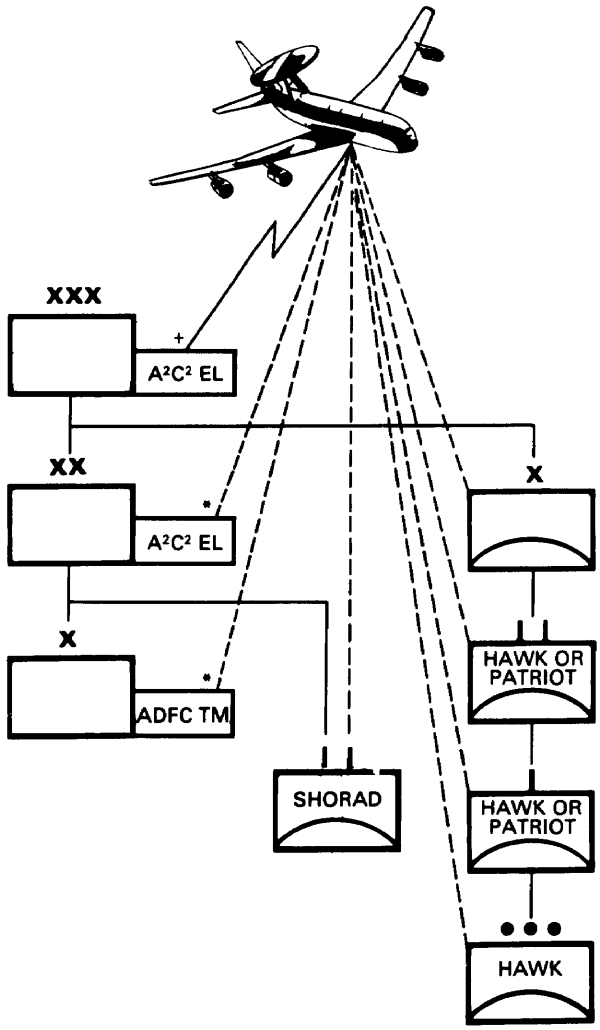
In both Level I and Level II situations, the SHORAD battalion must be prepared to convert GECREF into MSCS to expedite early warning to subordinate elements. Net participants are shown in the illustration at right.

Division Deployed

Level 1 is early warning to division. Net participants will be the AWACS, the SHORAD battalion TOC, and the ADE at the division A^2C^2 element. In a receive-only mode, the SHORAD battalion's ADFC team located at each maneuver brigade may monitor this net or the division EWBN. A Hawk battalion TOC will be added to the airborne early warning net upon deployment of such a battalion in the area of operations. Hawk AFPs may also monitor the net in a receive-only mode.

Corps Deployed

Level II is early warning to corps. This level consists of integrating additional division(s), corps TOC, and an ADA brigade into the airborne early warning net.



LEGEND:

+ NCS RESPONSIBILITY MAY BE DELEGATED TO THE ADA BRIGADE.

* THE A^2C^2 ELEMENT AND THE AIR DEFENSE FIRE COORDINATION TEAM HAVE THE OPTION TO MONITOR THE EWBN OR THE AIRBORNE EW NET.

AWACS — NCS COMMUNICATION, TWO-WAY AS REQUIRED.

— — ONE-WAY COMMUNICATION WITH NET PARTICIPANTS. TWO-WAY AT THE DISCRETION OF NCS.

APPENDIX D

Patriot and Hawk in Composite Units

The development of Hawk and Patriot interoperability is a staged or stepped procedure. The Patriot system upgrade known as PDB-2 includes the first stage, Block 1, of the interoperability program. Block 1 provides the field with the capability for control of a composite defense including Patriot and Hawk fire units through the Patriot ICC. Although allied forces may form permanent composite units, US units are not expected to form new composite organizations. However, the capability of controlling a composite Patriot and Hawk battalion formed as a reconstitution measure will be available with Block 1.

BLOCK 1

The principal features of Block 1 are designed to enhance coordinated operations without degrading any stand-alone capability of the Hawk or Patriot systems. Block 1 involves no hardware changes. Software changes for Block 1 are in the PDB-2 changes to the Patriot ICC. Block 1 changes are compatible with projected future changes so that nothing done for Block 1 will have to be undone for later changes.

SHARED DATA

Block 1 interoperability will provide the capability for integrated control of a mix of Patriot and Hawk battalions. A feature of Block 1 will permit units to share data. Shared data will provide the Patriot air picture to Hawk battalions within the same brigade if the data link from the Patriot or Hawk battalion to the brigade is lost (see the Shared Data illustration). This feature will not be automatic but will have to be initiated by both the Hawk and the Patriot battalion FDCs when the brigade link is lost.

