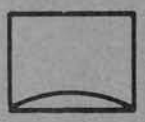
Patriot Battalion Operations



FM 44-15

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Change
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 4 March 1986

PATRIOT BATTALION OPERATIONS

FM 44-15, 4 April 1984, is changed as follows:

1. Remove old pages and insert new pages as indicated:

Remove pages	Insert pages
iii, iv	iii, iv
3-1 through 3-6	3-1 through 3-6
4-1 through 4-21	4-1 through 4-26
5-1 through 5-14	5-1 through 5-13
7-1 through 7-4	7-1 through 7-4
7-9 through 7-14	7-9 through 7-15

2. New or changed material is identified by a star.

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C2, FM 44-15
4 MARCH 1986

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

ACTIVE ARMY and USAR: To be distributed in accordance with DA Form 12-11A, Requirements for PATRIOT Battalion Operations (Qty rqr block no. 1170).

ARNG: None.

Additional copies may be requisitioned from the US Army Adjutant General Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220.

cy 3

C1, FM 44-15

basic 4 Apr 84

Change
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 13 March 1985

PATRIOT BATTALION OPERATIONS

FM 44-15, 4 April 1984, is changed as follows:

1. Remove old pages and insert new pages as indicated:

Remove pages	Insert pages
iii, iv	iii, iv
1-1 through 1-5	1-1 through 1-7
3-1 through 3-13	3-1 through 3-14
7-1 through 7-12	7-1 through 7-14
9-1 through 9-18	9-1 through 9-28
A-1 through A-9	A-1 through A-14

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C1, FM 44-15

13 MARCH 1985

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

Active Army and USAR: To be distributed in accordance with DA Form 12-11B, Requirements for US Army Air Defense Artillery Employment (Qty rqr block no. 348); Air Defense Artillery Employment, NIKE-HERCULES (Qty rqr block no. 369); and Operations of Army Forces in the Field (Qty rqr block no. 405).

ARNG: None.

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CONTENTS

This publication implements the following **STANAGS:**

3700	NATO Tactical Air Doctrine (Allied Tactical Publication [ATP] -27)
3736	Offensive Air Support Opertions (ATP-27)
3805	Airspace Control in the Combat Zone (ATP-40)
3880	Counter Air Operations (ATP-42)

Unless otherwise stated, whenever the masculine gender is used, both men and women are included.

Field Manual
No. 44-15

FM 44-15

Headquarters
Department of the Army
Washington, DC, 4 April 1984

PATRIOT
BATTALION OPERATIONS

Preface

US Army AirLand Battle Doctrine balances firepower with maneuver, stresses combined arms warfare, and requires cooperation with sister services and allies. It emphasizes tactical flexibility, speed, mission orders, the initiative of subordinates, and the spirit of the offense. The doctrine uses air mobility and air power to extend the battlefield to unprecedented depths. Air defense forces on the air-land battlefield must limit the effectiveness of enemy offensive air efforts to a level permitting freedom of action to the ground commander.

With so much reliance on air defense, air defenders must obtain the maximum combat effectiveness of all air defense systems. To achieve this effectiveness, sound operational art and tactics must be applied to each tactical situation. The difference between winning and losing could very well depend upon the choice of tactics.

The purpose of this manual is to provide doctrinal guidance on how to use the Patriot system in support of the air-land battle. All Patriot officers must have a thorough, in-depth knowledge of the technical capabilities of the Patriot system. Knowledge of AirLand Battle Doctrine is also a prerequisite to understanding the role of the Patriot system. That role is to provide effective very low-to very high-altitude air defense coverage. This manual is oriented toward operations in NATO although it is adaptable to any other theater of operations. A number of deployments for both area and point defenses are described. The actual choice of deployment is made by the Patriot battalion commander depending on the tactical situation. The manual is primarily for commanders, staff officers, tactical directors, and tactical control officers.

Since this manual is unclassified, threat information and system capabilities are discussed in general terms. Where detailed, precise threat information is required, authoritative threat documents should be consulted. Classified capabilities and planning data on the Patriot system, which form the basis for the employment concept, can be found in (SNF) FM 44-1A.

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

Commandant
US Army Air Defense Artillery School
ATTN: ATSA-TDT-H
Fort Bliss, Texas 79916

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

CHAPTER 1

Patriot and the Air Defense Artillery Mission

As part of the air defense family of weapons, the Patriot missile system contributes to the winning of the air-land battle and the accomplishment of the Air Defense Artillery mission by providing very low-to very high-altitude fires against enemy aircraft. This chapter defines the mission of Air Defense Artillery, discusses the objective of air defense, points out how the family of complementary air defense weapons counters the enemy air threat, and states the mission of the Patriot battalion and the role of the Patriot system in the air-land battle.

MISSION

The mission of US Army Air Defense Artillery is defined in the illustration below.

US ARMY AIR DEFENSE ARTILLERY MISSION

To nullify or reduce the effectiveness of attack or surveillance by hostile aircraft or missiles after they are airborne, thereby supporting the primary army function of conducting prompt and sustained land warfare operations (FM 44-1).

OBJECTIVE OF AIR DEFENSE

★ Joint Chiefs of Staff 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".

★ Joint Chiefs of Staff Publication 8 states that the objective of air defense is "to limit the effectiveness of enemy offensive air efforts to a level permitting freedom of action to friendly forces of all types."

To accomplish this objective, air defense performs these four basic functions:

1. Detection of potential air threats.
2. Identification of unknown airborne objects.
3. Interception of enemy air forces.
4. Destruction or nullification of hostile air weapons.

CONTENTS

Air defense forces are equipped, trained, and employed to carry out these functions by—

- Attacking the enemy air threat as soon as possible, and as far from the defended area as operationally feasible.

- Subjecting the enemy air threat to fires of increasing intensity and diversity as he approaches the defended area.

- Keeping the enemy under attack so long as he remains a threat.

All US services and allied forces have an air defense capability. However, no single element has enough air defense weapons to insure complete air defense protection against a threat having a large, modern air force. For this reason, the capabilities of all air defense weapons within a force must be integrated into an overall air defense operating under the direction of a single air defense commander. An integrated air defense insures that air defense weapons are employed to achieve optimum effectiveness against enemy aircraft without degrading friendly air operations.

DISTINCTION BETWEEN AD AND ADA

The distinction between air defense and air defense artillery must be emphasized. 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.

THE AIR-LAND BATTLE

★ The Army's AirLand Battle Doctrine describes the ways that campaigns and battles are conducted. Doctrine supporting the air-land battle is based on securing and retaining the initiative to defeat the enemy force. Operations conducted on the air-land battlefield are designed to throw the enemy off balance with a powerful initial blow from an unexpected direction followed by rapid exploitation to prevent his recovery.

TENETS OF AIRLAND 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 that is 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 our ability to achieve these four elements—initiative, depth, agility, and synchronization—in our combat operations.

Initiative

★ ADA is a combat arm which fights the air battle just as armor and infantry fight the land battle. ADA operations will cause the enemy air threat to react to what the ADA does, and lead to ineffective, uncoordinated, and piecemeal enemy responses and eventually to his defeat. ADA commanders at all echelons will develop a plan of action to mass combat power at the critical time and place to achieve their objective of permitting freedom of action to friendly forces. Destruction of the enemy will occur as far forward as possible to retain the independence of action necessary for the maneuver forces. To preserve this initiative, ADA commanders will assign

appropriate tactical missions that allow as much flexibility as possible to their subordinates. Subordinate commanders will 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 supports AirLand Battle Doctrine in all areas of operations (close-in battle, deep battle, and rear battle), during all hours of day or night, and during periods of reduced visibility. Corps ADA and echelon above corps ADA provide the depth of resources to provide flexibility and extension of influence throughout the battle area.

Agility

★ ADA commanders flexibly tailor their organizations to support the entire spectrum of missions and allow for rapid shifting of ADA forces to anticipate and counter any air threat. This agility is facilitated by the command, control, communications, and early warning networks available to the ADA units.

Synchronization

★ The ADA battle plan will flow from the force commander's concept of the operation. This will be true from theater commander to division commander. Their supporting ADA commander will ensure that a unified effort on the part of all of his subordinates is accomplished. Each individual mission assigned to a subordinate ADA unit will be a part of and contribute to the successful implementation of the force commander's concept of the operation. Provisions for exploitation of tactical success will be planned in order to insure sustained ADA support.

PLANNING CONSIDERATIONS

★ The air-land battle must be perceived in terms of collapsing the enemy's ability to fight. This concept is not new. 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—

- The deep battle.
- The close-in battle.
- The rear battle.

Successful operations require the unified employment of a wide range of systems and organizations on a battlefield that is much deeper for corps and divisions than portrayed in previous doctrine. The primary considerations within the concept of the air-land battle 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. This results from the threat's numerical superiority, which allows him to keep a substantial amount of his force out of the initial battle. These additional enemy forces can then be committed at will to overpower or bypass our forces. Their existence poses a substantial threat and gives the enemy a strong hold on the initiative that can only be broken by the conduct of a deep attack.

Limited Assets

Deep attack is conducted with limited resources for both acquiring and striking the enemy. This necessitates a high degree of coordination between the decisive close-in battle and the deep battle so that maximum combat power can be brought to bear on the enemy at the right time and place. The coordinated conduct of these two battles prevents second and succeeding echelons from joining the close-in battle.

Modern and Enhanced Weapon Systems

Modern and enhanced weapon systems of enormous lethality and range, supported by automated command and control systems and sensors of substantial capability, are employed in the air-land battle. These systems provide a means of generating levels of combat power not possible in previous conflicts.

Single Unifying Idea

AirLand Battle Doctrine is the single unifying idea which provides the basis for current operational planning. FM 44-1 provides a more detailed discussion of ADA in the air-land battle.

COMBAT IMPERATIVES

★ Success in battle—achieving superior combat power—also depends on using tactics appropriate to mission, enemy, terrain, troops, and time available (METT-T). The effectiveness of maneuver, firepower, and protection depends on how the commander combines operational procedures, battle drills, or other measures to solve a particular problem. Doctrine establishes common techniques of fighting. The successful tactician depends on proven techniques and on troops who are well-versed in employing them. As he plans and fights the battle, the tactician must understand the seven imperatives of combat, which are—

Insure Unity of Effort

★ The role of ADA is to support the force commander's concept of the operation. All subsequent actions are directed towards that goal. Mission orders will be simple and allow subordinates the greatest possible freedom. Where possible, ADA units will be employed as battalions in support of the force mission. The command and control system available to Patriot will facilitate battalion level control yet still allow higher level commanders to follow up and insure that their concept is driving the operation to completion.

Direct Friendly Strengths Against Enemy Weaknesses

★ The enemy air threat is most vulnerable while it is enroute to or at its ordnance launch position. To capitalize on this, the mobility of all ADA units must be exercised to rapidly position them to deny the enemy the use of very low-to low-altitude approaches and stand-off firing positions. Appropriate mix of ADA weapons with complementary capabilities will preclude evasive or suppressive air tactics designed to exploit individual ADA system weaknesses.

Designate and Sustain the Main Effort

★ ADA units will be massed to support the force commander's concept of the operation. This may necessitate executing economy of force measures in other areas. Certain relatively static assets may have to rely more on their own passive and active self-air defense measures.

Sustain the Fight

★ Positioning of maintenance support throughout the battlefield with emphasis on fixing forward provides the requisite depth of logistics resources for conducting continuous and flexible operations. Patriot units can fight 24 hours a day; however, maintenance, personnel, and movement requirements will normally limit the use of this capability.

Move Fast, Strike Hard, and Finish Rapidly

★ The mobility of Patriot units, the accuracy and lethality of their weapons, the ability to mass at the proper place and time, and the organizational flexibility to tailor to exploit tactical successes all contribute to the accomplishment of the ADA mission.

Use Terrain and Weather

★ Patriot units will make maximum use of natural terrain features. Covered and concealed routes will be used to the maximum degree possible. Patriot units will occupy positions that offer long range observation and fields of fire that reach deep along the enemy air attack avenues.

Protect the Force

★ The force commander will take all steps necessary to preserve the fighting strength of his unit. He must not be surprised by air attack. Early warning against air attack is provided by Patriot units to other ADA units who in turn alert the force. Patriot will be positioned to counter the air threat directed

against those assets crucial to the force commander's concept of the operation.

THE ROLE AND MISSION OF PATRIOT

The role of ADA weapon systems is to accomplish the ADA mission within the capabilities of these systems. The role of each system is tailored to the tactical situation and to the system's optimum, rather than maximum capabilities. For example, the role of the Hawk system is to accomplish the ADA mission within the very low- to medium-altitude boundaries of the battlefield, even though the Hawk system has some high-altitude capability. Because of the Patriot system's firepower, range, and altitude capabilities, the normal role of the Patriot system is to accomplish the ADA mission within the very low- to very high-altitude boundaries. This role may be tailored when airborne interceptors provide medium- to very high-altitude coverage. The mission of Patriot battalions is to provide very low- to very high-altitude air defense of high value assets and ground combat forces. The five standard altitude bands which are used in all air defense operations are shown here. These altitudes *do not necessarily* correspond directly to engagement capabilities of ADA systems or to altitude limits of weapon engagement zones.

STANDARD ALTITUDE BANDS

ALTITUDE BAND	ALTITUDE IN METERS	APPROXIMATE ALTITUDE IN FEET
1. VERY LOW	0-150	0-500
2. LOW	150-600	500-2,000
3. MEDIUM	600-7,500	2,000-25,000
4. HIGH	7,500-15,000	25,000-50,000
5. VERY HIGH	15,000 +	50,000 +

PATRIOT IN THE DEEP BATTLE

The deep battle begins before the enemy closes with our maneuver forces, continues throughout the covering force and main battle area operations. It will likely continue after initial direct contact between the forces ends. The deep battle is designed to prevent or delay the closure of follow-on echelons, and creating windows of opportunity for decisive attack of leading enemy echelons.

To fight the deep battle, the corps commander relies primarily on the following combat capabilities:

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

Of these assets, battlefield air interdiction is currently the principal means of conducting deep attack. In both the defense and the offense, the deep battle plans of the corps and its divisions must be carefully coordinated to insure unity of effort and to prevent duplication.

As previously stated, 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 all levels to consider protection of deep attack assets in the development of 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. These deep attack assets will include, but are not limited to, long-range delivery systems (to include aircraft, artillery, and missile systems), maneuver units, and command and control facilities at various levels.

★ At theater level, a mix of Air Force and Army ADA resources is usually allocated for 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 commensurate with that criticality. Patriot battalions normally provide point defense of deep attack assets in the communications zone. This coverage provides coverage of 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 short-range air defense (SHORAD) units are normally allocated to provide point defense of deep attack assets.

★ At the corps level, the corps ADA brigade supports the corps commander's concept of the operation. Since the corps commander normally has only one assigned high-to medium-altitude air defense (HIMAD) battalion, he must identify additional corps requirements for air defense to the theater commander. The theater commander normally allocates Patriot battalions to provide all-altitude protection of deep attack assets. Priority of coverage normally goes to the tactical operations area. The corps commander can locate deep attack assets, such as Lance, under the coverage provided by theater Patriot battalions in the tactical operations area. Patriot units would move further forward to support deep attack maneuvers. Patriot units also can engage stand-off jammers. Destruction of these jammers contributes to improved ADA system performance. Additionally, communications jamming may be reduced in the tactical operations area.

PATRIOT IN THE CLOSE-IN BATTLE

★ The maneuver brigades which fight the close-in battle must be protected against threat attack helicopters and ground support fighters. This protection should include integrated SHORAD and HIMAD defenses. The air defense protection provided by the Patriot battalion inflicts attrition on the enemy's deep attack aircraft. While at the same time, it forces enemy aircraft into the lower altitude engagement zones of SHORAD systems by denying medium- to very high-altitude attack options to the enemy. Coverage provided by Patriot battalions also 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 Patriot and divisional SHORAD battalion commanders must exchange operational information to optimize the integrated ADA protection rather than optimizing an individual weapon system's contribution. The same is true for the Patriot and corps ADA brigade commanders. Close coordination enhances air defense of critical assets for both the close-in battle and the deep battle.

PATRIOT IN THE REAR BATTLE

★ In rear areas, enemy forces will attempt to disrupt and demoralize forces by interrupting support activites, interdicting lines of communications, and diverting main battle area combat forces. The threat to this area includes air attack, special purpose forces, saboteurs, terrorists, airborne forces, airmobile forces, and amphibious forces. The size of these forces can range from single individuals to division-size elements and single to multiple attack aircraft.

ADA support for rear battle operations includes air defense of likely enemy targets to include the following:

- Nuclear sites

- Command and control headquarters.
- Airfields.
- Ports.
- Logistics installations.
- Intelligence facilities.
- Key civilian industrial and utility installations.

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

★ At theater level, these vital assets will generally be defended by ADA resources, including Patriot battalions, of the Army air defense command. The corps ADA brigade provides rear area protection of the corps in consonance with the corps commander's concept of the operation. In the corps areas, assets will be defended by the Air Force and theater level ADA if designated as priorities by the theater commander. In the division area, planned ADA protection is normally provided from theater Patriot and corps Hawk resources. Planned Patriot coverage also may extend into portions of the corps rear area. Patriot battalions normally are under the command of ADA brigades assigned to the Army air defense command. Control is exercised by the controlling Air Force control and reporting center.

The significant threat posed by airborne and air assault forces capable of penetrating division, corps, and theater rear areas through very low-altitude avenues of approach must be carefully evaluated. Extensive terrain analyses to determine very low-altitude avenues of approach and reductions in coverage caused by terrain masking are essential in ADA planning. Coverage should be weighted against these avenues of approach while at the same time providing contiguous lateral coverage in the assigned sector.

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

CHAPTER 2

The Threat

Soviet tactical aviation has been the focus of comprehensive modernization and reorganization programs emphasizing offensive capabilities. Changes over the last 5 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 NATO. Since 1978, the Soviets have introduced two new fighters and three new versions of reconnaissance/ground attack aircraft. These aircraft have increased ranges, improved avionics, and better altitude and all-weather capabilities than previous Soviet models.

There also have been significant changes in tactics and training that 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 increasing proficiency in combat employment of that equipment have greatly increased Soviet aviation capabilities to strike the NATO rear area.

CONTENTS

Improved tactics and training are aimed at maximizing performance of a new generation of Soviet aircraft that will have better 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. Their new structure now provides the Soviets with a peacetime organization that closely approximates their anticipated wartime structure for the employment of air power. This will allow a more rapid transition to a wartime posture and will enhance operational flexibility and coordination through centralized control of air assets at front and theater levels.

The Soviets and Warsaw Pact nations will continue to have an aircraft quantity advantage over NATO and are rapidly closing the qualitative capabilities gap. They have and must be expected to use these capabilities to attack our maneuver forces and their supporting elements, as well as striking corps and theater targets to destroy NATO deep strike assets.

Since Patriot will initially be deployed in NATO, the focus of section I of this chapter is on the most lethal part of that threat— the very-low- to medium-altitude attack by fighter-bombers and bombers. The section also describes the roles and capabilities of threat aircraft and the tactics which they will employ. Section II discusses the threat to Patriot units by enemy suppressive measures. Patriot units are certain to be a high priority for early destruction or neutralization. To accomplish their air defense mission, Patriot units must counter and survive enemy suppressive means.

All enemy order of battle data and doctrine presented are unclassified. It is accurate enough to be used for general planning by Patriot units. Additional unclassified threat information important to Patriot units is contained in the FM 100-2 series of manuals. Patriot S2s coordinate specific threat data bases for all tactical plans and operations. FM 44-1A also contains extensive, classified threat data.

Section I — THE AIR THREAT

MISSION TYPES

Soviet forces recognize that part of their air effort is initially 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 are used to engage targets beyond the range of artillery and to reinforce artillery fires on selected targets

and targets of opportunity. A combined bombardment by bombers and ground attack aircraft is coordinated with artillery preparatory fires. After the ground attack has begun, tactical air will provide close air support (CAS) for ground elements in contact. Priority tasks for enemy tactical air are the destruction/neutralization of hostile nuclear delivery means and other targets beyond artillery range.

GROUND ATTACK

Soviet forces consider air strikes an extension of field artillery. They place great emphasis on tactical air support of ground operations. Attacks are made against preplanned targets to neutralize support and reserves within the tactical-operational area. Soviet air forces usually do not use high-performance aircraft to provide close air support along the line of contact where artillery can be employed. Armed helicopters are the primary air threat along the forward line of troops.

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 been given an increased role in destruction of deep targets, the Soviets will retain a sizeable bomber force for many years to come. Bombers have certain advantages over ballistic missiles. Bombers can be used for nonnuclear as well as nuclear warfare, and can seek out and strike small and mobile targets. Additionally, they can be recalled or retargeted after launch. They can also conduct post-strike reconnaissance and have a restrike capability.

AERIAL RECONNAISSANCE

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

ELECTRONIC COUNTERMEASURES

Soviet aviation has several organic support squadrons with aircraft equipped to conduct electronic countermeasures (ECM) missions. These units can conduct ECM against enemy radar and electronic guidance and communications systems. The most common air ECM operations are spot or barrage jamming and dispensing chaff. This ECM is directed against enemy air defense early warning and fire control radars. Soviet bombing operations will be protected or camouflaged by aircraft using ECM in either a standoff or escort role. Jamming equipment, with an effective range of up to 200 kilometers and covering frequencies of NATO air defense radars, is installed in these ECM aircraft. They may also eject chaff to achieve deception and camouflage. Other individual aircraft may carry self-screening jammers and chaff dispensers.

TACTICAL AIRLIFT

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

AIR SUPERIORITY

Fighter aircraft are normally given the mission of destroying enemy aircraft on approaches, flanks, and beyond the maximum range of the ground-based air defense systems within a zone. For example, the integration of fighter and surface-to-air missile (SAM) systems within a zone is by geographical area, altitude layering, time separation, or by specific target allocation within a particular area. It should be understood that while aircraft may be hostile, not all aircraft are priority threats to air defense. A fighter/interceptor poses little or no threat to a defended asset when compared to a close air support 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 enemy forces from closing gaps created by nuclear strikes.
- Seize and hold important objectives in the rear operations area 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 capability.

Soviet doctrine stresses maintaining the momentum of the attack. Heavy use of air assault missions is one way to do this. Their 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, to include assault helicopters, is often used to create a fly-through zone in enemy 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 on air assault missions. Recently, however, emphasis has been placed on using motorized rifle battalions for these missions. Soviet leadership believes that these forces can be used effectively with a minimum of training. The threat presented by a motorized rifle battalion being airlifted behind our 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. The purpose of this type of mission is to establish a new battle front within a theater of operations. Operational missions are conducted in support of armies or fronts. Units conducting these operations are usually of regimental size or smaller and are dropped from 200 to 1,000 kilometers in the rear. Tactical missions are conducted up to 200 kilometers in 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 most often used to exploit a nuclear strike.

Although airborne operations can be conducted at almost any time, 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 their place; 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. These aircraft can be classified by the role of the aircraft or by the type of aircraft. All data presented is 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 FM 44-30.

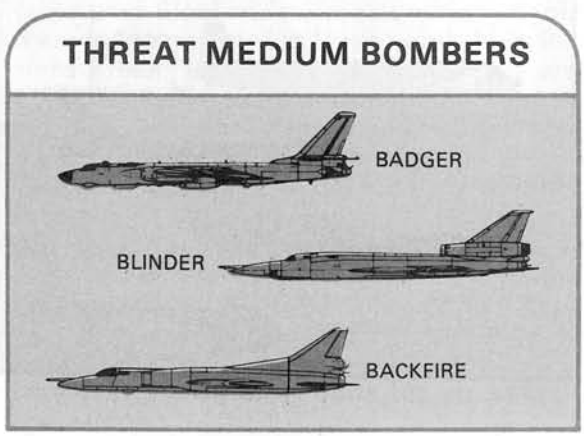
FIXED-WING AIRCRAFT

The primary air threat facing our forces and which the Patriot system was designed to counter is the fixed-wing threat. These

aircraft will operate in all areas over the battlefield and will make up the vast majority of Soviet air forces.

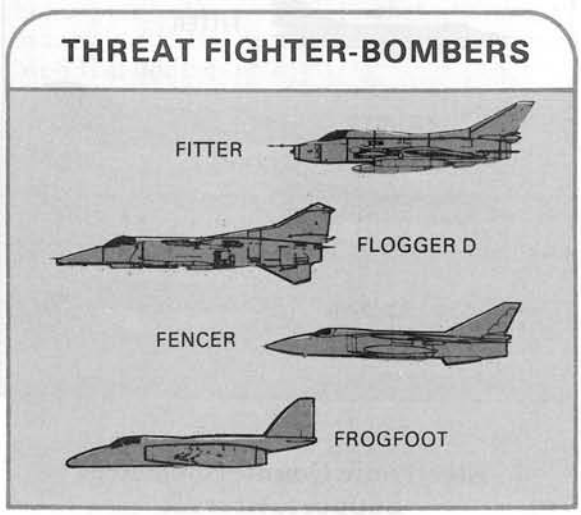
Bombers

Medium bombers will be used during the first phase of the air battle to strike targets critical to the theater in conducting and sustaining war efforts. These targets 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. These aircraft pose a unique threat to NATO units. Because of their extended range, they can be used in "end-around" tactics, to attack NATO rear areas from the flanks and rear.



Fighter-bombers

The early MiG-series aircraft (MiG-15, 17, 19, and 21) were all designed primarily as interceptors for use in the counter-air role. Early MiGs could only carry two bombs or rocket pods on wing pylons normally used to carry external fuel pods. Because of this limited ordnance carrying capability, their ability to attack ground targets was limited. Newer models of these 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 these improved, older generation aircraft. Two newer aircraft, in particular, 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 new ordnance 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 underfly friendly radar defenses while conducting deep penetrations. Additionally, a new ground support fighter, the Su-25 Frogfoot, is designed to fly high-performance missions and is capable of carrying a wide variety of munitions.



Fighters

Despite the fact that fighters are defensive in nature, Patriot units will encounter fighters escorting strike aircraft penetrating friendly 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. The second generation fighter currently in service is the MiG-23 Flogger B, which also has a secondary ground attack capability greater than Fishbed or Fitter.

Reconnaissance Aircraft

Tactical aerial reconnaissance is one

method of gathering intelligence concerning the enemy. The Soviets use reconnaissance aircraft equipped with photographic and electronic sensors. This equipment is capable of detecting, locating, and monitoring US operations in daylight, darkness, and inclement weather. Reconnaissance aircraft can operate singly, but probably will operate jointly with ground attack aircraft. Soviet aircraft used most often for reconnaissance today are the Fitter, Fishbed, Flogger, and Foxbat.

Electronic Countermeasures Support Aircraft

Generally, there are two roles for ECM support aircraft involved in support of offensive air operations. These two roles are standoff jammers (SOJ) and escort jammers (ESJ). These aircraft serve as airborne platforms for electronic jamming equipment primarily directed against radar but may also be directed against communications.

The Soviets have modified transports, fighters, bombers, and helicopters to provide both standoff and escort jamming of enemy radars and communications equipment using chaff and electronic jammers. Cub, Coot, and Badger aircraft have been extensively modified to give these aircraft primary roles of stand-off jamming while remaining outside the range of our HIMAD and defensive fighter aircraft. As other Badger, Backfire, Blinder, and Brewer bombers and Fishbed, Foxbat, and Flogger B and D fighters have had ECM equipment installed. This provides self-defense escort jamming on missions across the forward edge of the battle area (FEBA). The Brewer and Mi-4 Hound helicopters have been modified to provide jamming of enemy communications in the forward area in support of ground operations.

Drone Aircraft

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

Drones are classified as either refitted, retired aircraft (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 surface-to-air missile target drones for years. True drones are those designed and built as pilotless aircraft, such as the LA-17.

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

The most significant advantage of drones is the elimination of pilot loss. An especially effective use of this advantage is to reconnoiter NBC contaminated areas. On the other hand, the lack of on-board human control limits the drone's maneuver capabilities. Other uses of drones are to reconnoiter fire unit positions and force HIMAD missile expenditure.

ROTARY-WING AIRCRAFT

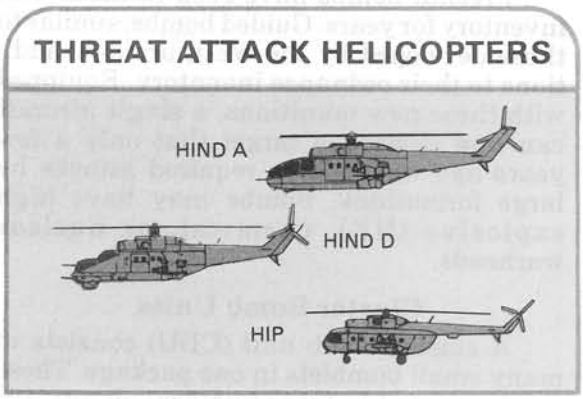
Helicopters have some distinct advantages over fixed-wing aircraft which enable them to be employed in large numbers in forward areas. They do not require large airfields or costly runways from which to operate. They are suitable for conducting reconnaissance of the enemy's forward forces. They are highly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

Attack Helicopters

The Soviets have the most heavily armed helicopters in the world today. They will employ them in the covering force area (CFA), in the main battle area (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.

The Mi-24 Hind is the first Soviet helicopter specifically designed for attack missions. However, it is also capable of landing a squad behind enemy lines. There are currently four operational versions of the Hind. The first two, Hind A and C, differ basically 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 Hind A. The Hind D has a four-barrel Gatling gun instead of the single-barrel machine gun of the Hind A. The Hind E version is basically the same as the Hind D except it is equipped with Spiral ATGMs carried on launch racks under each of its wings.

A new version of the Mi-8 Hip, called Hip E, has been introduced as being equipped with "the heaviest firepower seen on any helicopter in the world." Rocket and missile launching racks are now included on most Mi-8 Hip helicopter.



ECM Helicopters

These aircraft operate to reduce the effectiveness of our communications. Specifically, the Mi-4 Hound C is designed as an ECM emitter of noise and chaff.

Utility Helicopters

The Mi-8 Hip is the main utility helicopter for Soviet forces and 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. Helicopters may be targets for the Patriot system 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 munitions capable of being air dropped which are nearly as effective as those of our own Air Force. A new series of advanced munitions is in development and can be expected to be deployed during Patriot fielding in NATO.

THREAT MUNITIONS

Bombs

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

Cluster Bomb Units

A cluster bomb unit (CBU) consists of many small bomblets in one package. These can be carried in large numbers on any aircraft. CBUs are dropped at high speeds and low altitudes to cover a wide area, such as a Hawk or Patriot unit position.

Rockets

Rockets are loaded into pods or clusters which allow for a high rate of fire. These 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.

Cannons

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

Air-to-Surface Missiles

To improve capabilities against point targets, such as bridges and radar sites, the Soviets have developed new air-to-surface missiles (ASM) with improved guidance systems. These ASMs are either command-guided, passive-homing, or active-homing missiles. Command guided ASMs are flown into the target by the pilot or electronic warfare officer in the launching aircraft. 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 which illuminates the target. The missile then homes on the reflected energy. In passive homing, the missile homes on the target's own emissions, or on reflected energy when the target is illuminated from a source other than the missile.

Some of the earlier version 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 antiradiation missile (ARM) which passively homes in on the targeted radar's emissions. These ARMs may be carried by bombers or fighter-bombers and some can be launched outside the lethal kill envelope of Patriot, 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. These tactics/profiles include—

- Gravity drop-bombing.
- Dive-bombing.
- Toss-bombing.
- Standoff.
- Pop-up.
- Lay-down.

The attack variations illustration shows examples of attack profiles, ordnance, and targets.

ATTACK VARIATIONS

ATTACK TECHNIQUE	ORDNANCE	WEAPON RELEASE HEIGHT (Meters)	AIRCRAFT SPEED (Meters per Second)	ORDNANCE RELEASE DISTANCE (Meters)	TARGET
POP-UP	BOMBS	810	230	1,110	ARMOR CONCENTRATIONS
GRAVITY DROP-BOMBING	BOMBS	2,000	300	3,000	LOGISTICS COMPLEXES
LAY-DOWN	CBU	500	230	1,200	VEHICLES, PERSONNEL IN OPEN
LAY-DOWN	NAPALM	60	260	900	ALL EXCEPT HEAVY STRUCTURES
TOSS-BOMBING	BOMBS	1,500	240	3,200	LOGISTICS COMPLEXES, HEADQUARTERS
DIVE-BOMBING	ROCKETS/ BOMBS	475	230	800	HEADQUARTERS, VEHICLES
STANDOFF	ASM	100	250	10,000	PATRIOT BATTERY
STANDOFF	ASM	5,000	200	70,000	HEADQUARTERS COMPLEXES
POP-UP	CANNONS	475	130	800	VEHICLES, PERSONNEL IN OPEN

Gravity Drop-Bombing

Aircraft using gravity drop-bombing approach a predetermined drop-point. The ordnance is then delivered by free fall gravity drop. The ordnance will fall forward toward the target due to the inertia of the aircraft. This distance can be determined for planning purposes based on the speed and altitude of the aircraft. Normally gravity drop-bombing is used by bombers at medium and high altitudes but it may also be used by fighter-bombers at lower altitudes. This technique can be used to deliver nuclear as well as conventional ordnance.

Dive-Bombing

Aircraft using this attack technique start the attack run at medium altitude and dive directly at the target. Ordnance release will occur at low to medium altitudes. After delivering the ordnance, the aircraft will execute

an evasive maneuver. As in gravity drop-bombing, the ordnance falls forward, usually less than 1 kilometer.

Toss-Bombing

Aircraft using this attack technique usually ingress at low to medium altitude. At a predetermined point, the aircraft goes into a steep climb. The aircraft then releases its ordnance and reverses its direction. The ordnance can be thrown forward as far as 18.3 kilometers, 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 release 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 release.

Pop-up

Aircraft using the pop-up technique begin a low-level run-in about 10 to 20 kilometers from the target. When reaching a pull-up point about 3 to 8 kilometers offset from the target, the aircraft will climb to its attack height. This height will vary 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 begins to look for the target as soon as possible after pull-up. 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 and release its ordnance 500 to 1,500 meters from the target. It then escapes the target area at high speed and low altitude.

Lay-down

Aircraft using the lay-down technique fly at altitudes below 200 meters and at speeds from 150 to 250 meters per second. High speed and low altitude increase aircraft survival and mission success. The speed of ordnance fall is reduced by ordnance retardation devices, such as drogue chutes or retarding fins. This 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 provide clear insights into the nature of the future air battle. The next air battle will be a large numbers game, 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 be playing the air defense game 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; except, perhaps, in limited areas for short periods of time. This leads to the concept of two distinct phases to the air battle.

FIRST PHASE OF THE AIR BATTLE

The first phase 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 aviation, naval aviation, tactical aviation, and the strategic rocket forces. Their air forces will attempt to punch holes or lanes through our defended airspace by suppressing forward HIMAD units. Successive waves of aircraft will use these lanes to attack our air bases, command and control facilities, key logistics installations, and theater nuclear forces. If this initial air operation is successful, our retaliatory capability will be greatly reduced and the ability to sustain ground forces will be greatly degraded.

In the first phase air battle, Soviet aircraft will be loaded with munitions optimized to knock out our ADA units and to kill aircraft on air bases and in the air. While the air superiority phase will continue as long as conflict exists, it is the first attack which will be vital. As with other combat arms, *ADA*

must win the first battle. Our success will determine—

- The size of initial and subsequent attacks on our ground forces.
- The amount of close air support available to our ground forces.
- Our freedom of maneuver despite enemy air actions.
- The survivability of our logistics support systems.

The first phase of the air battle is illustrated below.

FIRST PHASE AIR BATTLE

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

RECONNAISSANCE

PRECEDING AND FOLLOWING ATTACK

HIGH ALTITUDE

LOCATING HIMAD UNITS

ASSESSING COMBAT DAMAGE

ECM SUPPORT

PRECEDE HIMAD ATTACK BY MINUTES

DIRECTED AGAINST HIMAD ACQUISITION RADARS

STANDING OFF OUTSIDE ENGAGEMENT RANGE

MOST EFFECTIVE FOR LOW-ALTITUDE AIRCRAFT

ESCORTING BOMBER FORMATIONS

SECOND PHASE OF THE AIR BATTLE

After the initial waves of air superiority attacks, the Soviets will shift their emphasis to close air support of maneuver forces. The second phase of the air battle will be the attack of maneuver forces and their support elements. If they fail to achieve air superiority, the second phase may be delayed and continued attacks could be directed against our ADA forces.

In the second phase, Soviet aircraft will attack forward maneuver elements, as well as command and control, fire support, and logistic assets in brigade and division areas.

Enemy flights will approach the forward edge of the main battle area at low altitudes to avoid HIMAD weapons. Most attacks on ground targets will be at altitudes below 1,000 meters and at speeds less than 250 meters per second. Flights will probably be composed of 2-4 aircraft. As they near their targets, these flights may divide into two separate elements. The aircraft may execute a pop-up maneuver 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 second phase of the air battle is illustrated below.

SECOND PHASE AIR BATTLE

FIGHTER-BOMBERS

ATTACKING AT LOW ALTITUDES (150-600 METERS)

DELIVERING MIXED ORDNANCE
—CBUs
—NAPALM
—ROCKETS
—CHEMICALS
—CANNON

ATTACK HELICOPTERS

FLYING NAP-OF-THE-EARTH (NOE)

TARGETING ARMOR AND MECHANIZED UNITS

DELIVERING MIXED ORDNANCE
—ATGM
—ROCKETS
—CANNON
—BOMBS, CHEMICAL, AND HE

RECONNAISSANCE

FLYING MEDIUM ALTITUDE

DIRECTING ARTILLERY FIRE

REPORTING TROOP CONCENTRATIONS AND MOVEMENT

ECM SUPPORT

COMMUNICATIONS JAMMING EMPHASIZED

JAMS HIMAD

Section II — THE SUPPRESSION THREAT

DETECTION OF PATRIOT UNITS

Before an enemy can attempt to suppress Patriot, he must first detect its presence, identify the weapon system, and determine its position. He has many assets to do this including the following:

- Human intelligence.
- Signal intelligence.
- Imagery intelligence.
- Electronic warfare support measures.

HUMAN INTELLIGENCE

Human intelligence (HUMINT) is the use of people to gather information. These people 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 be easily collected through HUMINT and pieced together to form essential intelligence.

SIGNAL INTELLIGENCE

Signal intelligence (SIGINT) is the intelligence derived from the intercept and interpretation of communications-electronics (C-E) systems. This includes the interception of both radio and radar systems. VHF, UHF, and the Patriot radar can all be detected, intercepted, and located. A direct line of sight must exist between the emitter and the electronic sensor. This normally precludes intercept by ground-based sensors because of terrain masking. However, all Patriot C-E systems may be intercepted by airborne sensors.

IMAGERY INTELLIGENCE

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 detection method. 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. Patriot units not properly camouflaged to reduce visual and infrared signatures will be easily detected and located through IMINT measures.

ELECTRONIC WARFARE SUPPORT MEASURES

Electronic warfare support measures (ESM) is that division of EW that involves actions taken to search for, locate, and identify radiated electromagnetic energy for the purposes of immediate threat recognition and tactical employment of forces.

ESM is often confused with SIGINT, which is largely concerned with intercepting, locating, and monitoring C-E emitters for intelligence information. ESM, however, is concerned with identifying, discriminating, and locating the emitters. ESM includes use of both ground and airborne radio direction finding (RDF) equipment.

RDF sensors can intercept signals at several times the operational range of Patriot radios and radar, if a direct line of sight exists. This allows an enemy to find the approximate azimuth to his target—your position. If the enemy can obtain three RDF bearings to your position, he can determine its location. The enemy can locate positions with sufficient accuracy for directing indirect fires in less than 3 minutes. After determining azimuth and range, he needs only a short time to coordinate a fire command. From the time of detection to "steel-on-target" is less than 30 minutes. This response time is expected to be significantly reduced by technological innovations being developed. The Patriot radar is the C-E emitter that is most susceptible to intercept, identification, and location by ESM. Operations security measures to counter ESM are contained in chapter 8.