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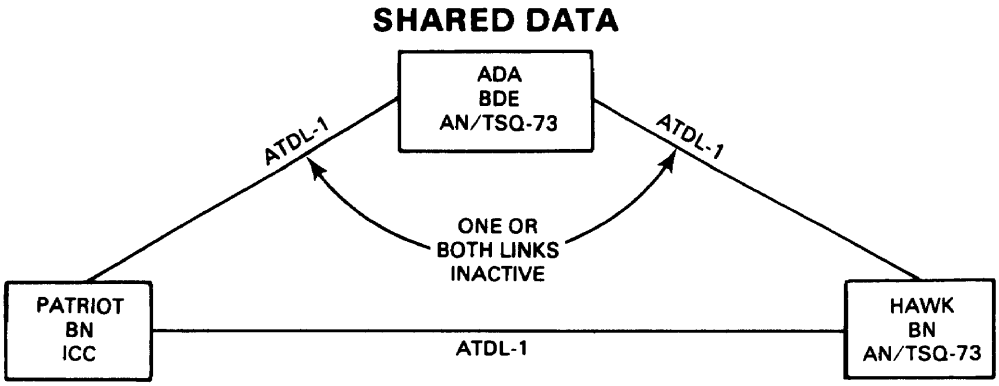
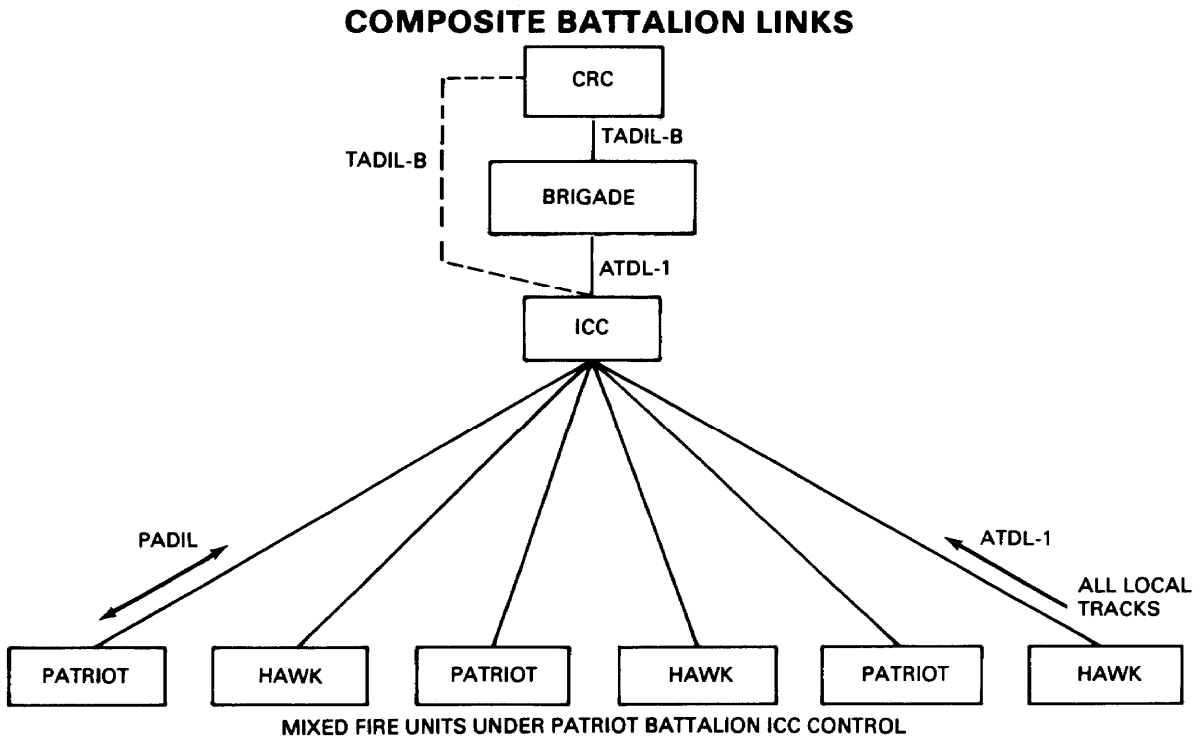


COMPOSITE BATTALIONS

The command and control concept for the composite battalion uses ATDL-1 between the brigade FDC and the Patriot battalion ICC or the Hawk battalion FDC. As an alternative, the ICC may be linked directly to the CRC with TADIL-B. From the ICC to Patriot fire units the link is PADIL. The ICC link to the Hawk fire units is ATDL-1. (See the Composite Battalion Links illustration below.) Hardware limitations at the ICC permit one ATDL-1 link to a higher echelon, one to an adjacent unit, and six to Hawk fire units. Hawk units provide local tracks to the ICC over ATDL-1. The ICC protides the Patriot air picture within a geographic filter to the Hawk unit. The system will establish and maintain correlation of Hawk track data with Patriot track data, other Hawk track data, and higher echelon track data. The ICC will act as correlation master.