SUPPRESSIVE MEANS

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

INDIRECT FIRE

The Soviets have a wide variety of indirect fire weapon systems, including cannon artillery, mortars, multiple rocket launchers (MRL), and tactical ballistic missiles (TBM). Mortar ranges are typically less than 6 kilometers, cannon artillery ranges are less than 30 kilometers, and MRL ranges are less than

20 kilometers. Normally, Patriot units are deployed out of range of those systems, but 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 50 kilometers, and the range of the Scaleboard is 800 kilometers. Replacement of the Frog-7 by the SS-21 with its improved accuracy and range will increase the likelihood of Patriot units being targeted. The threat posed by this array of TBMs is by far the most severe to Patriot units. Given the priority placed on destroying Patriot units early in the next battle, the Soviets will probably devote TBMs to destroy key Patriot units.

AIR ATTACK

Air attack will be used to suppress Patriot units. Section I clearly pointed out that fighter-bombers will be devoted to the mission of suppressing Patriot units. These fighter-bombers will attack at extremely low altitudes and at high speed. High-performance aircraft will attack in flights of 2-4 aircraft, attempting to saturate and overrun the Patriot unit. Aircraft will attempt to suppress Patriot units by employing ARMs and may also deliver CBUs, if they can penetrate to the Patriot unit position. Chemical munitions may also be used.

GROUND ATTACK

This is the third method of direct physical suppression. This method includes the use of conventional forces as well as unconventional forces, such as guerrillas, saboteurs, and commandos. Even a small force has the capability to neutralize a Patriot 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 is known as EW, and is a viable form of air defense suppression. The Soviets will use ECM extensively to screen aircraft, to deceive identification, friend or foe (IFF), systems, to degrade missile guidance, and to jam command and control 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 ranges and missile accuracy and increase response time, thereby improving an aircraft's ability to penetrate the defense.

CHAPTER 3

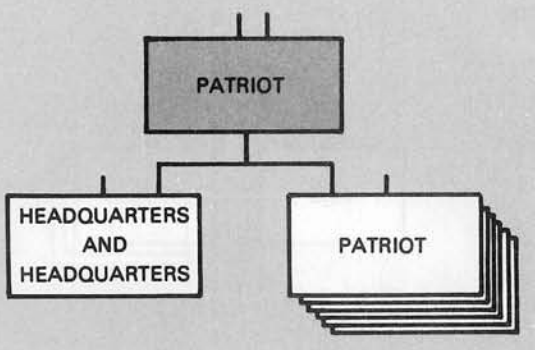
Patriot Battalion

★ This chapter describes Patriot battalion organization and equipment. Emphasis is on key fundamental features of the system and organizational functions required for the understanding of tactical employment of Patriot units. The Patriot tables of organization and equipment provide more detailed information on unit personnel and equipment authorizations. Patriot tables of organization and equipment are listed in the references. Detailed data on system characteristics are contained in Patriot technical manuals. Classified performance and planning data are in (SNF) FM 44-1A.

BATTALION

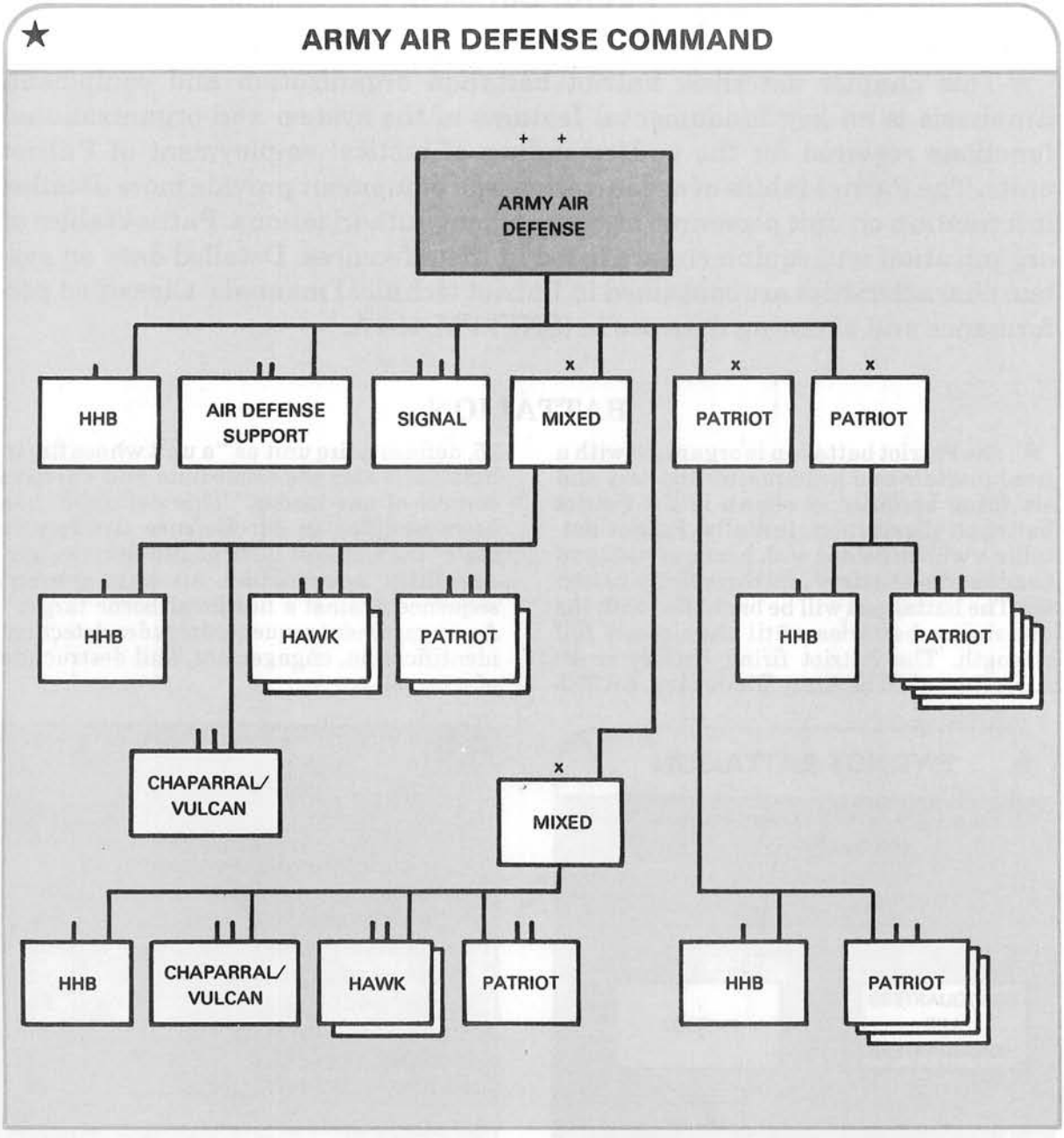
★ The Patriot battalion is organized with a headquarters and headquarters battery and six firing batteries as shown in the Patriot battalion illustration. Initially, Patriot battalions will be fielded with headquarters and headquarters battery and three firing batteries. The battalions will be backfilled with the remaining batteries until they reach full strength. The Patriot firing battery is an ADA 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 state "the smallest tactical unit that can successfully accomplish an engagement sequence against a hostile airborne target." An engagement sequence includes detection, identification, engagement, and destruction of a target.

★ PATRIOT BATTALION



CONTENTS

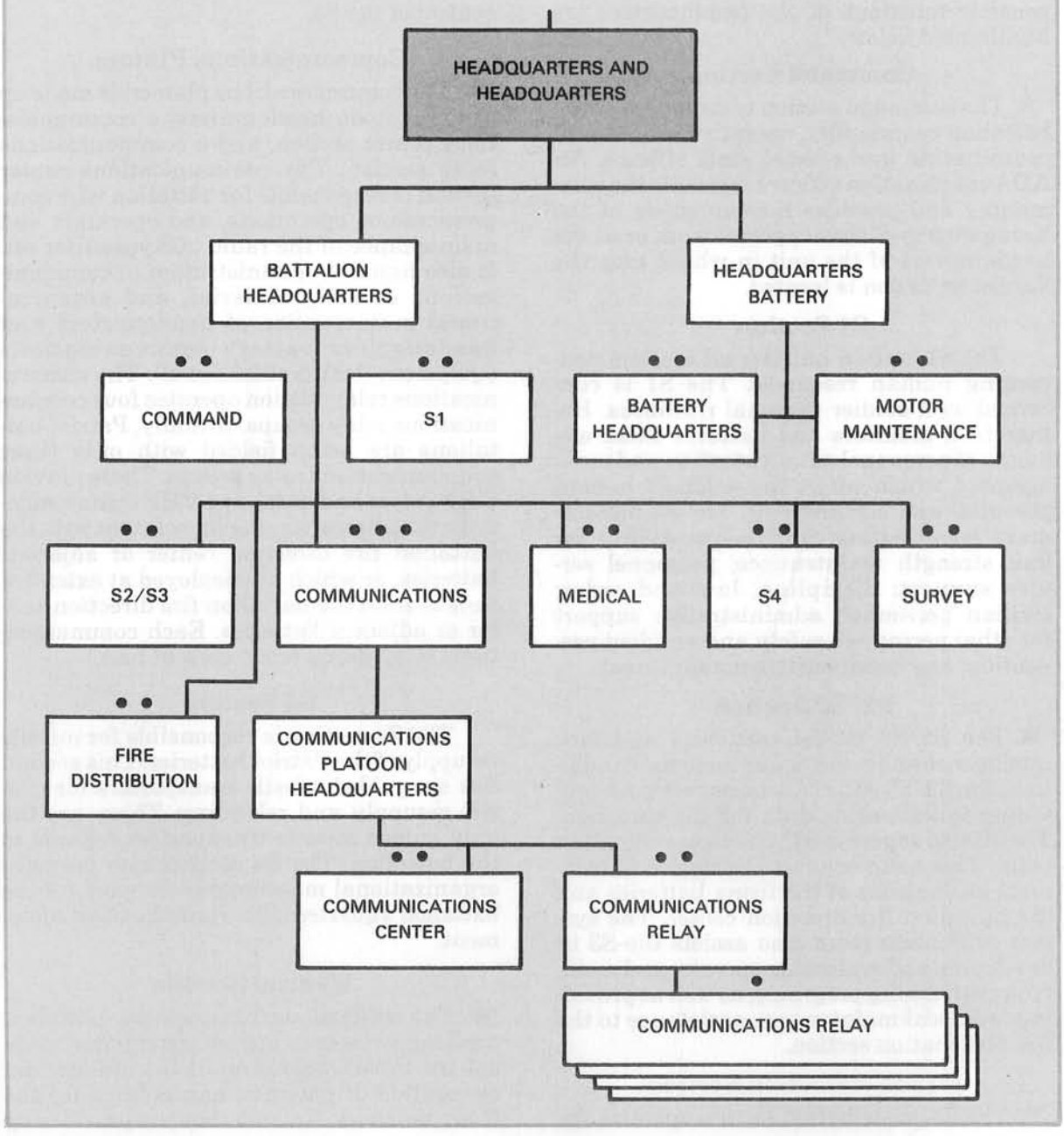
★ The battalion is normally assigned to a theater army ADA brigade. A theater army ADA brigade may consist purely of Patriot battalions, or may be a mix of Patriot, Hawk, and Chaparral/Vulcan battalions. Theater army ADA brigades are organized and assigned to an army air defense command as shown in the army air defense command illustration.



HEADQUARTERS AND HEADQUARTERS BATTERY

★ The headquarters and headquarters battery of the Patriot battalion is organized as shown in the headquarters and headquarters battery illustration.

★ HEADQUARTERS AND HEADQUARTERS BATTERY



BATTALION HEADQUARTERS

★ The headquarters provides command, operational control, and administrative and logistic support for the battalion. While most functions performed in the Patriot battalion headquarters are similar to those performed in other types of organizations, the Patriot-peculiar functions of the headquarters are highlighted below.

Command Section

★ The command section is composed of the battalion commander, executive officer, and coordinating and special staff officers. An ADA coordination officer represents the commander and provides liaison, either at the headquarters of the supported unit, or at the headquarters of the unit in whose area the Patriot battalion is located.

S1 Section

The S1 section handles all matters concerning human resources. The S1 is concerned with soldier personal readiness. He, therefore, monitors and assesses those elements of personnel administration and management which affect the soldier's human potential and commitment. The S1 has primary coordinating staff responsibility for unit strength maintenance; personnel service support; discipline, law and order; civilian personnel; administrative support for other personnel; safety and accident prevention; and headquarters management.

S2/S3 Section

★ The S2/S3 section performs standard intelligence and operations functions. In addition, the S2/S3 section is responsible for providing initialization data for the battalion. The S3 also supervises the system evaluation team. This team conducts tactical and technical evaluations of the firing batteries and the battalion fire direction center. The system evaluation team also assists the S3 in developing and evaluating operator and maintenance training programs, as well as providing technical maintenance assistance to the fire distribution section.

Fire Distribution Section

★ The fire distribution section operates the battalion fire direction center which exercises direct control and supervision of the firing batteries. The battalion fire direction center also interfaces with the brigade and adjacent battalion fire direction centers. The fire distribution section is under the operational control of the S3.

Communications Platoon

★ The communications platoon is made up of the platoon headquarters, a communications center section, and a communications relay section. The communications center section is responsible for battalion wire communications operations, and operation and maintenance of the radio teletypewriter set. It also handles administration of communications security material, and organizational maintenance of headquarters and headquarters battery communications equipment (less multichannel). The communications relay section operates four communications relay groups. Initially, Patriot battalions are being fielded with only three communications relay groups. These provide UHF (voice and data) and VHF communications to units not having line of sight with the battalion fire direction center or adjacent batteries, or which are deployed at extended ranges from the battalion fire direction center or adjacent batteries. Each communications relay group has a crew of four.

S4 Section

The S4 section is responsible for missile resupply of the Patriot batteries. This section has six guided missile transporters for missile resupply and reloading. These are the only guided missile transporters organic to the battalion. The S4 section also provides organizational maintenance support for the battalion's quartermaster and chemical equipment.

Medical Section

★ The medical section provides battalion medical services to include emergency medical treatment, operation of the aid station, evacuation of patients, and aidmen for the firing batteries. An ambulance is provided by

the section for evacuation of casualties directly to the nearest medical facility or to the battalion aid station.

Survey Section

The survey section is responsible for providing survey data to the firing batteries for siting and orienting radar sets and launching stations. A survey information center and two survey teams comprise the survey section. Each team has a position and azimuth determining system and a theodolite as a backup. The survey section operates under the operational control of the S3.

HEADQUARTERS BATTERY

Headquarters battery provides food service, unit supply, refueling, and organizational maintenance support for vehicles, power generators, and engineer missile equipment. Headquarters battery is organized with a battery headquarters and a motor maintenance section.

Battery Headquarters

★ The battery headquarters is composed of the command element, the unit supply element, and the unit food service element. All weapons and nuclear, biological, and chemical protective masks are consolidated in the battery headquarters. The headquarters also has equipment for one Stinger team to provide self-defense of the fire direction center. The team is manned by battery personnel as an additional duty. Patriot (16T) crew members are designated as Stinger team members on an additional duty basis. These crew members normally receive familiarization training on the Stinger system prior to deployment of the Patriot battalion. In the case of HHB, the commander should consider training additional personnel, as the designated 16Ts will not be available to man the Stinger equipment during missile resupply operations.

Motor Maintenance Section

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

FIRING BATTERY

★ The Patriot firing battery is organized with a battery headquarters, a maintenance platoon, a fire control platoon, and a launcher platoon as shown in the Patriot firing battery illustration. The battery is normally integrated with the rest of the battalion defense through the battalion fire direction center; however, it is capable of autonomous operations.

BATTERY HEADQUARTERS

The Patriot firing battery headquarters has a command element, supply element, and food service element. The battery command post is a mobile, 2-1/2-ton shop van.

MAINTENANCE PLATOON

★ The maintenance platoon is organized with a platoon headquarters, communications section, motor maintenance section, and system maintenance section. The platoon headquarters ensures responsive, coordinated organizational maintenance support. The platoon leader serves as a tactical control officer on a rotational basis with the other platoon leaders. The communications section is responsible for supporting battery wire communications and performing organizational maintenance on field communications equipment. The battery motor maintenance section performs organizational maintenance on all vehicles and generators (less turbines). It also recovers vehicles, refuels all battery generators and vehicles, and maintains the battery repair parts prescribed load list (less Patriot system). The system maintenance section accomplishes all Patriot system maintenance below the intermediate maintenance level on the major items of battery

equipment as well as platoon maintenance and test equipment. The section also maintains the Patriot system prescribed load list.

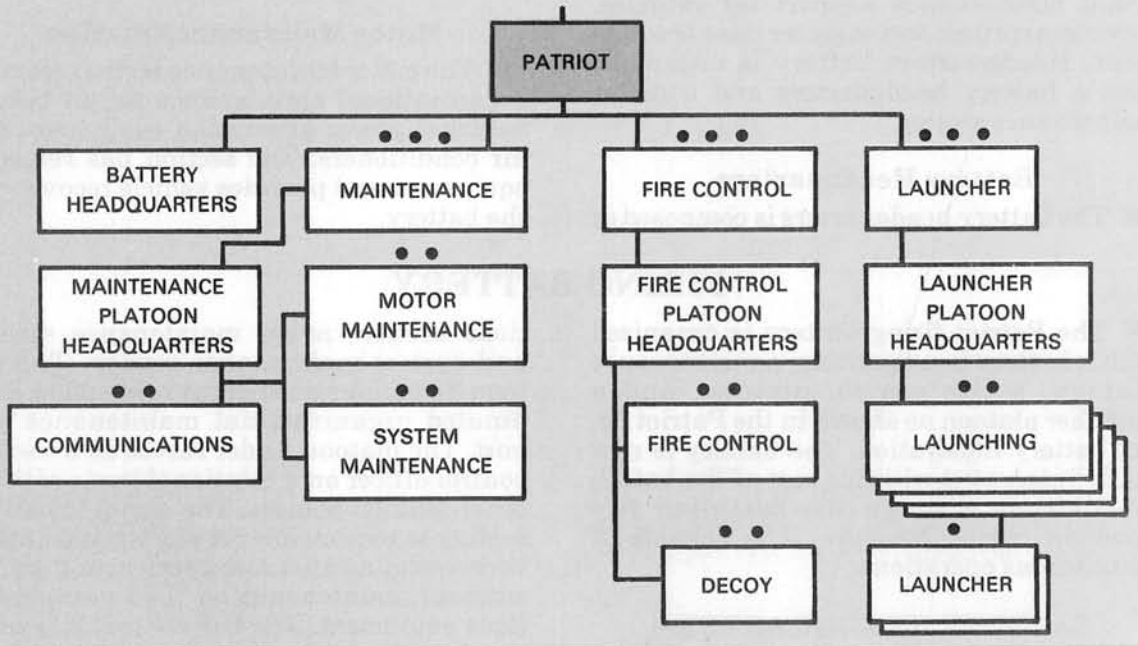
LAUNCHER PLATOON

★ The launcher platoon contains four launcher sections. Each section has two launching stations. Each launching station is manned by three crew members. The launcher platoon mans a Stinger team for self-defense of the battery.

FIRE CONTROL PLATOON

★ In the fire control platoon there is a platoon headquarters, fire control section, and decoy section. The platoon is capable of sustained operations and is fully mobile. The fire control platoon also provides a Stinger team for self-defense of the battery. The equipment in the fire control section includes the engagement control station, radar set, electric power plant, and an antenna mast group. The UHF multichannel communications are installed and operated by a three-man team. The decoy section consists of a four-man team which deploys the four electronic decoys that enhance the survivability of the radar set. The Patriot firing batteries have been initially fielded without the decoys, but will be backfilled in the near future. The platoon has personnel to operate the electric power plant and perform turbine maintenance.