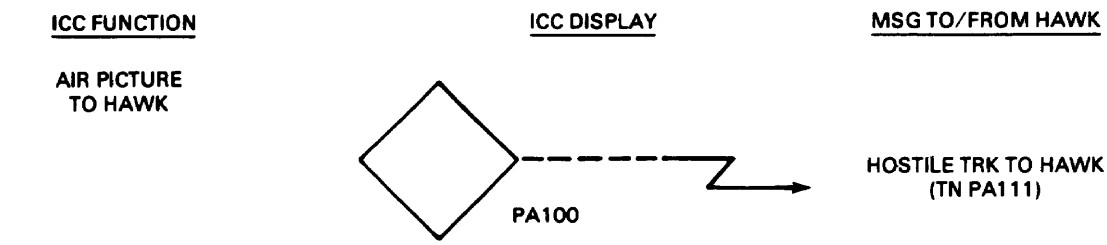


TRACK DATA TRANSFER

In the composite battalion concept, the ICC will function as the battalion FDC. The ICC will treat Hawk track reports the same way it handles Patriot track reports. The ICC will pass hostile tracks with Patriot track numbers to the Hawk unit. The Hawk unit will correlate the Patriot track, if possible, and transmit the track data for the Hawk track it correlates with to the Patriot ICC. The ICC will compare the track data it receives from the Hawk unit with its own track files. If the track data transmitted by the Hawk unit correlates to the original hostile track sent down, the track data transfer is complete. If, for example, the track data the Hawk unit sends to the ICC correlates to a friendly track at the Patriot unit, the ICC will transmit a ***friend change*** order to the Hawk unit. If this occurs, the ICC will then transmit the original hostile track to the Hawk unit again, this time with a new Patriot track number. The correlation process is then repeated. See the Track Data Exchange Steps illustration.

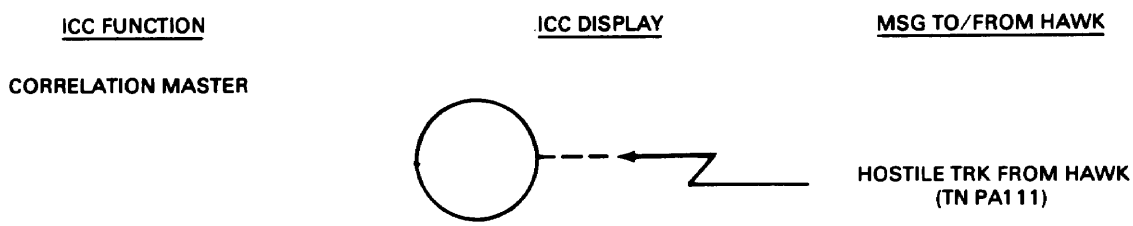
TRACK DATA EXCHANGE STEPS

STEP1



ICC SENDS HOSTILE TRACK TO HAWK FIRE UNIT

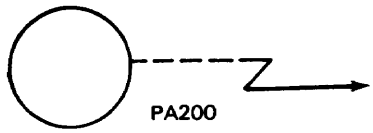
STEP 2



HAWK UNIT CORRELATES PA111 WITH PATRIOT'S PA200 (FRIEND)

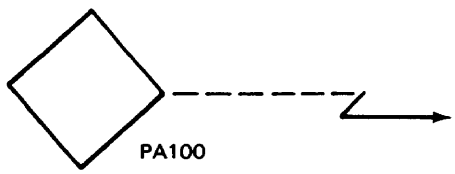
TRACK DATA EXCHANGE STEPS (continued)

STEP 3

ICC FUNCTION	ICC DISPLAY	MSG TO/FROM HAWK
CORRELATION MASTER (CORRECTED MISCORRELATION) STATUS COORDINATION	 PA200	FRIEND CHANGE ORDER TO HAWK (TN PA111)

ICC SENDS ID CHANGE ORDER; HAWK'S PA111 TO FRIEND

STEP 4

ICC FUNCTION	ICC DISPLAY	MSG TO/FROM HAWK
AIR PICTURE TO HAWK	 PA100	HOSTILE TRK TO HAWK (TN PA112)

ICC SENDS HOSTILE TRACK TO HAWK FIRE UNIT (NEW TN ATAFP)

Note: Track number (TN) to/from Hawk independent of displayed TN and independent of TN to/from other Hawk units.

Glossary

Section I. Acronyms and Abbreviations

A

A^2C^2	army airspace command and control
A&S	assembly and storage
AACG	arrival airfield control group
AADC	area air defense commander
AADCOM	Army air defense command
ACA	airspace control authority
ACL	allowable cargo load
AD	air defense
ADA	air defense artillery
ADC	air defense control
ADE	air defense element
ADFC	air defense fire coordination
adj	adjacent
ADL	automatic data link
admin	administration
ADOLT	air defense operations liaison team
ADP	automatic data processing
ADSCOM	air defense support command
ADW	air defense warning
AFP	assault fire platoon
ALCE	airlift control element
ALOC	air lines of communications
alt	altitude
AM	amplitude modulated
amb	ambulance
AMCO	air movement control officer
AME	airspace management element
ant	antenna
AOC	air operations center
AR	Army regulation
ARM	antiradiation missile
ARW	air raid warning
ASCC	Air Standardization Coordinating Committee
ASF	aeromedical staging facility
ASIT	adaptable surface interface terminal
ASL	authorized stockage list
ASM	air-to-surface missile
ASP	ammunition supply point
asst	assistant
assy	assembly
ATDL-1	Army tactical data link 1
ATDS	airborne tactical data system
ATGM	antitank guided missile
ATO	air tasking order
ATP	allied tactical plan
attn	attention
AWACS	airborne warning and control system

B

BCC	battery control central
bde	brigade
BITE	built-in test equipment
bn	battalion
BRL	bomb release line
BSE	brigade support element