★ **PATRIOT FIRING BATTERY**



KEY SYSTEM FEATURES

Patriot is a mobile air defense guided missile system designed to counter the tactical air threat of the 1980s and 1990s. Patriot is effective against aircraft at all tactical altitudes and has replaced US Nike Hercules and will replace most Hawk systems. The key features of the Patriot system are a multifunction, phased-array radar; track-via-missile guidance; and automated operations with capability for human override. The single, multifunction, phased-array radar performs the tactical functions that presently require

nine separate radars within currently operational ADA systems. The track-via-missile guidance increases the single shot engagement kill probability. This automated operation provides firepower at levels many times greater than currently fielded systems.

The major items of Patriot equipment discussed below are only described to the extent necessary to understand the tactical function of the equipment. Detailed information is contained in the appropriate technical manuals listed in the references.

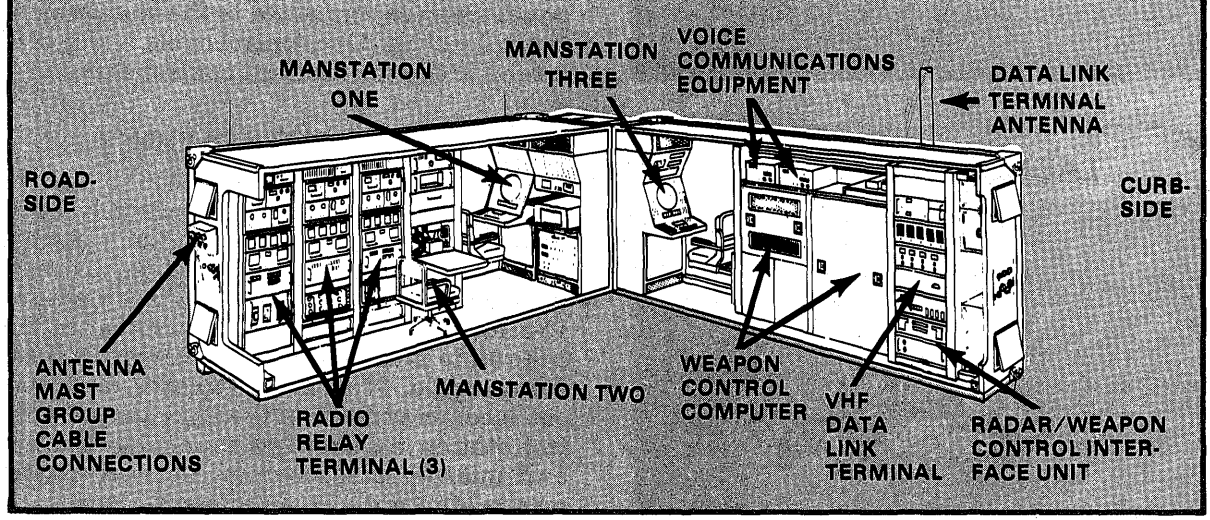
FIRING BATTERY EQUIPMENT

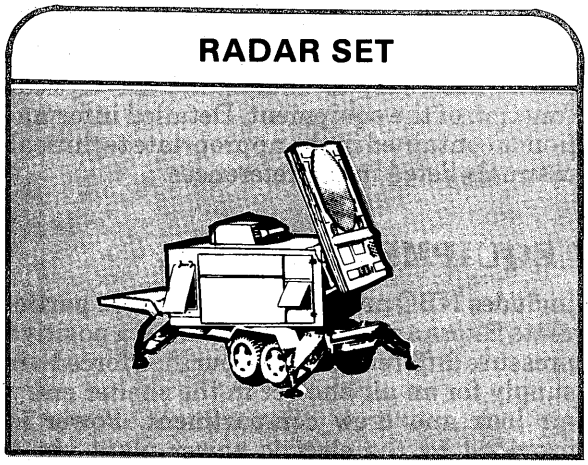
Major equipment items found in the Patriot firing battery include the engagement control station, radar set, electric power plant, launching stations, Patriot guided missiles, and antenna mast group.

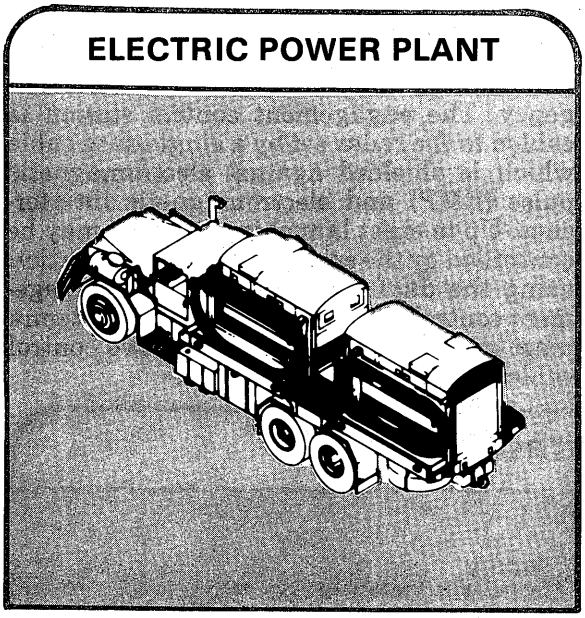
ENGAGEMENT CONTROL STATION

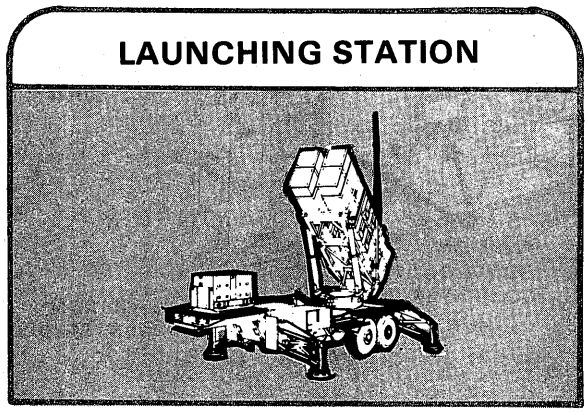
The engagement control station is the fire direction center of the Patriot firing battery and is the only piece of equipment manned during the air battle (see the engagement control station illustration). It contains the weapons control computer, display and control group, three UHF radio terminals, a VHF data link terminal, and two VHF voice radios. The shelter is a radio frequency shielded and weather-tight enclosure. The walls and inlets include electromagnetic shielding. The shelter is air conditioned and includes NBC protection devices. Gas particulate filters and blowers maintain a positive pressure differential and a purified forced-air supply for an air-shower in the shelter entry air lock and crew compartment. Power is provided by the electric power plant via a single power cable. A control cable from the electric power plant provides the capability for the operator to monitor the electric power plant status and shut it down in an emergency. The engagement control station is cabled to the radar set by a single data cable which is shielded against electromagnetic pulse (EMP) and electromagnetic interference. Up to eight launching stations may be controlled by the engagement control station using the data link terminal. The engagement control station is cabled to the antenna mast group by one power cable, two control cables, and eight signal cables.

ENGAGEMENT CONTROL STATION









RADAR SET

The radar set (see the radar set illustration) consists of a multifunction, phased-array radar mounted on a semitrailer. The radar set is monitored and controlled by the engagement control station, and is unmanned during operations. The radar set is capable of performing surveillance, target tracking, missile tracking, identification, electronic counter-countermeasures (ECCM), and missile guidance. The antenna can be positioned in azimuth using a motor-driven pedestal assembly which supports and rotates the entire radar shelter. The antenna is erected to a fixed elevation angle of 67.5° for tactical operations. The beam is positioned electronically. Power for the radar set is provided from the electric power plant by three power cables.

ELECTRIC POWER PLANT

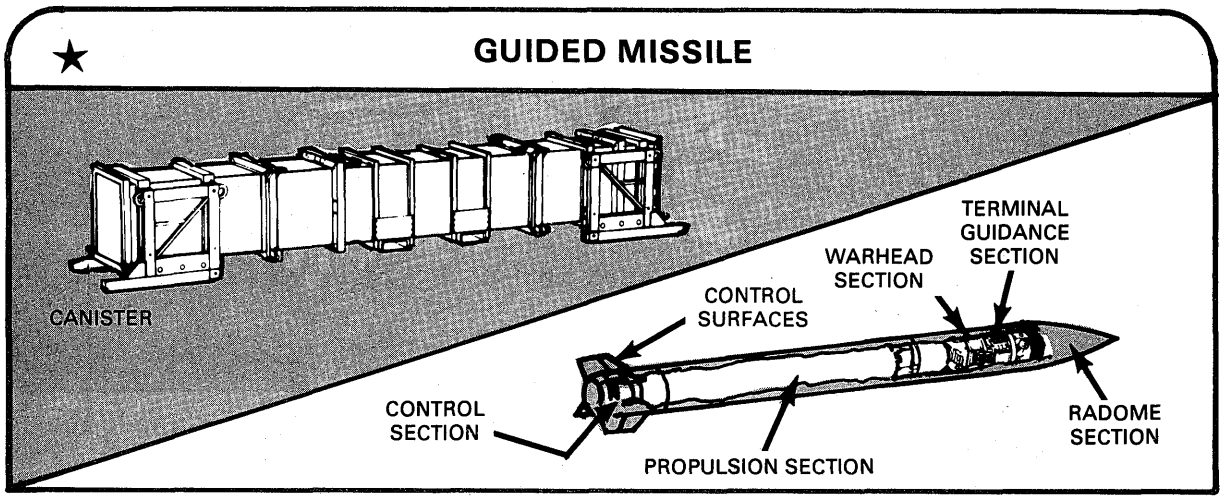
The electric power plant (see the electric power plant illustration) provides power for the engagement control station and radar set. The electric power plant has two EMP-hardened, 150-kilowatt turbine engine generator sets mounted on an M811 truck. Each electric power plant contains two 75-gallon fuel tanks. Normal operation requires only one generator on line while the other generator serves as a backup. The electric power plant can be monitored and shut down from the engagement control station. Three power cables are connected to the radar set and one power cable is connected to the engagement control station. One control cable is also connected to the engagement control station.

LAUNCHING STATIONS

The launching stations (see the launching station illustration) are remotely operated, fully self-contained units. Each launching station can carry up to four guided missiles. Power is provided by an onboard 15-kilowatt generator. The launching station can rotate in azimuth and elevates to a fixed firing angle. It receives, decodes, and executes commands from the engagement control station and reports launching station and missile status reports as well as the results of recently commanded actions.

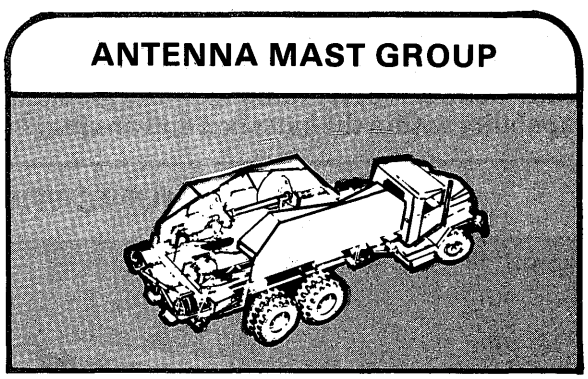
GUIDED MISSILE

The guided missile (see the guided missile illustration) consists of a Patriot missile, intercept aerial, MIM-104, mounted within a canister that functions both as a shipping and storage container and as a launch tube. Four missiles are transported on a launching station at one time. A single cable and grounding strap connects each canister with the launching station and provides the means for status monitoring, preheating, and launching. The Patriot missile has four clipped-delta, all-movable tail control surfaces and is propelled by a single-stage, all-boost, solid propellant rocket motor. The main sections of the missile are the radome section, terminal guidance section, warhead section, propulsion section, and control section.



ANTENNA MAST GROUP

The antenna mast group (see the antenna mast group illustration) has four high-power amplifiers and four antennas for UHF communications. The antenna mast group is cabled to the engagement control station to provide radio frequency (RF) signal circuits and to permit control of the antenna azimuth. The antennas can be rapidly erected to obtain communications line of sight. (The antenna mast group is also used with the information and coordination central and communications relay groups at battalion).



BATTALION EQUIPMENT

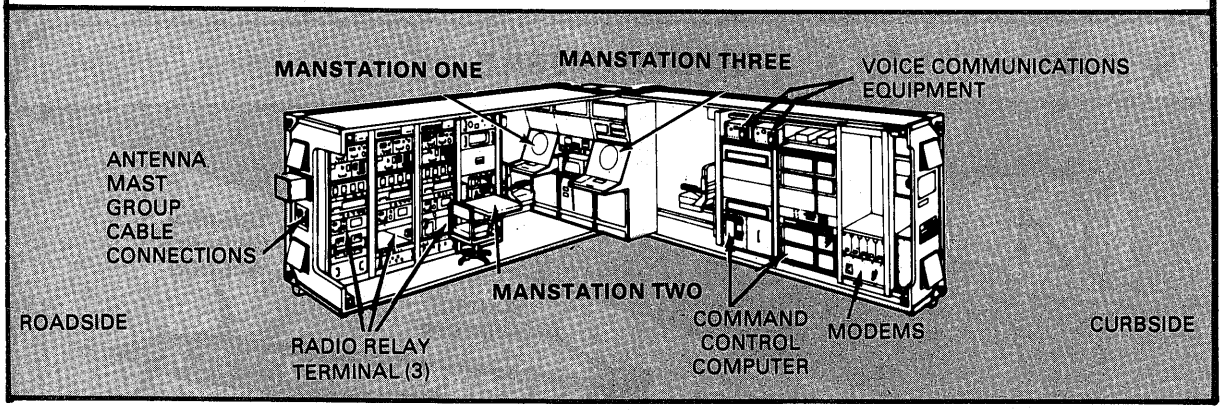
Major items of Patriot equipment at the battalion level include the information and coordination central, communications relay group, electric power unit, and antenna mast group which was explained previously.

INFORMATION AND COORDINATION CENTRAL

The fire direction center for air defense operations in the Patriot battalion is the information and coordination central (see the information and coordination central illustration). The FDC controls up to six

firing batteries and coordinates their operations with those of adjacent battalions and higher headquarters. The information and coordination central interfaces with the AN/TSQ-73 through use of an army tactical data link-1 modulator/demodulator (MODEM). Physically, the information and coordination central is similiar to the engagement control station. Each uses the same type of shelter, antenna mast group, VHF (voice) and UHF radios, and NBC protection.

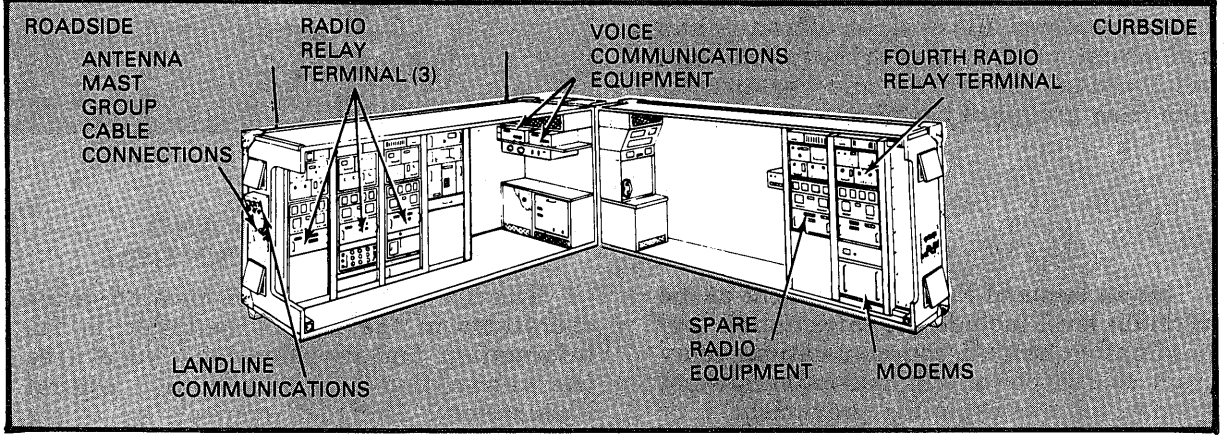
INFORMATION AND COORDINATION CENTRAL



COMMUNICATIONS RELAY GROUP

★ The communications relay group (see the communications relay group illustration) enables non-line-of-sight deployment between the information and coordination central and engagement control station. It provides both an UHF radio-wire integration capability within the battalion and an entry/exit point for interbattalion communications as well as an UHF and VHF radio relay capability. The CRG uses an antenna mast group and includes a shelter, four active UHF terminals and one inactive UHF terminal, MODEMs, and VHF radio relay equipment.

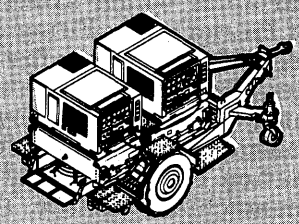
COMMUNICATIONS RELAY GROUP



ELECTRIC POWER UNIT

The electric power unit (see electric power unit illustration) is the prime power source for the information and coordination central and the communications relay groups. The electric power unit consists of two 60-kilowatt, 400-hertz turbine engine generator sets mounted on a trailer which also mounts a palletized dual-chamber fuel tank. Only one generator is required for all power needs of the information and coordination central or communication relay group.

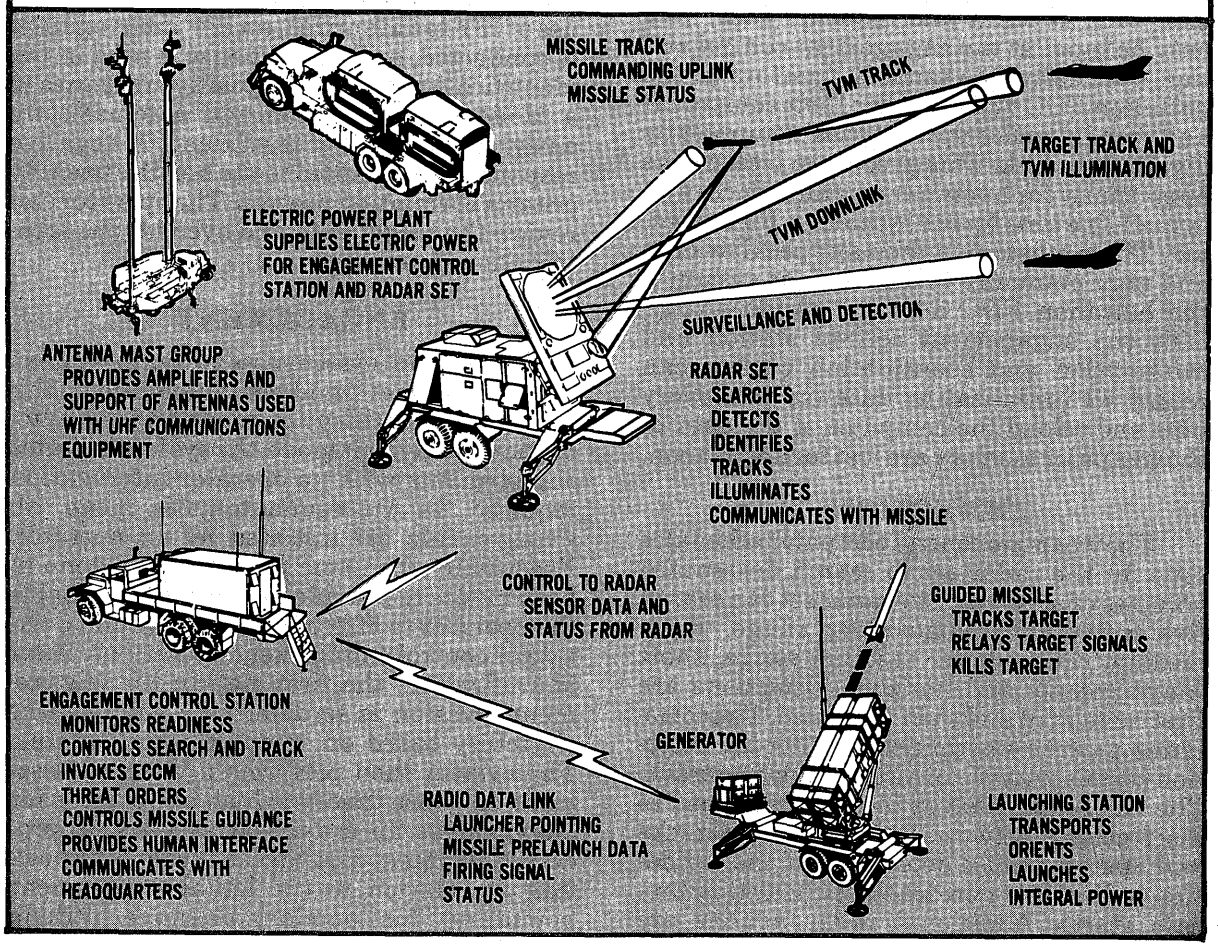
ELECTRIC POWER UNIT



SYSTEM OPERATION

The illustration below shows the scheme of operation of a Patriot fire unit and provides the principal functions of each major item of equipment.