C

C^2	command and control
C^3	command, control, and communications
CAME	corps airspace management element
CAP	combat air patrol
CAS	close air support
CBU	cluster bomb unit
CC	circuit card
cdr	commander
CE	communications-electronics
CENTCOM	central command
CESO	communications-electronics staff officer

CFA	covering force area
clr	clearing
cmd	command
co	company
commo	communications
COMMZ	communications zone
COMSEC	communications security
cont	control
CONUS	continental United States
COSCOM	corps support command
CP	command post
CRC	control and reporting center
CRP	control and reporting post
CSA	corps storage area
CSH	combat support hospital
CSR	controlled supply rate
CSS	combat service support
CW	continuous wave
CWAR	continuous-wave acquisition radar

D

DA	Department of the Army
DACG	departure airfield control group
DAME	division airspace management element
DAO	division ammunition officer
DARCOM	US Army Material Development and Readiness Command
DCO	deputy commanding officer
DEFCON	defense readiness condition
DEFREP	defense readiness posture
div	division
DLA	defense logistics agency
DMMC	division materiel management center
DS	direct support
DS2	decontaminating solution-2

E

EAC	echelons above corps
ECCM	electronic counter-countermeasures
ECM	electronic countermeasures
ECP	entry control point
EE	engagement effectiveness
el	element
ELSEC	electronic security
EMCON	emission control
EMMO	electronic missile maintenance officer
EMP	electromagnetic pulse
ESJ	escort jammer
ESM	electronic warfare support measures
etc	et cetera
evac	evacuation
EW	electronic warfare
EWBN	early warning broadcast net
EWL	early warning line
EWPL	early warning phase line

F

FAAR	forward area alerting radar
FDC	fire direction center
FEBA	forward edge of the battle area
FEZ	fighter engagement zone
FLIR	forward-looking infrared radar
FLOT	forward line of own troops
FM	frequency modulated
FSCL	fire support coordination line

G

GEADGE	German air defense ground environment
gen	general
GEOREF	world geographic reference system

G

GHz	gigahertz
GS	general support
GSA	General Services Administration
GSR	general support reinforcing
GSSB	general support supply base

H

HE	high explosive
HF	high frequency
HHB	headquarters and headquarters battery
HIDACZ	high density airspace control zone
HIMAD	high- to medium-altitude air defense
HIPIR	high-powered illuminating radar
hq	headquarters
hr	hour
HUMINT	human intelligence
Hz	hertz

I

IAW	in accordance with
ICC	information and coordination central
id	identification
IFF	identification, friend or foe
IJMS	interim JTIDS message standard
IMINT	imagery intelligence
intel	intelligence
IOT	integrated operator trainer
ir	infrared
IRR	intelligence and radar reporting

J

JCS	Joint Chiefs of Staff
JINTACCS	joint interoperability of tactical command and control systems
JPO	joint petroleum office
JTAO	joint tactical air operations
JTIDS	joint tactical information distribution system

K

KRP	known reference point
km	kilometer
kw	kilowatt

L

LABS	low-altitude bombing system
LASHE	low-altitude simultaneous Hawk engagement
LAW	light antitank weapon
LC	line of contact
lchr	launcher
LD	line of departure
ldr	leader
log	logistics
LP	listening post
LRC	logistics readiness center
LSCB	launcher section control box
LZ	landing zone

M

m	meter
MAC	Military Airlift Command
MACCS	marine air command and control system
maint	maintenance
MANPAD	man-portable air defense
MASF	military assistance service funded
MBA	main battle area
MCE	modular control equipment
MCPE	modular collective protection equipment
METT-T	mission, enemy, terrain, troops, and time available
MEZ	missile engagement zone
MHE	materials handling equipment
MHz	megahertz
min	minute
mm	millimeter
MMC	materiel management center
MOPP	mission-oriented protective posture

MOS	military occupational specialty
MPC	message processing center
MPL	message passing line
MRL	multiple rocket launcher
MRR/LLTR	minimum risk route/low level transit route
MSCS	manual SHORAD control system
msl	missile
MST	mission support team

N

NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NCS	net control station
NICP	national inventory control point
no	number
NOE	nap-of-the-earth
NTDS	naval tactical data system
NUDET	nuclear detonation

O

OIC	officer in charge
OP	observation post
OPCON	operational control
OPDAT	operational data/report
OPLAN	operation plan
OPORD	operation order
ops	operations
OPSEC	operations security
OR	operational readiness
ord	ordnance
ORE	operational readiness evaluation
ORF	operational readiness float

P

PAC	personnel administration center
PADIL	Patriot air defense information language
PAR	pulse acquisition radar
PCP	platoon command post
PIP	product improvement program
plt	platoon
POL	petroleum, oils, and lubricants
PPI	plan position indicator
psn	position
PTL	primary target line
pub	publication
PZ	pickup zone
PZC	pickup zone coordinator

Q

QA	quality assurance
QC	quality control
QSTAG	Quadripartite Standardization Agreement