PATRIOT FIRE UNIT OPERATIONS



INITIALIZATION

★ Initialization is the process of loading the software into a computer's memory and inputting variables which affect tactical operations of Patriot units. Firing decisions based on target identification, fire distribution, and rules of engagement are automatically computed and controlled by the engagement control station and information and coordination central computers with minimal man-machine interface. Therefore, it is essential that the computers be programmed correctly. Some examples of initialization variables are defended assets, identification parameters, launch decision parameters, and radar frequencies. A complete set of operator inputs may be found in TM 9-1430-600-10-1 and TM 9-1430-602-10-1. Recommended values for initialization are contained in (SNF) FM 44-1A. Some variables, such as radar and launcher sites, may only be input at the engagement control station. Normally, the tactical directors at the battalion FDC will initialize their equipment and then initialize the batteries' computer by digital data link. This procedure lessens the opportunity for human error and reduces system off-line time for initialization. Firing battery TCOs must input their site peculiar data and may manually initialize their system if the battalion FDC does not. Additionally, both the engagement control station and information and coordination central can record all initialization data on a recovery tape and reload the computer, if the data in the computer memory are lost for any reason.

DETECTION

The weapons control computer schedules time for the radar set to search designated volumes of airspace. The radar set can search five sectors of airspace (long range, upper medium range, lower medium range, short range pop-up, and horizon). Detections are first correlated and then validated. The correlation process determines whether the detection correlates with an already existing track. The validation process is then performed to discriminate between legitimate new tracks and spurious noise detections. If the validation indicates a new track, the tracking process starts. Additional radar actions are scheduled to get additional data on the target. Once the necessary data are obtained, the track on the target is maintained.

IDENTIFICATION

The Patriot system has two identification modes—automatic and manual. The tracking function gives accurate position, altitude, speed, heading, and ECM emission data on the target. Target data are compared with the current set of hostile/friendly criteria when in the automatic identification mode and assigned one of the following identifiers: friend, true friend, assumed friend, unknown, or hostile. Tabs also display correlation between target track data and hostile/friendly criteria so the operator can assign an identity in the manual identification mode. If the initial identity assigned is unknown, and the use of IFF is authorized, an IFF interrogation is conducted, and the response is used in the identification process. A positive response to a Mode 4 interrogation will automatically assign an identity of true friend. A negative response will be added to the hostile/friendly criteria correlation process. The operator can review the target data and override the identification if necessary.

ENGAGEMENT

★ The Patriot system uses two engagement modes—automatic and semiautomatic. In the automatic identification mode and the automatic engagement mode, the system initiates engagements with no operator intervention required. In the semiautomatic mode, all engagements are initiated by an operator. Essentially the same processing is done in both modes to provide information to enable the operator to effectively monitor and override or control engagement operations. After identification, the first step in the engagement decision is to determine engagement eligibility based on weapon control status. The system then performs a threat assessment on those targets which are eligible for engagement. In the threat assessment process, the system first checks the target's position in relation to the lethal engagement boundary. This boundary is a range/altitude

boundary which is established during the initialization process. This range may be adjusted during tactical operations. However, such range adjustments may affect the system's probability of kill. Refer to (SNF) FM 44-1A for a discussion and recommendation on the use of engagement range bias. Only targets within, or approaching the lethal engagement boundary, are further evaluated based on the target's time of flight from the defended assets. A limited number of targets will be listed in the TO BE ENGAGED QUEUE from "most threatening to high priority assets to least threatening to low priority assets." The system displays the time when missile launch should occur.

DESTRUCTION

Once a missile is launched, either automatically by the system or by the operator, it is acquired by the radar set and guided to target intercept. There are no actions necessary by the operator during missile flight. The system automatically counters ECM and evasive maneuvers of the target. The Patriot system achieves a very high probability of kill through the use of track-via-missile terminal guidance. In the terminal phase of engagement, the radar set illuminates the target with an RF beam. The missile seeker receives RF reflected from the target and reports that information to the radar set. The computer then gets two perspectives of the target—one from the radar set and one from the missile. The computer nulls out any pointing errors, sends steering commands to the missile, and sends fuse commands. Depending on the type and effectiveness of any ECM employed, the missile also has several other modes of operation.

SYSTEM CAPABILITES

The Patriot air defense missile system is designed to counter the air threat of the 1980s and beyond. Patriot units are 100 percent mobile. The Patriot system has fewer major items of equipment and requires fewer operating personnel than other HIMAD systems. As an example, the Patriot phased-array radar performs all the functions currently performed by four different Hawk radars.

The Patriot air defense missile system can—

- Engage and destroy threat aircraft operating at all tactical speeds and altitudes. The system is effective from near ground level up to altitudes in excess of 20 kilometers and ranges in excess of 80 kilometers.
- Deliver sufficient firepower to counter threat saturation attacks.
- Operate at night and under all conditions of weather and reduced visibility.
- Function effectively in an intense ECM environment.
- Move about the battlefield using organic wheeled vehicles. The system can be transported by rail and ship, and can be airlifted by C-141 aircraft with some disassembly and by C-5 aircraft without alteration.

SYSTEM CHARACTERISTICS

The Patriot system has inherent technical and tactical characteristics which can affect its employment. Understanding these characteristics and how they affect the system can reduce their impact on operations.

TECHNICAL

Technical characteristics that must be considered are line of sight, sectored engagement zone, and Patriot signatures.

Line of Sight

Communications line of sight is required to support the UHF system. Use of multichannel radio relay techniques eliminates the need for line of sight between the firing batteries and the battalion FDC. Visual line of sight is also desirable between the radar set and the launching stations, but is not required.

Sectored Engagement Zone

The Patriot system can search, track, and engage within an azimuth-specified sector. See (SNF) FM 44-1A for search and track sectors.

Patriot Signatures

As with other ADA systems, the Patriot system has distinctive visual, communications, and radar signatures. As explained in chapter 2, these signatures can be detected at several times their operational ranges and are used to locate and identify Patriot units.

TACTICAL

Tactical characteristics that must be considered include terrain and launching station reloading.

Terrain

Terrain slope and surface firmness must be considered when selecting positions. The launching station and radar set can be leveled to compensate for slopes up to 10°. Most pieces of Patriot equipment, the launching station and radar set in particular, are outsized and heavy. Routes into and from the position must be able to support this equipment.

Launching Station Reloading

Launching station reloading is a time consuming process. See (SNF) FM 44-1A for reloading time. Therefore, reloading must be carefully planned to provide a continuous firing capability.

CHAPTER 4

Command and Control

★ Patriot battalions need effective command and control to perform their combat mission on the air-land battlefield. Air defense artillery fires must be directed and controlled to support the overall force objectives. This chapter discusses typical command and control procedures required to integrate Patriot battalions into both the force commander's concept of the operation and the battle for air superiority.

The information contained in this chapter is applicable 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, depending on a number of factors which include the following:

- Nature of the air threat.
- Size of the total force structure.
- Mission of the force.
- Nature of the transition from peace to war.
- The command relationships established among the services and with allied forces.

CONCEPTS

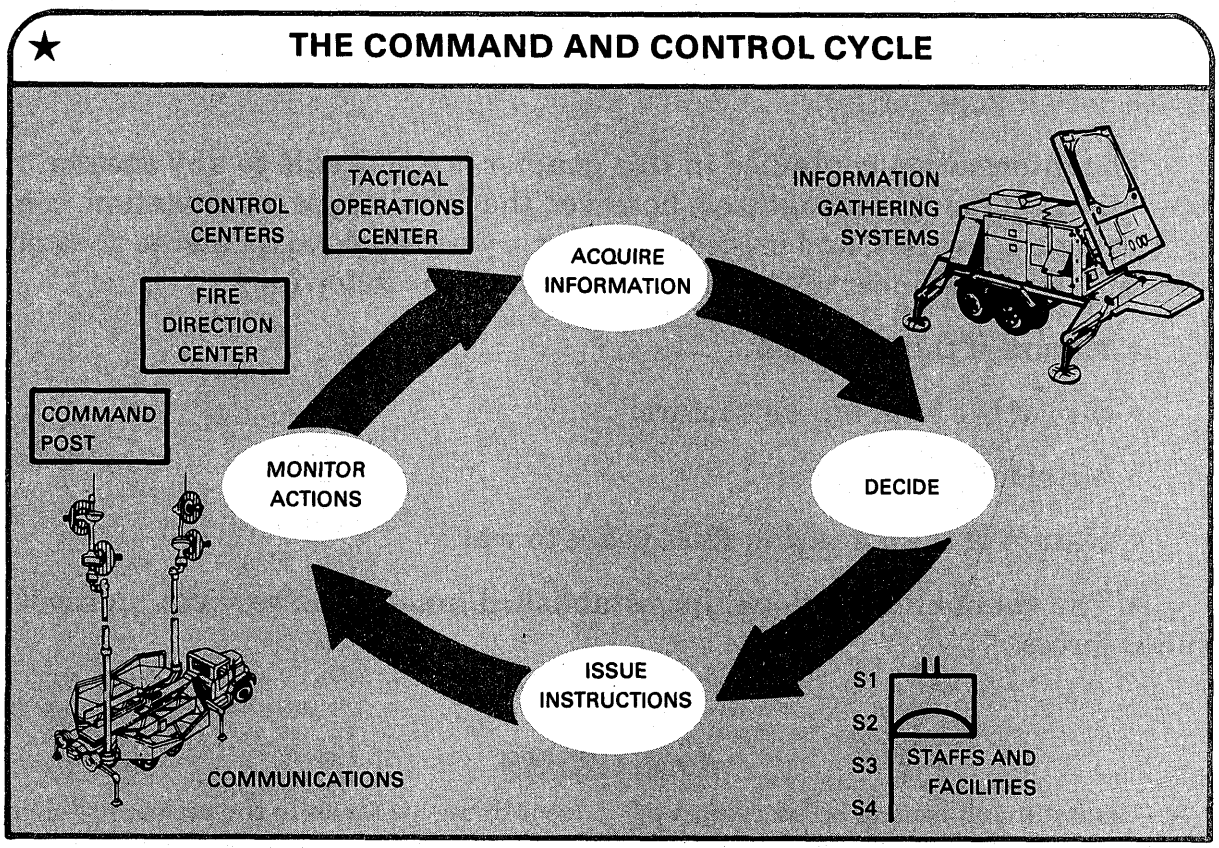
★ Command and control is the process of directing the activities of military forces to attain an objective. This process involves two basic concepts: *command* and *control.* Command is the authority and responsibility to use available resources to accomplish missions in accordance with established procedures. Control is the authority, which may be less than full command, exercised by a commander over part of the activities of subordinate or other organizations. Command and control functions are performed through the integration of personnel, communications, facilities, equipment, and procedures which allow the commander to plan, direct, and coordinate his forces in the accomplishment of the mission.

CONTENTS

CYCLE

★ The heart of command and control is the cycle of acquiring information, making appropriate decisions, issuing instructions, and monitoring subordinates for compliance. The critical element which underlies all these tasks is time. The command and control cycle (see the command and control cycle illustration) must be so well organized and efficient that it is faster than the enemy's command and control cycle. Through the fusing and filtering of information comes the ability to think and act faster so that we can actually turn inside the decision cycle of the enemy. Speed is vital to operational effectiveness, and effectiveness in command and control is a prerequisite to successful air defense.

★ THE COMMAND AND CONTROL CYCLE



COMMAND AND CONTROL FUNCTIONAL AREAS

★ Air defense command and control must satisfy two functional areas—control of the air battle and defense planning. Both are continuous processes but have basically different information and processing time requirements.

Control of the Air Battle

★ Control of the air battle must be executed on a real-time basis. Real-time control is supported by automatic data processing at the battery, battalion, and brigade fire direction centers. There are dedicated data and voice communications circuits between fire direction centers. Air battle command and control procedures are explained further starting on page 4-11.

Defense Planning

Defense planning is the process of prioritization of assets requiring ADA protection, allocation of forces, assignment of tactical

missions, and design of the defense. This process at the battalion level typically takes from 6 to 24 hours to complete one cycle. Defense planning is explained in detail in chapter 6.

MANAGEMENT

★ Three fundamental tasks form the basis for ADA command and control. These tasks relate the management of the Patriot battalion to the conduct of the overall air battle. They are:

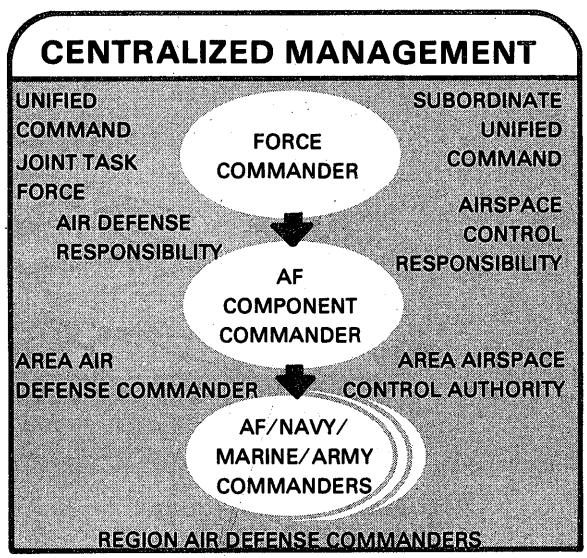
- Centralized management with maximum decentralized authority to engage.
- Air battle management.
- Management by exception.

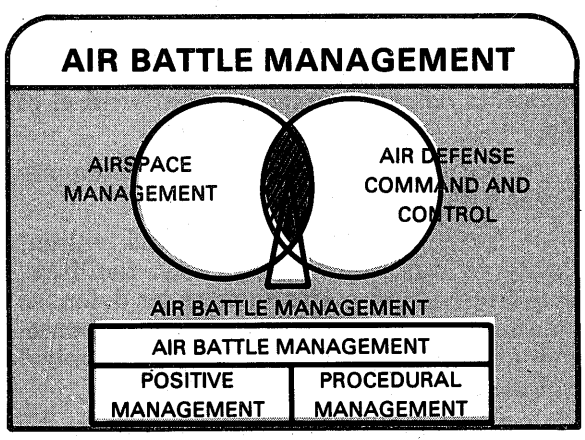
CENTRALIZED MANAGEMENT WITH MAXIMUM DECENTRALIZED AUTHORITY TO ENGAGE

★ Organizations established for air defense operations are an integral part of the overall force structure. Of necessity, air defense organizations are structured at different command levels with different areas of responsibility. Centralized management must, therefore, be exercised to ensure the coordination, integration, and maximum operational effectiveness and economy of the entire air defense organization. However, the number of air defense units prevents a single commander from directing the many actions required in defending a large number of assets and achieving air superiority. To ensure rapid and flexible response to the threat, decentralized execution of air defense tasks is essential. This is accomplished by delegating authority for mission execution, as shown in the centralized management illustration.

AIR BATTLE MANAGEMENT

★ Air battle management encompasses the principles for the control and coordination of both tactical air and ground-based Air Defense Artillery resources. This includes airspace management (to include Army airspace command and control), as well as air defense command and control (see the air battle management illustration). Close coordination among the diverse elements of an air defense is important because of the short reaction times available to engage the air threat, and 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. Exacting centralized coordination must be effected to prevent mutual interference between ADA weapons and offensive air forces. The two basic methods of exercising air battle management are positive management and procedural management.





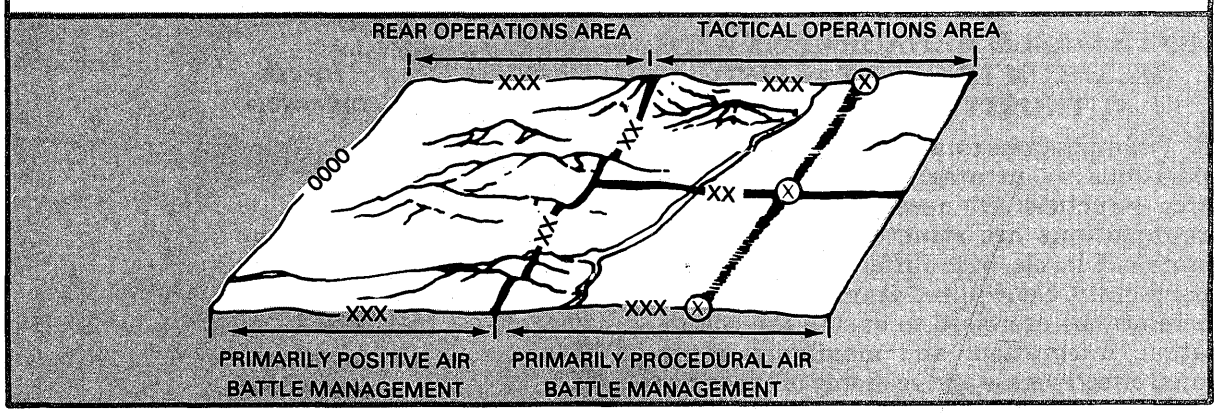
Positive Management

★ Positive management requires real-time data from radar; identification, friend or foe; computer; and communications equipment. This equipment is used for both air defense and airspace management purposes. Such positive management facilities are vulnerable as they are subject to air and ground attack, as well as to sabotage. Also, they can be degraded by the necessity for line of sight, electronic interference, and limited communications. The Patriot battalion relies heavily on positive management procedures.

Procedural Management

★ Procedural management includes such techniques as the segmenting of airspace by volume and time and the use of weapons control statuses. This method is usually more restrictive than positive management, but is less vulnerable to interference by electronic and physical attack. It does, however, ensure continuity of operations under adverse environmental conditions. Procedural management must always be available to provide an immediate backup system should positive management be degraded, and to provide a permanent management technique for those air defense systems lacking a real-time data transmission capability. The Patriot system automates many of the procedural management techniques.

REAR AND TACTICAL OPERATIONS AREAS



Air Battle Management Methods and Areas

★ Usually, a combination of the two methods of air battle management is employed. The degree to which each method is used is determined from consideration of the—

- Nature and magnitude of the enemy threat and operations.
- Availability, capability, and vulnerability of friendly management facilities, including airborne and surface air defenses command and control as well as by peacetime air traffic control and terminal control facilities.
- Number, deployment, and characteristics of friendly airborne weapon systems.
- Type of terrain and likely weather conditions in the combat area.

Patriot battalions will almost always use both positive and procedural management techniques. The mix of techniques will be greatly influenced by the location of the Patriot battalion.

In addition, the combat area can be divided into two areas — *the rear operations area and the tactical operations area* — based on general patterns of air traffic flow and the types of ongoing combat operations (see the

rear and tactical operations areas illustration at left). The boundary between the tactical and rear operations area will normally be the division's rear boundary. Air battle management takes into account the differences in traffic flow and characteristics and complexities of air operations in each area.