R

R	reinforcing
RADC	region air defense commander
RAM	reliability, availability, and maintainability
RAMIT	rate-aided manually initiated tracks
RAOC	rear area operations center
RAP	rear area protection
RATT	radio teletypewriter
RDF	rapid deployment force
RF	radio frequency
ROE	rules of engagement
RPG	rocket propelled grenade
RRA	refitted, retired aircraft
RSOP	reconnaissance, selection, and occupation of position
RSR	required supply rate

S

S	secret
SADIP	strategic airlift deployment improvement program
SAM	surface-to-air missile
SE	system effectiveness
SHORAD	short-range air defense

S

SIDPERS	standard installation/division personnel system
SIF	selective identification feature
SIGINT	signal intelligence
SIGSEC	signal security
SITREP	situation report
SLAR	sidelooking airborne radar
SNB	salty net buffer
SOA	state of alert
SOC	sector operations center
SOE	state of emission control
SOI	sector of interest
SOJ	standoff jammer
SOP	standing operating procedure
SOR	state of readiness
SP	self-propelled
spt	support
SSB	single side band
sta	station
STANAG	standardization agreement
STB	supertropical bleach
SUPCOM	support command

T

TA	theater army
TAACOM	theater Army area command
TACC	tactical air control center
TACOPS	tactical operations
TACS	tactical air control system
TADIL-B	tactical digital information link-B
TAMMC	theater Army materiel management center
TAOC	tactical air operations center
TAS	see VGTR
TBM	tactical ballistic missile
TCA	tactical control assistant
TCO	tactical control officer
TD	tactical director
TDA	tactical director assistant
TDECC	tactical display and engagement control console
TEMPEST	see AR 530-4
TIDP	technical interface design plan
TM	technical manual
TOC	tactical operations center
TOE	table of organization and equipment
TPFDL	time phased force deployment list
TRADOC	(United States Army) Training and Doctrine Command
TSA	theater storage area
TSOP	tactical standing operating procedure
tv	television

U

UHF	ultrahigh frequency
US	United States
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy

V

VAC	volts alternating current
VGTR	video group tracking radar, formerly TAS
VHF	very high frequency

W

WAD	weapons alert designator
WCS	weapons control status
WEZ	weapons engagement zone
WSRO	weapon system replacement operations

X

XO	executive officer

Z

ZI	zone of interior

Section II. Definitions

Air battle management — a fundamental task of air defense C^2 and airspace management which encompasses the principles for the control and coordination of both tactical air and ground-based air defense resources. Air battle management is exercised through positive and procedural methods.

Air defense — all measures designed to nullify or reduce the effectiveness of attack by hostile aircraft or guided missiles after they are airborne.

Air defense artillery — ground-based surface-to-air weapons, including guns and support equipment, for engaging air targets from the ground.

Air defense priorities — the commander's prioritized list of selected force assets to be defended by the supporting ADA commander.

Air-land battle doctrine — the Army's operational concept which outlines an approach to military operations based on securing or retaining the initiative and exercising it aggressively to defeat the enemy. Two ideas — extending the battlefield and integrating conventional, nuclear, chemical, and electronic means — are combined to describe a battlefield where the enemy is attacked to the full depth of his formations.

Airspace management element — an Army element within corps (CAME) and division (DAME) TOCs responsible for the coordination, integration, and regulation of airspace within the organization's area of territorial responsibility. It coordinates directly with Air Force elements integrated into each TOC.

Alternate position — a place located generally adjacent to the primary position from which a weapon, a unit, or an individual can perform the original task when the primary position becomes untenable or unsuitable.

Area defense — a posture designed for the defense of a broad area. Airborne air defense resources have primary responsibility for providing area air defenses. In an area defense, no particular asset receives priority of defense.

Attrition — the reduction of the effectiveness of a force caused by loss of personnel or materiel. In air defense, attrition is a narrative mission assigned to the Air Force and certain HIMAD units to inflict maximum damage to the enemy and prevent his penetration to certain areas. This attrition mission is executed through area defenses and through a specialized application of area defenses called belt defenses. While SHORAD weapons attrite enemy aircraft in accordance with established WCSs and hostile criteria, attrition as a separate mission is not normally acceptable due to the limited number of available SHORAD systems and their limited AD coverage.

Belt defense — a specialized application of area air defense where ADA resources are deployed in a linear configuration to provide for early attrition of the enemy as he attempts penetration to rear areas.

Combat service support — that support provided operating forces primarily in the fields of administration, chaplain services, civil affairs, finance, legal services, health services, supply, maintenance, and transportation.

Command post — a unit or subunit headquarters where the commander and staff perform their activities. In combat, the headquarters is often subdivided. The element in which the commander is located or operates is called a CP. It is his principal facility for commanding and controlling combat operations.

Control and reporting center — a subordinate air control element of the TACC from which radar control and warning operations are conducted within its area of responsibility.

Defense design — the process of considering AD employment principles, ADA employment guidelines, and ADA defense design requirements in conjunction with weapon system capabilities: one of the four phases of the defense planning sequence.

Defense design requirements — factors based on a consideration of METT-T in conjunction with the specific characteristics of each type of ADA weapon to be employed in the defense. Defense design requirements are considered along with employment principles and employment guidelines in the defense design phase of the defense planning sequence.