In the rear operations area, air traffic will be mostly along an axis perpendicular to the forward line of own troops, in transit between forward and rear areas. Since this area is more easily defined in terms of air traffic movements and electronic control, aircraft will be controlled by radar to the maximum extent possible. *Patriot battalions within this area will be managed primarily through positive management means.*

In the tactical operations area, air traffic will be both parallel and perpendicular to the forward line of own troops. Air operations in this area are characterized by the need for rapid and flexible response to both air and ground commanders' requirements. Freedom of movement throughout the area is paramount. The required flexibility for tactical operations and the potential density of air traffic make control of individual ADA units much more difficult. Therefore, *Patriot battalions within this area will be primarily managed through procedural management techniques.*

MANAGEMENT BY EXCEPTION

★ This task of Air Defense Artillery command and control is based on the idea that no single commander can direct the overall air battle on a real-time basis. The area/region air defense commander must supplement positive management with procedural techniques to ensure coordination and provide unified direction when positive management capability is degraded. 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, positive management exceptions will be made on a case-by-case basis to countermand or modify previous guidance (either positive or procedural). Strict procedural management should be used only when a combination of positive and procedural techniques is not possible (for example, during a communications outage, or for units without real-time data transmission capability).

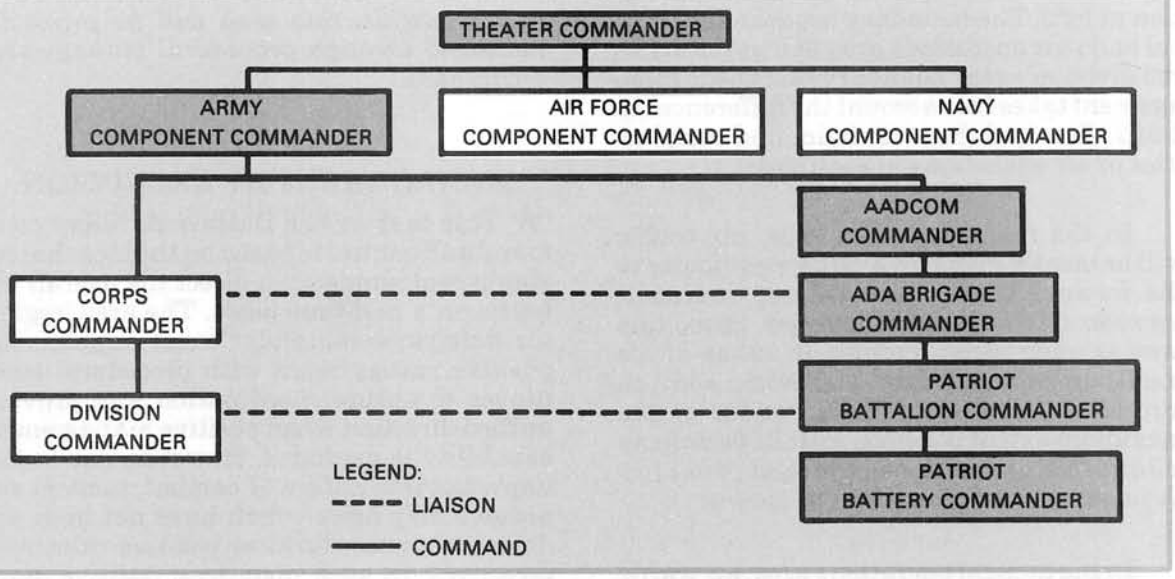
STRUCTURES AND PROCEDURES

ADA is unique in that it relies upon separate chains for command functions and control functions.

COMMAND CHAIN

★ The ADA command chain for a Patriot battalion links the theater commander to the Army component commander, the army air defense command commander, the ADA brigade commander, the Patriot battalion commander, and the Patriot battery commander in a successive chain. The ADA brigade commander exercises full command of assigned Patriot battalions. See the Patriot command chain illustration for a typical command structure. ADA liaison is also provided to the ground force commander by the ADA brigade and Patriot battalion in the tactical operations area. The ADA brigade conducts liaison with the corps. In NATO, the ADA brigade liaison team provided to the corps is termed the air defense operations liaison team and acts as a point of coordination between the integrated air defense system and the corps. The Patriot battalion conducts liaison with the division. In the rear operations area, liaison is also provided to defended asset commanders, such as wing commanders.

★ **PATRIOT COMMAND CHAIN**



SPECIAL COMMAND STATUSES

★ Special command statuses can be formed by attaching the Patriot battalion to another unit or by placing the Patriot battalion under engagement control or operational control of another unit. These statuses create special operational, training, administrative, and logistic relationships among the Patriot battalion, its parent organization, and the receiving unit.

Attachment

★ Attachment is the temporary placement of a unit under the command authority of another organization. Subject to the limitations imposed by the attachment order and by the rules and procedures established by the area air defense commander, the commander of the organization receiving an attached Patriot unit will exercise the same degree of command and control over attached units as he does over units organic to his command. This includes administrative and logistical support. The parent ADA unit commander retains the responsibility for the transfer and promotion of personnel. Generally, Patriot batteries are attached only to Patriot battalions. Likewise, Patriot battalions usually are attached only to ADA brigades.

Engagement Control

★ Engagement control is the degree of control exercised over the operational functions of a Patriot unit that are related to detection, identification, engagement, and destruction of hostile targets. Although the Air Force exercises engagement control of the ADA brigade, the ADA brigade exercises engagement control of the Patriot battalion. When a Patriot unit is under the engagement control of another unit, the parent ADA unit commander retains training, administrative, and logistical responsibilities.

Operational Control

In this special command status, the commander receiving the Patriot unit has authority for —

- Composing subordinate forces.
- Assigning missions and/or tasks.
- Designating objectives.

The parent ADA unit commander is responsible for —

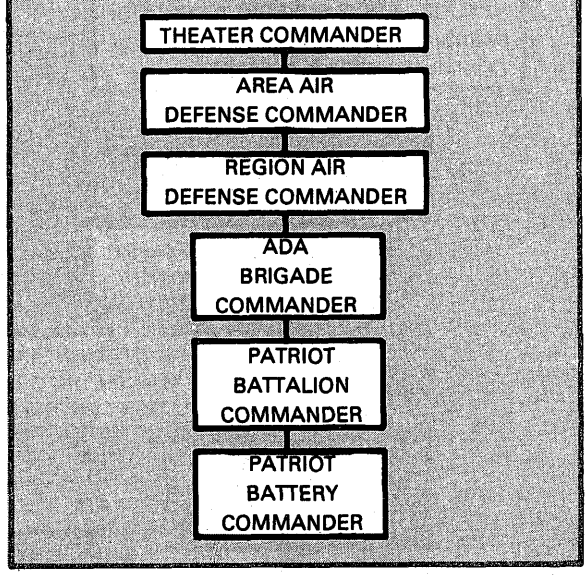
- Administration.
- Discipline.
- Internal organization.
- Logistics.
- Training.

CONTROL CHAIN

★ The control chain is a more complex structure than the command chain (see Patriot control chain illustration at right). The theater commander assigns responsibility for overall air defense and airspace control to a single commander. This is normally the Air Force component commander who is both the area air defense commander and the area airspace control authority. The area air defense commander manages the coordination and integration of the entire air defense effort within the command from his command post at the tactical air control center. He may create air defense regions and appoint a commander for each. The region air defense commander may be selected from any service component, but is normally an Air Force commander. He is fully responsible for, and has full authority for, the air defense of his region. The region air defense commander is normally located at the control and reporting center. The control and reporting center supervises the surveillance and control activities of subordinate radar elements, provides means for air traffic identification, and directs region air defense operations. In the Army chain, the control and reporting center exercises engagement control of theater ADA brigade fire direction centers. ADA brigades exercise engagement control of Patriot battalions. Under contingency conditions, a Hawk battalion performing the role of master battalion could exercise engagement control of Patriot battalions. Patriot battalions exercise engagement control of Patriot batteries.

★ When Army air defense units are assigned, attached, or organic to Army maneuver elements, they remain subject to area/region air battle management directives to ensure a coordinated and integrated air defense effort. The region air defense commander will normally relinquish operational control, less the engagement control previously described, of these assigned, attached, or organic Army air defense units to the respective maneuver commander. Priorities for these air defense resources will be developed by the maneuver commander.

★ PATRIOT CONTROL CHAIN



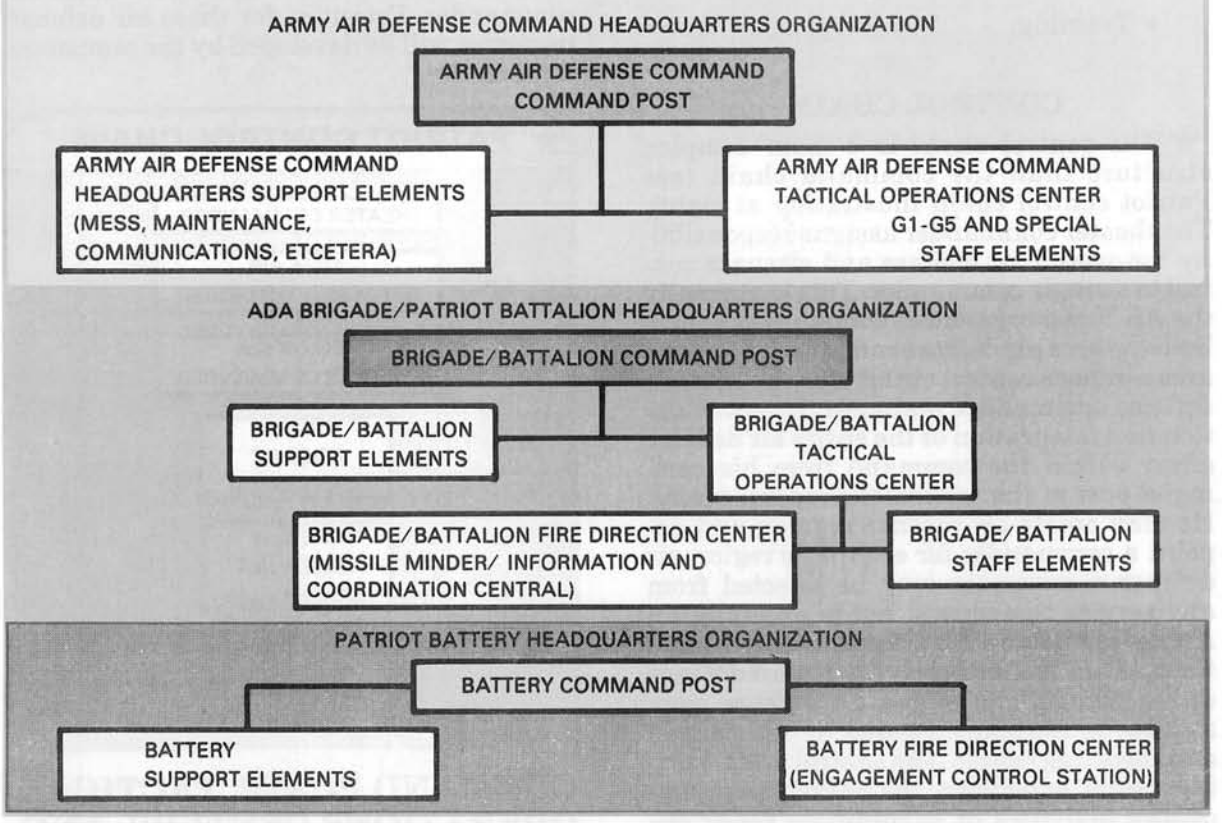
COMMAND POSTS, TACTICAL OPERATIONS CENTERS, AND FIRE DIRECTION CENTERS

★ ADA headquarters and headquarters elements were formerly known as army air defense command posts, group operations centers, and battalion operations centers. These nonstandard terms for Army air defense artillery command and control facilities have been eliminated. The standard terms for these facilities are command posts, tactical operations centers, and fire direction centers.

COMMAND POSTS

★ A command post is 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 command post. It is his principal facility for commanding and controlling combat operations. Any ADA echelon from army air defense command to platoon may have a command post. (See the air defense artillery command organizations illustration.) Patriot battalions may establish a jump command post during moves of the main command post.

★ AIR DEFENSE ARTILLERY COMMAND ORGANIZATIONS



TACTICAL OPERATIONS CENTERS

★ A tactical operations center is a subelement of a command post for headquarters with staff elements (army air defense command, brigade, or battalion). It consists of a physical grouping of the staff elements concerned with current tactical operations and tactical support (see illustration).

★ The Patriot battalion commander exercises command and control of his fire units through the battalion tactical operations center at his command post. The tactical operations center is made up of a fire direction center, an operations and intelligence element (includes an NBC subelement), a personnel and logistics element, and other elements as required and directed by the commander.

★ The operations and intelligence element plans, coordinates, and supervises activities other than those involved in the minute-to-

minute conduct of the air battle. These activities include the following:

- Processing and evaluating intelligence on both the air and ground situations.
- Planning defenses.
- Providing battalion input for the initialization function of Patriot.
- Planning, directing, and coordinating unit movements.
- Receiving and disseminating NBC information.
- Coordinating with supported units.
- Reconstituting forces.

The personnel and logistics element plans tactical support of battalion operation. The fire direction center is discussed below.

FIRE DIRECTION CENTERS

★ A fire direction center is that subelement of brigade and battalion tactical operations centers and battery command posts where the commander exercises fire direction and/or fire control. The fire direction center receives target intelligence and fire control orders and translates them into appropriate fire directions. Army air defense commands do not have fire direction centers except when augmented with fire direction equipment (see the air defense artillery command organizations illustration). Two different fire direction systems are used at HIMAD brigade and battalion fire direction centers. The Missile Minder system performs fire direction functions for Hawk battalions and theater army ADA brigades. The information and coordination central performs these functions in Patriot battalions.

★ The Missile Minder system is an automated electronic air defense command and control system which is capable of operating at battalion and brigade levels. It furnishes information for the command and control of individual fire units (to include control of radar emissions), coordinates the actions of subordinate command and control systems, and provides an interface with other services. The Missile Minder contains situation display consoles, radar interface equipment, automatic data processing equipment, and communications equipment. It is capable of providing automatically processed digital information and advanced voice communications.

★ The brigade-level Missile Minder acts as the overall ADA operational activity director by coordinating the operations of subordinate battalions and providing command and control interface with other services. The brigade-level system can coordinate 8 battalions with a total of 48 individual fire units. In the absence of a brigade level system, a battalion Missile Minder is capable of assuming the brigade-level command and control functions. Through the Missile Minder, the ADA brigade commander exercises engagement control of Patriot battalions.

★ Air battle command and control of Patriot firing batteries is accomplished by the information and coordination central, which is the battalion's fire direction center. The information and coordination central is the nerve center for the Patriot battalion's air defense operations. It controls the firing batteries and coordinates their activities with those of adjacent battalions and higher headquarters. The information and coordination central is capable of controlling up to six firing batteries and interfacing with the brigade-level Missile Minder.

★ Through the information and coordination central, the battalion commander exercises engagement control, provides fire direction, and coordinates battery operations. In addition, the information and coordination central connects the battalion to the other elements of the air defense force. The information and coordination central can interface —

- External Army command and control facilities (for example, an ADA brigade fire direction center for the purpose of

engagement control and receiving and forwarding data). This normally requires external signal support.

- Adjacent Patriot battalions for firing coordination. Each information and coordination central can interface with up to three other battalions.

- Other air defense systems for the purpose of integrating fire direction. For example, the information and coordination central can interface with Hawk battalions through the brigade Missile Minder or, in its absence, a Hawk battalion Missile Minder configured as a master battalion system. Currently, only a manual interface can be established with SHORAD units.

- Other services' command and control facilities (for example, a control and reporting center when the ADA brigade is not available).

★ The information and coordination central provides control for its firing batteries in two basic areas: target evaluation and engagement control. Target evaluation includes identification and threat assessment. Engagement control consists of determining what targets to engage, determining the priority for engaging targets, selecting firing batteries to engage each target, and monitoring engagements.

★ A manual fire direction center may be established, with existing resources, as a back-up means to *monitor* the air battle when the information and coordination central becomes nonoperational, the automatic data link channel stops functioning, or the information and coordination central redeploys.

★ In the past, manual fire direction centers were elaborate facilities designed to use several large plotting boards and a dedicated vehicle. This fire direction center could maintain centralized control of fire units during training exercises if only a few aircraft were involved. However, on today's air-land battlefield, saturation tactics will be the norm. It will be impossible for a manual fire direction center to control the operations of six firing batteries. The degree of coordination which is necessary between the battalion and the firing batteries can be provided by the manual fire direction center when the information and coordination central is nonavailable or nonoperational. Because the manual fire direction center cannot effectively exercise centralized control against saturation attacks, control should be decentralized to the firing battery level. If voice communications between the battalion and batteries are still operational, the batteries would be conducting independent operations, which is a subset of decentralized control. The primary function of the manual fire direction center is to pass changes in the air battle command and control procedures to the firing batteries. In a low density threat environment, the manual fire direction center has a limited capability to prevent simultaneous engagements. One of the tactical directors monitors communications, and plots, on a simple lap board, tracks which are reported by tactical control assistants of the firing batteries approximately 5 seconds prior to engagement. The tactical director determines whether a simultaneous engagement is taking place and, if necessary, issues the appropriate fire control order.

★ During redeployment of the information and coordination central the reconnaissance party can operate a manual fire direction center at the new site. This may compromise the new site by exposing it to the enemy's radio direction finding efforts. However, the amount of risk is low due to the relatively short time the manual fire direction center would be in operation and the even shorter time the manual fire direction center would be transmitting.

★ The manual fire direction center could also be established at the old fire direction center site while the information and coordination central redeploys. This method reduces the reconnaissance party's workload and size. However, this method has the disadvantage of splitting the fire distribution section into three parts:

1. The reconnaissance party.

2. The information and coordination central convoy.

3. Manual fire direction center.

★ Whenever possible, the information and coordination central should be moved during periods of low air activity, such as adverse weather or at night, as the manual fire direction center is easily saturated. The most important point to remember is that the battalion's effectiveness is directly related to the survival of the information and coordination central. Commanders should not hesitate to redeploy the information and coordination central if it is targeted, even if a manual fire direction center cannot assume decentralized control and the firing batteries must operate autonomously for short periods of time.

AIR BATTLE COMMAND AND CONTROL PROCEDURES

The area air defense commander manages the integrated air defense through the command and control structure and the use of air battle procedures. The three categories of air battle command and control procedures are —

1. Warning procedures and alert statuses.

2. Rules of engagement.

3. Supplemental fire control measures.

WARNING PROCEDURES AND ALERT STATUSES

★ These measures are used to alert, prepare, or build up units for combat. All of the warning procedures and alert statuses are implemented in the Patriot system as display information only. The operator must take action to implement any changes in the warning procedures or alert statuses, as required by the tactical standing operating procedures.

Defense Readiness Conditions

★ Defense readiness conditions are a uniform system of progressive alert postures for use between the Joint Chiefs of Staff and commanders of unified and specified commands. Defense readiness conditions are graduated to match situations of varying military severity. In NATO, a similar formal military alert system of stages of alerts is used. Also in NATO, a countersurprise system of states of alert is used. The Patriot display for defense readiness conditions can be used for states and stages of alert as well.

Air Defense Warnings

★ Air defense warnings reflect the commander's evaluation of the probability of air attack within his respective area of operation. Air defense warnings are routinely issued by the air defense division or sector commander. (Air defense divisions and sectors are geographical subdivisions of air defense regions.) They can also be issued by any commander for his command. The issuance of an air defense warning is not tied to any other warning procedure or alert status; that is, a commander can issue an air defense warning for his command irrespective of a low defense readiness condition or weapons alert designator. In NATO, the term air raid warning is used.

★ The three air defense warnings are as follows:

1. *Air defense warning red.* Attack by hostile aircraft or missiles is imminent or in progress.

2. *Air defense warning yellow.* Attack by hostile aircraft or missiles is *probable.*

3. *Air defense warning white.* Attack by hostile aircraft or missiles is *improbable.*

Air Defense Emergency

★ Air defense emergency is an emergency condition declared when attack upon the Continental United States, Alaska, Canada, or US installations in Greenland by hostile aircraft or missiles is considered probable, is imminent, or is taking place. The initial declaration of air defense emergency automatically establishes an air defense warning other than air defense warning white to enable secure control of air traffic.

Weapons Alert Designators

★ Weapons alert designators are a progressive system of alert postures. Weapons alert designators are based on the defense readiness condition. They are used by the area/region air defense commander to specify minimum percentages of ADA fire units required to be at given states of readiness or states of emission control (see the brigade weapons alert designators illustration below). Weapons alert designators are disseminated down to battalion level. Each battalion must determine the state of readiness or state of emission control of each battery in order to meet the weapons alert designator. In NATO, defense readiness postures are the equivalent of weapons alert designators.

★ BRIGADE WEAPONS ALERT DESIGNATOR

Here is how an ADA composite brigade's state of readiness requirements might vary based on the weapons alert designator—

ADA BRIGADE ALERT REQUIREMENTS (Percent of fire units at each state of readiness)						
CODE	BATTLE STATIONS	5 MIN	20 MIN	1 HR	3 HR	12 HR
A				34%	33%	33%
B			34%	33%	33%	
C		34%	33%	33%		
D		50%	50%			
E	100%					

★ BATTALION STATE OF READINESS

From the requirements shown in the example above a subordinate Patriot battalion commander would designate the number of fire units within his battalion to be at these states of readiness—

PATRIOT BATTALION ALERT REQUIREMENT TOTAL NUMBER OF FIRE UNITS: 6 (Number of fire units at each state of readiness)						
CODE	BATTLE STATIONS	5 MIN	20 MIN	1 HR	3 HR	12 HR
A				2	2	2
B			2	2	2	
C		2	2	2		
D		3	3			
E	6					

States of Readiness

★ States of readiness represent the degree of readiness of ADA fire units from time of alert notification to time of engagement (see the battalion state of readiness illustration at left). States of readiness can also be used to specify personnel/manning requirements. The actual time for each state of readiness is based on the threat. States of readiness are primarily used during peacetime, deterrent operations.

States of Emission Control

★ States of emission control represent the degree of emission control by radar-directed ADA units such as a Patriot firing battery. The states of emission control identify the equipment which can be emitting and the time from alert notification to time of engagement. The states of emission control range from all equipment off to all equipment on. For illustrative purposes, six Patriot states of emission control are shown in the illustration below.

★ At state one, the battery is at battle stations and all equipment is on. At state two, the battery has only internal and external data and voice communications equipment emitting. At state three, the battery has only internal data and voice communications equipment emitting. At state four, the battery has only external data and voice communications equipment emitting. At state five, no equipment is emitting, but all equipment is emplaced. At state six, no equipment is emitting and all equipment is in a hidden position. See chapter eight for more discussion on emission control.

★ **BATTALION STATE OF EMISSION CONTROL**

From the requirements shown in the brigade weapons alert designator, a subordinate Patriot battalion commander would designate the numbers of fire units within his battalion to be at these states of emission control—

PATRIOT BATTALION EMISSION CONTROL ALERT REQUIREMENTS TOTAL NUMBER OF FIRE UNITS: 6 (Number of fire units at each state of emission control)						
CODE	STATE ONE	STATE TWO	STATE THREE	STATE FOUR	STATE FIVE	STATE SIX
A				2	2	2
B			2	2	2	
C		2	2	2		
D		3	3			
E	6					

RULES OF ENGAGEMENT

★ Rules of engagement are both positive and procedural management directives issued by appropriate military authority which specify the circumstances and limitations under which forces will initiate or continue combat engagements with other forces.

★ Rules of engagement are established by the area air defense commander and allow him to do two things. First, they enable him to delegate the authority to engage aircraft or missiles. Second, they allow him to retain control of the air battle by prescribing the exact conditions under which engagements can be conducted. Rules of engagement have

seven common components which are as follows:

1. Right of self-defense.
2. Hostile criteria.
3. Levels of control.
4. Modes of control.
5. Autonomous operations.
6. Weapons control status.
7. Fire control orders.

The Right of Self-Defense

★ Commanders at all echelons have the responsibility to take whatever action is required to protect their forces and equipment against air attack. Normally, such action will be governed by established rules and procedures. However, the right of self-defense is never denied. Self-defense engagements may be initiated when a battery or an adjacent battery is under attack. To implement self-defense measures, the battalion fire direction center and each firing battery should be initialized as defended assets. The priority should be the same as the highest priority critical asset, usually an asset threat category one or two. This doctrine applies to both area and point defenses.

Hostile Criteria

★ Hostile criteria are basic rules promulgated by the commanders of unified or specified commands which are used by echelons having identification authority to determine if detected targets are friendly or hostile. Identification authority may be retained at the air defense sector level. Identification authority can also be delegated to lower echelons. Delegation of identification authority can be made separately from delegation of engagement authority. However, identification and engagement authority should reside at the same level. This normally results in identification authority being held at Patriot battalion level.

★ The Patriot system has two identification modes, *automatic* and *manual.* In the automatic mode, the system assigns an identity to each track. In the manual mode, the operator must assign an identity to each track. *The automatic mode is the preferred identification mode.* Even when higher echelons have retained identification authority, Patriot should be used in the automatic identification mode. Hostile criteria processed by the Patriot system are: negative identification, friend or foe; selective identification feature, modes 1 and 3; hostile origin volume correlation; prohibited volume correlation; restricted volume correlation; emission of electronic countermeasures; and violation of pop-up criteria. Friendly criteria in the Patriot system are: positive identification, friend or foe; selective identification feature, modes 1 and 3; positive corridor correlation; friendly origin correlation; and minimum safe velocity. Additional criteria, such as speed, altitude, heading, and raid size, currently must be manually evaluated by the operator. Positive mode 3 responses may require the tactical director or tactical control officer to manually identify the target as friend. The use of Patriot identification criteria is greatly affected by the location of the Patriot battalion and the air situation. In a mixed ADA brigade, Patriot should be the primary source of identification data.

★ In the tactical operations area, the following guidance is provided for battalion-level operations:

- The battalion should establish a restricted volume from the rear firing batteries to the fire support coordination line. To save points, the restricted volume need not follow the fire support coordination line exactly. It should have the same altitude as the missile engagement zone.

- The battalion should establish a prohibited volume from the rear firing batteries to the forward line of own troops. To save points, the prohibited volume need not follow the forward line of own troops exactly. Care must be taken to ensure that hostile identification range does not reduce maximum automatic engagement range. It should have the same altitude as the missile engagement zone.

• The battalion may establish a hostile origin volume over all enemy airspace beyond the fire support coordination line or around selected, known enemy air bases. The battalion should inactivate the first type of hostile origin volume when friendly aircraft are operating beyond the fire support coordination line. The battalion should deactivate the hostile origin volumes around enemy air bases when friendly aircraft are attacking these air bases.

• The battalion may establish a friendly origin volume around division and corps airfields, Air Force forward operating bases, and at the intersection of rearmost battery search sectors and safe passage corridors. The size of the last type of volume should allow for speed of the aircraft and frame time of the radar set.

• The battalion should establish safe passage corridors for every minimum risk route/low level transit route in the battalion area. Preplanned but inactive routes would also be initialized but not activated. Any buffers to allow for aircraft navigation or radar set inaccuracies should be built into the width of the corridor.

• The battalion should use modes 1, 3, and 4 in accordance with the area air defense commander's directives. The interrogation line normally coincides with the fire support coordination line.

• The battalion may authorize the use of minimum safe velocity criteria. However, the battalion should deactivate it when enemy close air support aircraft and helicopters are the dominant low and slow airspace user.

• The battalion may authorize the use of pop-up criteria. However, the battalion should deactivate it when friendly, high-performance aircraft are operating in the area.

• The battalion may authorize the use of electronic countermeasures criteria. However, the battalion should deactivate it when special jamming missions are operating forward of Patriot units.

★ In the rear operations area, the following guidance is provided for battalion-level operations:

• The battalion should establish a prohibited volume throughout the entire sector of coverage. The size of the volume should support identification prior to maximum engagement range. The altitude of the volume should correlate to the altitude of the missile engagement zone.

• The battalion should establish a restricted volume throughout the entire sector of coverage. It should have the same dimensions as the prohibited volume.

• The battalion does not generally use hostile origin volumes.

• The battalion should establish a friendly origin volume around main operating bases, collocated operating bases, and corps airfields if they are in the sector.

• The battalion should establish safe passage corridors for all air routes and corridors in the battalion sector of the rear operations area.

• The battalion should use modes 1, 3, and 4 in accordance with the area air defense commander's directives. An interrogation line is not established in the rear operations area.

• The battalion should authorize the use of minimum safe velocity criteria all the time.

• The battalion should authorize the use of pop-up criteria.

• The battalion should authorize the use of electronic countermeasures criteria.

Units may need to tailor the above guidance for specific theaters and for specific operations. See FM 44-1A for a more thorough discussion of the Patriot system identification process and doctrine.

Levels of Control

★ The level of control specifies which air defense echelon within the overall air defense command and control chain is conducting

positive management of the air battle. This can be any of the following:

- Tactical air control center.
- Control and reporting center.
- Control and reporting post.
- ADA brigade.
- Patriot battalion.
- Patriot firing battery.

The normal wartime level of control for Patriot is the battalion. This level of control maximizes air defense protection capabilities of the Patriot system. The echelon designated as the level of control exercises engagement and identification authority.

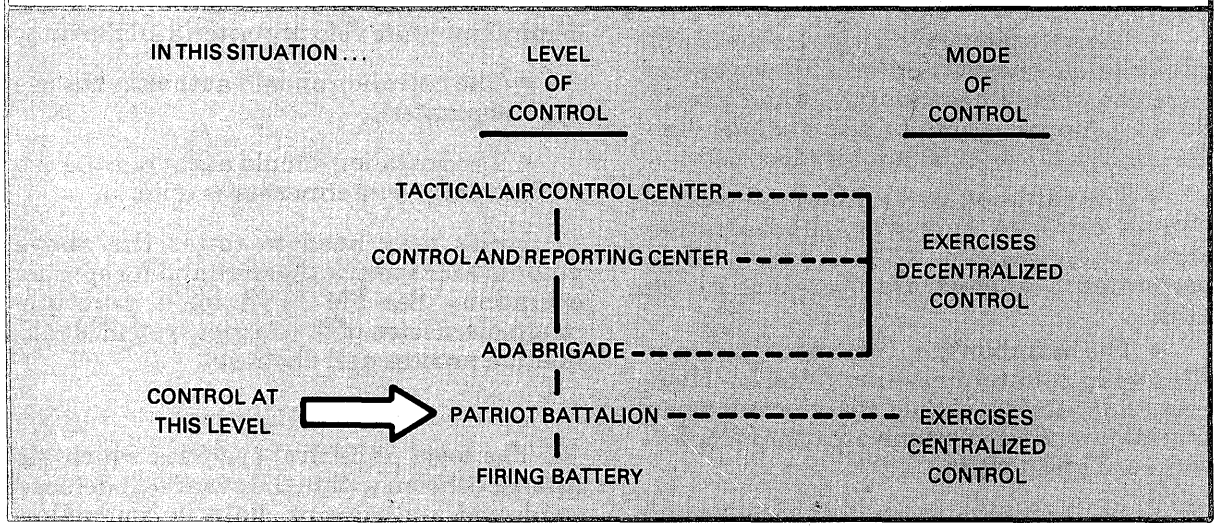
Modes of Control

★ The two modes of control are centralized and decentralized control. In the centralized mode of control, a higher air defense echelon initiates engagements. In the decentralized mode of control, a higher air defense echelon monitors subordinate unit actions, making target assignments only when necessary to ensure proper fire distribution or to prevent engagement of friendly aircraft. Independent operations are essentially a subset of decentralized control and are conducted when a Patriot battery only has voice communications with its parent battalion. In this case there is no operational data link between the two echelons.

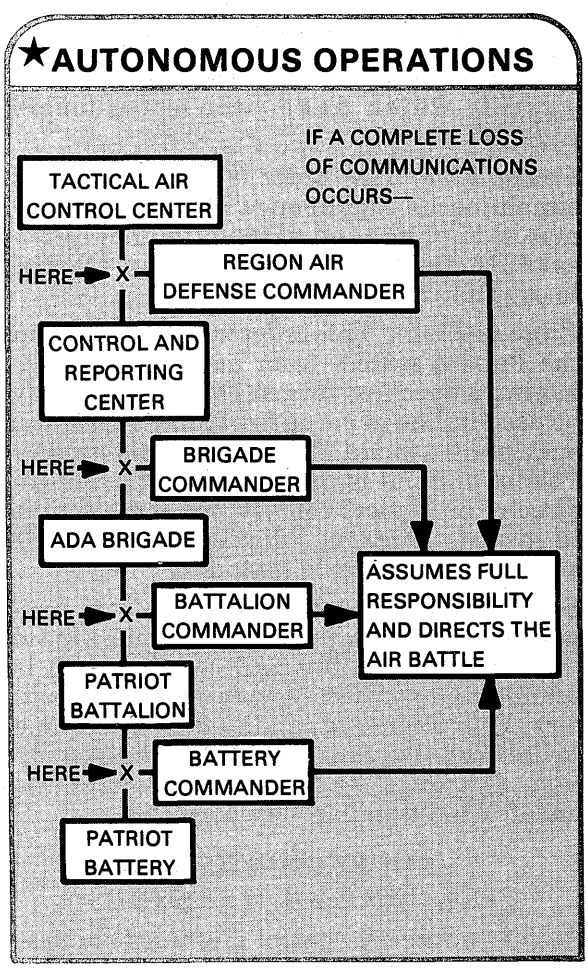
★ The processes of raising and lowering the echelon at which the air battle is being managed are termed centralizing control and decentralizing control, respectively. Air battle management is centralized when it is conducted at battalion level or higher, as long as that echelon has the capability to initiate engagements, and higher echelons have the capability to monitor firing battery actions.

★ Consider a situation in which air battle management has been decentralized to the Patriot battalion fire direction center. Here, the Patriot battalion commander exercises centralized control of subordinate batteries. At the same time, however, the ADA brigade is continuously monitoring the actions of the battalion. Therefore, the ADA brigade is exercising decentralized control, while the Patriot battalion commander is exercising centralized control. In other words, centralized control and decentralized control can be conducted simultaneously, although at different echelons (see the level and mode of control illustration).

★ **LEVEL AND MODE OF CONTROL**



★ The capabilities of the Patriot system are maximized when operating under the centralized control of the battalion. Control should be maintained at the battalion level unless the information and coordination central can no longer control the firing batteries due to saturation. In the early stages of the air battle, control normally will be centralized at the highest possible level. However, the tempo of the air battle will dictate that control be decentralized to the air defense echelon most capable of directing ADA weapons—usually the Patriot battalion. *The normal wartime mode of control for the Patriot battalion is decentralized. The normal wartime mode of control for the Patriot firing batteries is centralized.*



Autonomous Operations

★ Autonomous operations are conducted when a unit loses *all* communications with higher echelons (see autonomous operations illustration). The rules of engagement will define specific actions and procedures to follow for autonomous operations. Normally, the hostile criteria in effect at the time of communications loss remain in effect until communications are regained. Weapons control statuses may become more restrictive. Prearranged tactical standing operating procedures are followed for all other aspects of air battle management.

Weapons Control Statuses

★ Weapons control statuses describe the degree of fire control imposed upon Army ADA units. This degree or extent of control will vary, depending on the relative priorities of the need to provide for the protection of friendly aircraft and the need to maintain a high level of air defense for a specific tactical situation.

★ The weapons control status normally is imposed by the area/region air defense commander. However, other commanders (corps, division, brigade, and battalion) have the authority to impose a more restrictive weapons control status within their respective area of operations for assigned and attached ADA weapons, as well as the authority to request a less restrictive weapons control status. The Patriot system will automatically consider weapons control status in the engagement eligibility process. Patriot units must be prepared to use weapons control status effectively. The three weapons control statuses are—

1. *Weapons free.* Fire at any aircraft not positively identified as friendly. This is the least restrictive weapons control status.

2. *Weapons tight.* Fire only at aircraft positively identified as hostile according to the prevailing hostile criteria.

3. *Weapons hold.* Do not fire except in self-defense or in response to a formal order. This is the most restrictive weapons control status.

★ In peacetime, Patriot battalions will normally be at weapons hold. However, the normal weapons control status for wartime air defense operations is weapons tight.

Fire Control Orders

★ Fire control orders are commands which are used on a case-by-case basis, regardless of the prevailing weapons control status. Fire control orders can be transmitted electronically or verbally. Engagement modes and methods of fire are used in conjunction with fire control orders. Patriot fire control orders are engage, hold fire, cease fire, engage hold, and stop fire.

★ ***Engage.*** This order is used to direct a unit to fire on a specific target. This order cancels any previous fire control which may have been issued on that target. *Because of the anticipated intensity of future conflicts, the preferred engagement mode for Patriot is the automatic engagement mode.* Engagements directed by higher headquarters, which are time sensitive and cannot be held until optimum engagement range, must be given as a verbal "engage now" fire control order. Engagements may be conducted using one of three firing methods. The methods of fire described below are for a single target or multiple targets presenting a single track. Based on the tactical situation, a method of fire other than the one selected by the computer may be manually selected by the operator.

★ Ripple fire is the firing of a series of two missiles from one or more launchers with a predetermined time between launches (see FM 44-1A). Ripple fire is selected when the commander desires to engage multiple targets at short range. Ripple fire is preferred over other methods during an engagement of multiple targets because of the high probability that if the first missile destroys the first target, the second missile will be guided toward a second target in the same formation.

★ Salvo fire is the firing of two missiles from two separate launchers with a minimum time interval between launches. Salvo fire may be selected when the commander desires an extremely high kill assurance against a single target. Since the Patriot system already has an inherently high probability of kill, it is recommended that the use of salvo fire be discouraged. This is the least desirable method of fire when engaging multiple targets due to the high probability of destroying only one aircraft.

Shoot-look-shoot is the firing of missiles against a single target, one at a time, with kill assessment being automatically performed by the computer after each firing and prior to the launch of a second missile at the target. This is the only method used by the computer for automatic engagements as it provides the most effective use of missiles considering the high probability of kill by a single missile. Shoot-look-shoot is normally the preferred method of firing.

★ ***Hold Fire.*** This is an emergency fire control order used to stop firing and includes the command destruction of any missiles already in flight. This order is used to protect friendly aircraft which have been erroneously engaged.

★ ***Cease Fire.*** This order is used to prevent simultaneous engagement of air threats by manned fighters and ADA units, or by different ADA units. Missiles in flight are allowed to continue to intercept.

★ ***Engage Hold.*** This order is used to restrain the Patriot system from automatically engaging a specified target. Engage hold may be used in lieu of cease fire in the automatic engagement mode. This order is only used by Patriot units. It is used to allow the tactical director or tactical control officer more time to identify a target. Missiles in flight are allowed to continue to intercept.

Stop Fire. This command is used to temporarily halt the engagement sequence due to internally unsafe fire unit conditions. It is seldom transmitted outside the firing battery. This command can be given by anyone in the fire unit who observes an unsafe condition. The engagement continues after the unsafe condition has been corrected.

SUPPLEMENTAL FIRE CONTROL MEASURES

★ Supplemental fire control measures are procedural management measures issued by

appropriate military authority which delineate or modify hostile criteria, delegate identification authority, or which serve strictly as aids in fire distribution or airspace control. The five supplemental fire control measures are—

1. Air defense operations area.
2. Weapons engagement zone.
3. High density airspace control zone.
4. Temporary airspace restrictions.
5. Sectors of fire and primary target lines.

Air Defense Operations Area

★ An air defense operations area is an area and the airspace above it within which procedures are established to minimize mutual interference between air defense and other operations. These designations can include air defense action area, air defense area, and air defense identification zone. Currently, only the air defense identification zone is used. This is airspace of defined dimensions within which the ready identification, location, and control of airborne vehicles are required. This type of air defense operations area is normally used only for airspace control. Areas within an air defense identification zone will normally be characterized by extremely stringent hostile criteria and weapons control statuses. In wartime, the air defense identification zone is usually bounded by the fire support coordination line and the forward line of own troops. Friendly aircraft begin minimum risk procedures at the fire support coordination line when returning to friendly airspace. Establishment of safe passage corridors; restricted and prohibited volumes; and identification, friend or foe, on/off lines are tied to the air defense identification zone. In peacetime, the limits of the air defense identification zone are related to political boundaries.