Defense planning — a command responsibility which begins with the establishment of air defense priorities and follows a sequential

process of four complete phases. These are the analysis, defense design, evaluation of alternatives, and implementation phases.

Doctrine — fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative, but requires judgment in application.

Electromagnetic pulse — an "electronic wave" generated by a nuclear detonation which induces a current in any electrical conductor. EMP can temporarily disrupt or overload and damage components of electronic equipment if improperly protected.

Employment guidelines — the six guidelines considered in conjunction with employment principles and defense design requirements in the defense design phase of the defense planning sequence. They are provided as aids to ADA commanders for positioning individual fire units in the designing of an air defense, and are incorporated in a proper mix which considers the availability of ADA resources and the requirements of each tactical situation. They are —

- Balanced fires.
- Weighted coverage.
- Early engagement.
- Defense in depth.
- Mutual support.
- Overlapping fires.

Employment principles — the four principles which provide the doctrinal basis for ADA defense design and underlie the effective employment of air defense weapons on the battlefield. These factors are considered in conjunction with employment guidelines and defense design requirements in the defense design phase of the defense planning sequence. They are —

- Mass.
- Mix.
- Mobility.
- Integration.

Fire control orders — commands which are used to control air defense engagements on a case-by-case basis, regardless of the prevailing WCS. These commands are most often used by higher control echelons when monitoring the decentralized operations of subordinate units.

Fire direction center — that subelement of brigade and battalion TOCs and battery and platoon CPs where the commander exercises fire direction, fire distribution, and/or fire control.

Fire support coordination line — a line, normally identifiable from the air, beyond which all targets may be attacked by any weapon system (including aircraft and special weapons) without endangering friendly troops or requiring additional coordination with the establishing headquarters, so long as the effects of the weapon do not fall short of this line. Its purpose is to expedite attack of targets beyond the line. It is normally established by corps or independent division.

Forward edge of the battle area — the forward limit of the MBA.

Forward line of own troops — a line which indicates the most forward positions of friendly forces in any kind of military operation at a specific time.

High- to medium-altitude air defense system — currently includes Hawk and Patriot weapons systems.

Locate — to establish a broad operating area for the employment of air defense artillery fire units.

Main battle area — that portion of the battlefield extending rearward from the FEBA and in which the decisive battle is fought to defeat the enemy attack. Designation of the MBA may include the use of lateral and rear boundaries.

Maneuver — the employment of forces through movement supported by fire to achieve a position of advantage from which to destroy or threaten destruction of the enemy. Maneuver is the dynamic element of combat, the means of concentrating forces in critical areas to gain and to use the advantages of surprise, psychological shock, position, and momentum which enable smaller forces to defeat larger ones. Maneuver is supported by fire, which provides the enabling, violent destructive component of combat power.

Mission, enemy, terrain, troops, and time available — fundamental considerations in

the planning and execution of any military operation.

Mission-oriented protective posture — a flexible system for protection against a chemical attack devised to maximize the unit's ability to accomplish its mission in a toxic environment. This posture requires personnel to wear individual protective clothing and equipment consistent with the chemical threat, work rate imposed by their mission, temperature, and humidity without excessive mission degradation.

Mutual support — the characteristic of a defense achieved by positioning individual fire units so that effective fires can be delivered into the dead zone surrounding an adjacent fire unit resulting from weapons system characteristics. (See (S)FM 44-1A.)

Operations security — the process of denying adversaries information about friendly capabilities and intentions by identifying, controlling, and protecting indicators associated with planning and conducting military operations and other activities.

Overlapping fires — the characteristic of a defense achieved by positioning ADA weapons so that engagement envelopes overlap. (See (S)FM 44-1A.)

Passive air defense — all measures other than active air defense taken to minimize the effects of hostile air action.

Point defense — a posture designed for the protection of a limited area, normally in the defense of the vital elements of a force and or the vital installations of the rear area. A point defense is characterized by priority of defense being given to specific assets. These assets can either be mobile or static, and they can be organizations or installations.

Position — the selection of an exact point within the operating area for the employment of ADA fire units.

Positive management — a method of air battle management which relies upon real-time data from radar, IFF, computer digital data link, and communications equipment to provide air defense command and control and airspace management.

Procedural management — a method of air battle management which relies on the use of techniques such as segmenting airspace by volume, time, and WCSs.

Rear area — the area to the rear of the MBA in which supply, maintenance support, communications centers, and administrative echelons are located. A division's rear area extends from brigade rear boundaries (rear of the MBA) to the division's rear boundary.

Short-range air defense systems — currently includes all MANPAD (Redeye, Stinger), Duster, Vulcan, Roland, and Chaparral.

Site — the placement of individual items of equipment on selected spots within the position.

Standard tactical missions — (now called support relationships) missions that apply to all types of ADA units and which assign mutual responsibilities and define specific relationships between supported and supporting units. The four ADA support relationships are —

- GS.
- GSR.
- R.
- DS.

Tactical operations center — a subelement of a CP for headquarters with staff elements (AADCOM, brigade, or battalion) consisting of a physical grouping of the staff elements concerned with current tactical operations and tactical support.

Tactics — the employment of units in combat or the ordered arrangements and maneuver of units in relation to each other and or to the enemy in order to use their full potentialities. Tactics require the specific application of doctrinal principles.

Troop leading steps — steps that are followed to respond to the requirements of the commander stated in the OPORD. They are —

- Receive the mission.
- Issue the warning order.
- Make a tentative plan to accomplish the mission.
- Initiate the necessary movement sequence.
- Reconnoiter.
- Complete the plan.
- Issue orders.
- Supervise and refine.

Unified command — a command with a broad continuing mission under a single commander and composed of significant assigned components of two or more services.

Weapons control statuses — three degrees of weapons fire control used by a commander to control the fires of air defense weapons. The three WCSs are —

- WEAPONS FREE.
- WEAPONS TIGHT.
- WEAPONS HOLD.

References

REQUIRED PUBLICATIONS

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

FIELD MANUALS (FMs)

1-103	Airspace Management and Army Air Traffic in a Combat Zone
3-4	NBC Protection
3-100	NBC Operations
21-10	Field Hygiene and Sanitation
(C) 32-20	Electronic Warfare (U)
44-1 (HTF)	US Army Air Defense Artillery Employment
(S) 44-1A	Air Defense Artillery Operational Planning Data (U)
100-5 (HTF)	Operations
100-16	Support Operations: Echelons Above Corps

JOINT CHIEFS OF STAFF PUBLICATIONS (JCS PUBs)

JCS-8	Doctrine for Air Defense from Oversea Land Areas
JCS-9	Doctrine for Unified Defense of the United States Against Air Attack

RELATED PUBLICATIONS

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

ARMY REGULATIONS (ARs)

380-5	Department of the Army Information Security Program
(c) 530-4	Control of Compromising Emanations (U)
710-2	Supply Policy Below the Wholesale Level

FIELD MANUALS (FMs)

3-3	NBC Contamination Avoidance
3-5	NBC Decontamination
3-9	Military Chemistry and Chemical Compounds
3-50	Deliberate Smoke Operations
5-20	Camouflage
5-36	Route Reconnaissance and Classification
5-100	Engineer Combat Operations
9-6	Ammunition Service in the Theater of Operations
9-59	Unit Operations for Support of Missile and Air Defense Gun Systems
10-63	Handling of Deceased Personnel in the Theaters of Operations
11-44 (TEST)	Air Defense Artillery (ADA) Signal Operations Battalion
11-92 (HTF)	Combat Communications Within the Corps

RELATED PUBLICATIONS (continued)

FIELD MANUALS (FMs) (continued)

21-26	Map Reading
24-1	Combat Communications
24-18	Tactical Single-Channel Radio Communications Techniques
24-21	Tactical Multichannel Radio Communications Techniques
24-33	Communications Techniques: Electronic Counter-Countermeasures
34-62	Counter-Signals Intelligence (C-SIGINT) Operations
34-64	Electronic Security (ELSEC) Techniques
44-1-2	Air Defense Artillery Reference Handbook
44-3	Air Defense Artillery Employment: Chaparral/Vulcan/Stinger
44-8	Small Unit Self-Defense Against Air Attack
44-10	Air Defense Artillery Employment, Roland
44-15 (HTF)	Patriot Battalion Operations
44-18 (HTF)	Air Defense Artillery Employment, Stinger
44-30	Visual Aircraft Recognition
(c) 44-70	Air Defense Artillery Command and Control System, AN/TSQ-73 Missile Minder (U)
44-90-1	Hawk Firing Platoon Operations
55-12	Movement of Units in Air Force Aircraft
55-450-1	Army Helicopter External Load Operations
63-1	Combat Service Support Operations, Separate Brigade
63-2	Combat Service Support Operations — Division
63-3	Combat Service Support Operations — Corps
63-4	Combat Service Support Operations — Theater Army Area Command
63-5	Combat Service Support Operations — Theater Army
90-2 (HTF)	Tactical Deception
90-14	Rear Battle
100-10	Combat Service Support
100-15 (TEST)	Larger Unit Operations
100-27	US Army/US Air Force Doctrine for Joint Airborne and Tactical Airlift Operations
100-28	Doctrine and Procedures for Airspace Control in the Combat Zone
101-5	Staff Organization and Operations
101-5-1	Operational Terms and Symbols
101-10-1	Staff Officer's Field Manual: Organizational, Technical, and Logistical Data (Unclassified Data)

RELATED PUBLICATIONS (continued)

JOINT CHIEFS OF STAFF PUBLICATIONS (JCS PUBs)

JCS-1	Dictionary of Military and Associated Terms
JCS-2	Unified Action Armed Forces (UNAAF)
JCS-12	Tactical Command and Control Planning Guidance and Procedures for Joint Operations

TECHNICAL MANUALS (TMs)

5-200	Camouflage Materials
9-1410-530-14	Operator, Organizational, Direct Support, and General Support Maintenance Manual: Intercept-Aerial, Guided Missile, M1M-23B, MTM-23B, and M18E2.
9-1425-525-L	List of Applicable Publications (LOAP) for Improved Hawk Air Defense Guided Missile System
(C) 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)
9-1430-529-12-1	Operator's and Organizational Maintenance Manual: Radar Set, AN\ MPQ-51 (XO-1) 10399038 W/E: 10674604 WO/E (NSN 1430-00-178-8454) (Hawk Air Defense Guided Missile System)
9-1430-1526-12-1	Operator's and Organizational Maintenance Manual for Guided Missile Battery Control Central AN/TSW-11 (NSN 1430-01-042-4910) (Hawk Air Defense Guided Missile System)
9-1430-1528-12-1	Operator's and Organizational Maintenance Manual for Radar Set, AN/MPQ-55 (XO-1) 11510700 (NSN 1430-01-042-4907) (Hawk Air Defense Guided Missile System)
9-1430-1534-12-1	Operator's and Organizational Maintenance Manual for Radar Set, AN/MPQ-50 (XO-2) (NSN 1430-01-042-4908) (Hawk Air Defense Guided Missile System)
9-1430-1535-12-1	Operator's and Organizational Maintenance Manual for Information and Coordination Central Guided Missile System, AN/MSQ-110 (US Army), (NSN 1430-01-042-4918) and AN\MSQ-111 (USMC) (NSN 1430-01-042-4917); and Platoon Command Post, Guided Missile, AN/MSW-13 (US Army) (NSN 1430-01-042-4915) and AN/MSW-14 (USMC) (NSN 1430-01-042-4916) (Hawk Air Defense Guided Missile System)
9-1440-531 -12-1	Operator's and Organizational Maintenance Manual for Guided Missile Zero Length Launcher, M192 (NSN 1440-00-805-3012); Guided Missile Loading and Storage Pallet, M1E2 (NSN 1450-00-103-5399); and Guided Missile Launching Section Control Box, AN/GSA-132A (NSN 1440-00-602-5055) (Hawk Air Defense Guided Missile System)

RELATED PUBLICATIONS (continued)

TECHNICAL MANUALS (TMs) (continued)

9-1450-500-10	Operator's Manual for Loader-Transporter, Guided Missile: XM501E3 (Hawk Guided Missile System) (NSN 1450-00-066-8873)
38-250	Packaging and Materials Handling: Preparation of Hazardous Materials for Military Air Shipment
38-750-1	The Army Maintenance Management System (TAMMS) Field Command Procedures
43-0002-24	Organizational Maintenance Manual: Destruction of Equipment to Prevent Enemy Use (Improved Hawk Air Defense Guided Missile System)
740-1525	Organizational, Direct Support, General Support, and Depot Manual: Shipment, Handling, Storage, Inspection, and Preservation (Improved Hawk Air Defense Guided Missile System)

TRAINING CIRCULARS (TCs)

5-200	Camouflage Pattern Painting
11-4	Handbook for AN/VRC-12 Series of Radio Sets
11-6	Grounding Techniques
44-90-1	Standardized Hawk Crew Drills

TABLES OF ORGANIZATION AND EQUIPMENT (TOEs)

09497 L000/09597LA00	Maintenance Company, Direct Support, Hawk (Triad)
09693L000	Maintenance and Supply Company Guided Missile (General Support)
09697L000/09597LB00	Maintenance Company Direct Support, Hawk (Square)
44495L000	Air Defense Artillery Battalion, Hawk (Corps)
44601L000	Headquarters and Headquarters Battery, Air Defense Command (Theater Army)
44685L000	Air Defense Artillery Battalion, Hawk (Theater Army)
63623L000	Headquarters and Headquarters Company/Materiel Management Center, Air Defense Support Command

TECHNICAL BULLETINS (TBs)

9-380-101-11	Security Classification Guide for Hawk Guided Missile Systems
43-0118	Field Instructions for Painting and Preserving Communications-Electronics Equipment
43-0166	Color, Marking and Camouflage Pattern Painting of Improved Hawk Guided Missile System Ground Support Equipment
43-0209	Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment
55-46-1	Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Other Outsize/ Overweight Equipment
(S) 380-6-8	Electronic Security (ELSEC) for Air Defense Artillery Battlefield Survivability (U)

RELATED PUBLICATIONS (continued)

ARMY TRAINING AND EVALUATION PROGRAM (ARTEP)

44-245	Air Defense Artillery Battalion, Hawk

PROJECTED RELATED PUBLICATIONS

Projected publications are sources of additional information that are scheduled for printing but are not yet available. Upon print, they will be distributed automatically via pinpoint distribution. They may not be obtained from the USA AG Publications Center until indexed in DA Pamphlet 310-1.

FIELD MANUALS (FMs)

3-101	Chemical Staffs and Units
34-1 (HTF)	Intelligence and Electronic Warfare Operations
44-32	Army Air Defense Command Operations

COMMAND PUBLICATIONS

These international agreements are available on request from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

STANAG	QSTAG/ASCC	TITLE
2047	183	Emergency Alarms of Hazard or Attack (NBC and Air Attack Only)
2103	187	Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas (ATP-45)
2112		Radiological Survey
3700	45/3A	NATO Tactical Air Doctrine (ATP-33(A))
3805	45/6	Doctrine and Procedures for Airspace Control in the Combat Zone (ATP-40)
3880	45/4	Counter Air Operations (ATP-42)

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