Weapons Engagement Zone

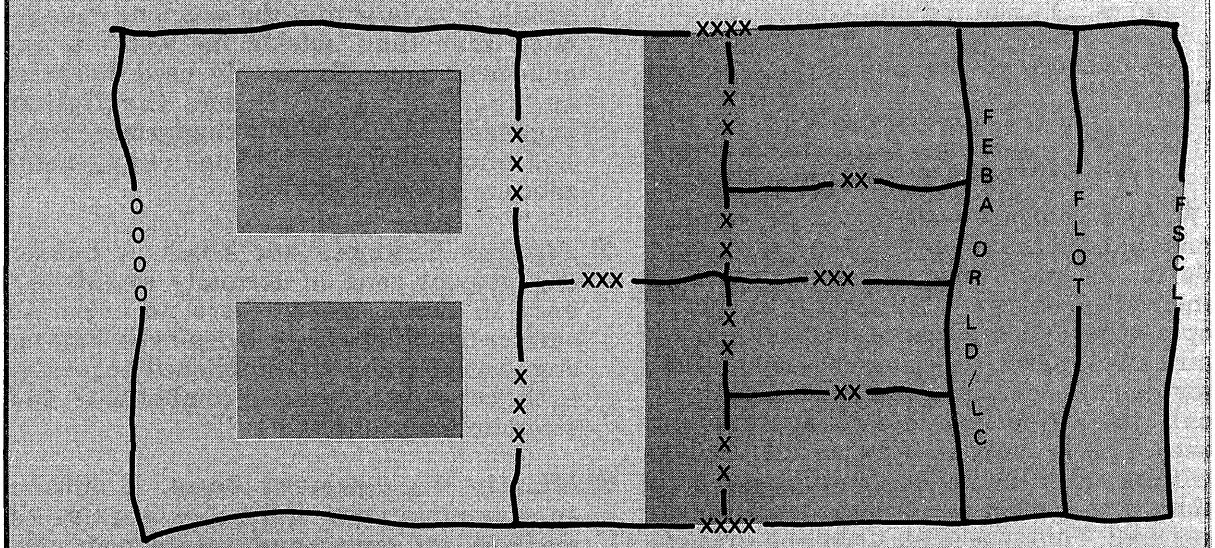
★ A weapons engagement zone is a volume of defined airspace within which a specific type of air defense weapon is preferred for use in an engagement (see the weapons engagement zone boundaries illustration on page 4-20). Use of weapons engagement zones does not preclude engagement of high-priority targets by more than one type of weapon system, if centralized control of each weapon system involved is available. The activation of a weapons engagement zone can be used to delegate identification and engagement authority to respective subordinate units by specifying different (usually more stringent) hostile criteria within the weapons engagement zone than outside the weapons engagement zone. Commonly used weapons engagement zones include the fighter engagement zone, missile engagement zone, and short-range air defense engagement zone.

★ ***Fighter Engagement Zone.*** A fighter engagement zone is normally established only in those areas where no effective surface-to-air capability is deployed. Fighter engagement zones are established frequently in the corps rear area, rear combat zone, and communications zone.

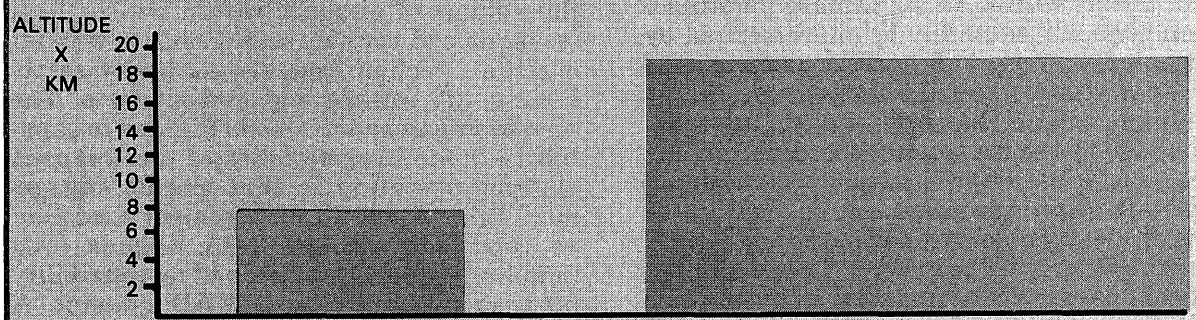
★ ***Missile Engagement Zone.*** A missile engagement zone normally applies to medium- and long-range surface-to-air missiles. A missile engagement zone establishes the volume of airspace within which these weapons can conduct engagements without specific direction from the authority establishing the missile engagement zone. The missile engagement zone is tailored to capabilities and characteristics of the weapons systems operating in that missile engagement zone. A missile engagement zone may be subdivided by the ADA brigade commander into separate areas of responsibility between two different HIMAD systems. A forward Patriot missile engagement zone is usually established between the fire support coordination line and the line formed by rear firing batteries of the forward Patriot battalions. The forward missile engagement zone usually extends between 0 and 15,000 + meters in altitude. The forward missile engagement zone is established to permit freedom of action to Patriot units in the forward areas. A rear missile engagement zone may

be established to prevent potential interference between air superiority fighters, Patriot, and Hawk. Typically, this missile engagement zone is established between 0 and 7,500 meters over critical deep-attack assets. Exact dimensions of a missile engagement zone are determined by the area/region air defense commander. In some cases a missile and fighter engagement zone may overlap.

★ 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: MEZ ☐ FEZ ☐

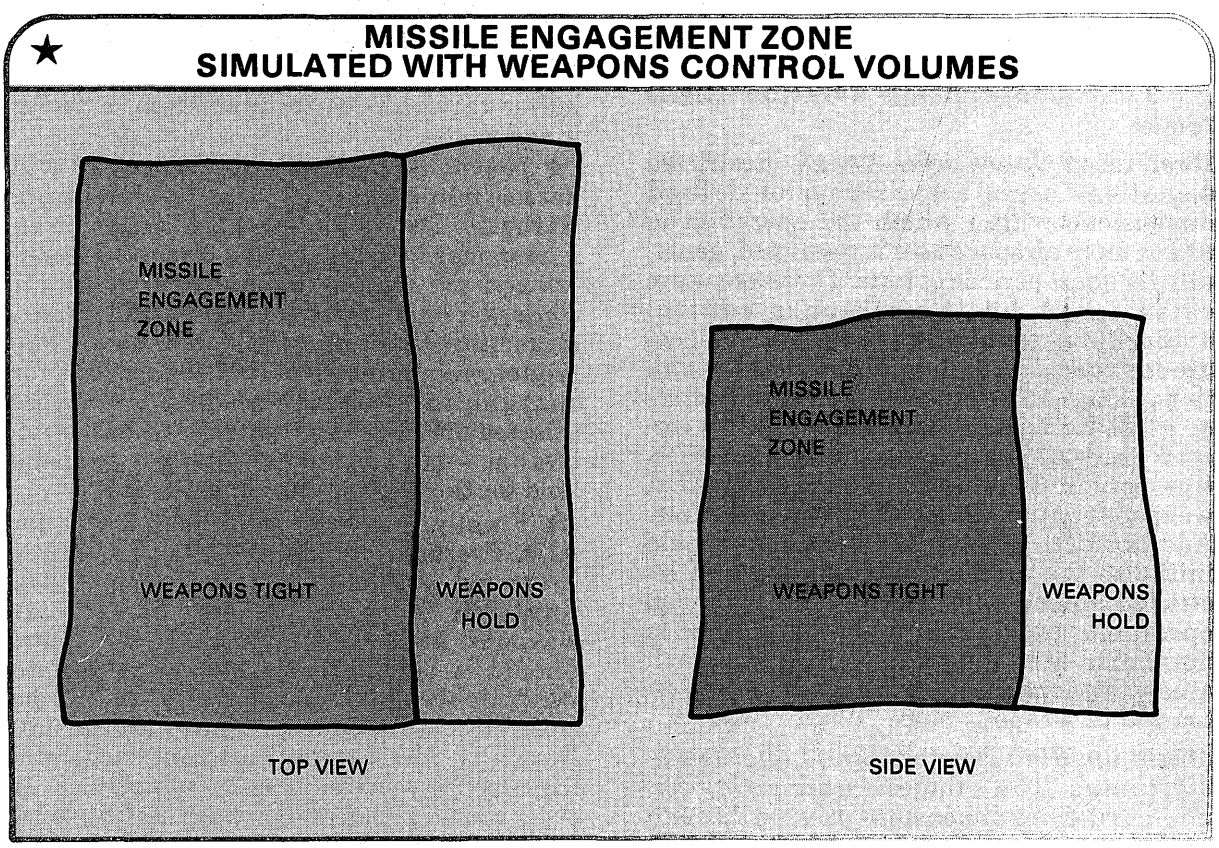
★ The Patriot system cannot automatically process weapons engagement zone information. However, weapons control volumes can be used to represent a missile engagement zone. The missile engagement zone simulated with weapons control volumes illustration shows how a missile engagement zone can be simulated using weapons tight and weapons hold volumes. Since this use of weapons control statuses is not in line with the traditional use of weapons control statuses, this tactic must be coordinated with the area/region air defense commander by the ADA brigade commander.

High Density Airspace Control Zone

★ This zone is airspace of defined dimensions in which there is a concentrated employment of airspace users. These users may include aircraft, field artillery, mortars, naval guns, air defense artillery weapons, and surface-to-surface missiles. The zones are established by the area air defense commander in his capacity as the airspace control authority, upon request of ground force commanders. When a request is approved, the requesting commander is normally given weapons control status authority for SHORAD within the area.

★ High density airspace control zones are established when the level of intensity of airspace use dictates the need for special airspace control measures. The number of such zones will vary depending on the combat situation or the complexities of air traffic control in conjunction with fire support coordination. The establishment of such a zone normally increases temporary restrictions within the zone. The Patriot system does not contain a separate volume for a high density airspace control zone but through the use of other volumes can closely represent one. These measures include the use of safe passage corridors and weapons control volumes.

★ **MISSILE ENGAGEMENT ZONE SIMULATED WITH WEAPONS CONTROL VOLUMES**



Temporary Airspace Restrictions

★ Temporary airspace restrictions can be imposed on volumes of airspace of defined dimensions in response to specific situations and requirements. These volumes can include search and rescue operations areas, air refueling areas, high density airspace control zones, concentrated interdiction areas, weapons free areas, and combat air patrol areas. The declaration of temporary airspace restrictions will include—

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

Three common temporary restrictions are:

1. Restricted operations areas.
2. Minimum risk routes/low level transit routes.
3. Standard Army aviation flight routes.

★ ***Restricted Operations Areas.*** Restricted operations areas are airspace of defined dimensions within which the operation of one or more airspace user is restricted, generally for short periods of time. These areas are established by the airspace control authority in response to the requests of local ground force commanders. Restricted operations areas can be declared for either aircraft or ADA. Restricted operations areas for aircraft are established to maximize ADA effectiveness. In such areas, the normal ADA weapons control status will be weapons free. Additionally, the Patriot battalion should initialize the area as a prohibited and restricted volume. On the other hand, restricted operations areas for ADA are established to maximize aircraft effectiveness. In such areas, the normal ADA weapons control status will be weapons hold.

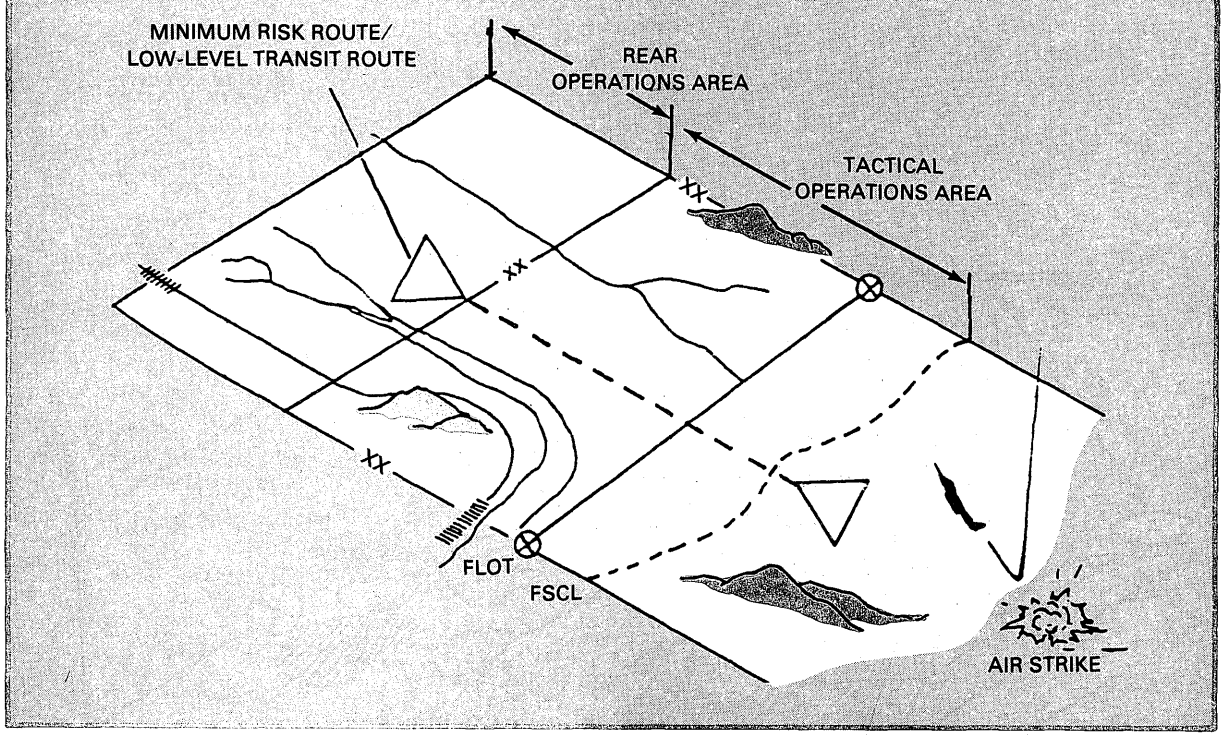
★ ***Minimum Risk Routes/Low Level Transit Routes.*** These routes are temporary corridors of defined dimensions passing through ADA defenses, a high density airspace control zone, or through a restricted operations area (see the minimum risk routes/low level transit routes illustration). They are designed to reduce risk to friendly high-speed aircraft transitting the tactical operations area at very-low-to-medium-altitudes. These routes will normally be confined to that airspace in which ADA is not at weapons free. Such circumstances will exist where there is inadequate timely control capability to permit a more flexible method of air defense. However, aircraft transitting the tactical operations area are not required to use these routes. The individual pilot decides whether to use a route after consideration of flight plan information, route suitability to mission requirements, degree of acceptable risk necessary for mission success, and control and reporting center recommendations. When aircraft do not use these routes, established air defense procedures will apply. Patriot battalions should initialize these routes as safe passage corridors. The size of the safe passage corridors should include the size of the buffer required due to navigation or radar inaccuracies.

★ Normally, close air support aircraft will not use minimum risk routes/low level transit routes. Close air support sorties are flown in response to Army ground force commanders and are coordinated by the forward air controller or other tactical air control system elements with the supported ground unit. The requesting Army unit is responsible for changing the weapons control status of those affected SHORAD fire units to a more restrictive one — such as weapons tight or weapons hold for the appropriate time period.

★ Finally, the weapons control status for ADA fire units whose engagement ranges intercept an *activated* minimum risk route/low level transit route remains at weapons tight for that part of the route. Should it become necessary to change to weapons free, that particular route will be closed by the commander who established it. Normally, the Patriot battalion initializes these routes as weapons tight volumes. If other routes are established for high-speed

aircraft in the rear operations area, the Patriot battalion should treat these routes the same as minimum risk routes/low level transit routes.

★ **MINIMUM RISK ROUTES/LOW LEVEL TRANSIT ROUTES**

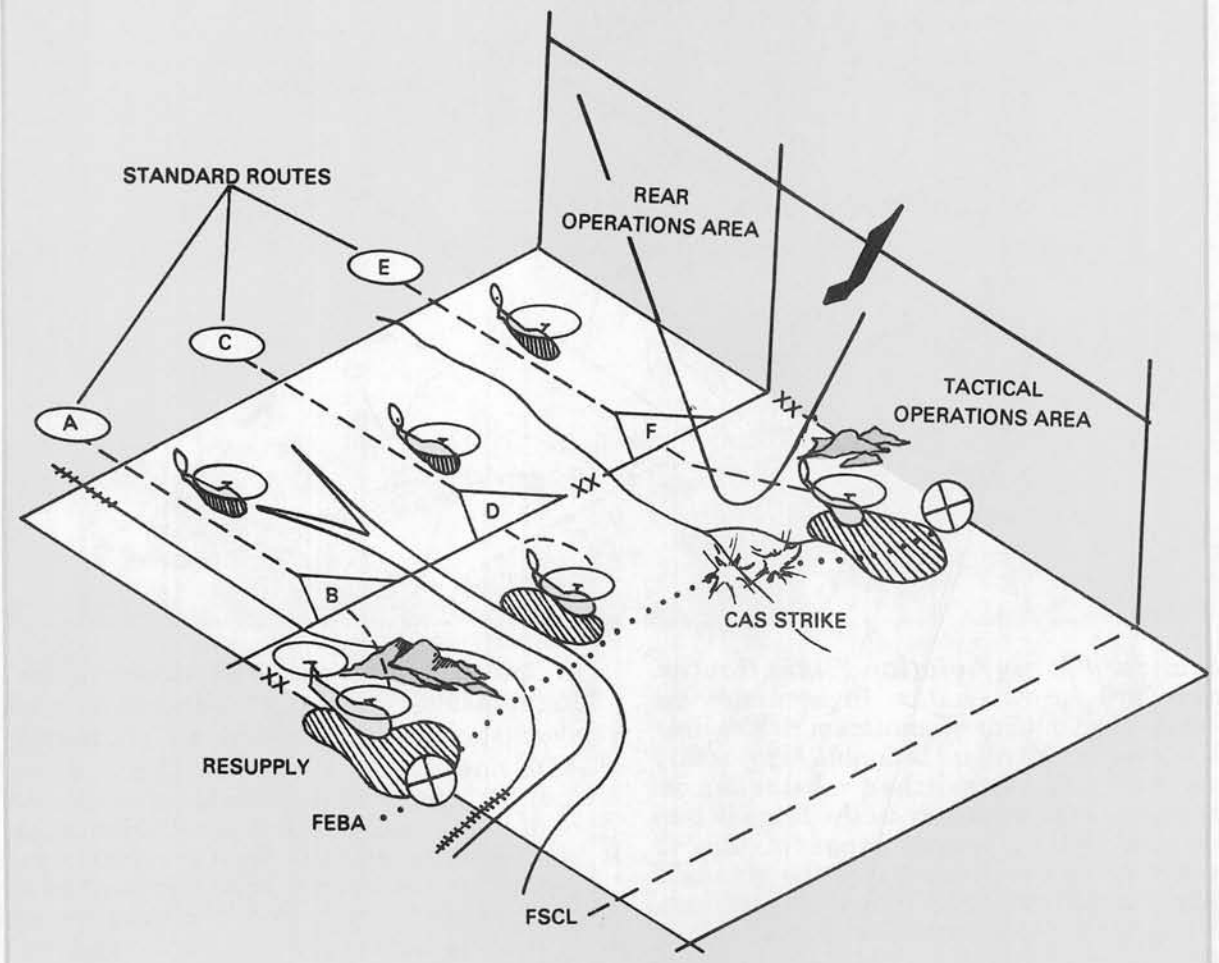


★ ***Standard Army Aviation Flight Routes.*** Standard Army aviation flight routes are established outside of minimum risk routes/ low level transit routes to enable Army rotary wing aircraft to transit the combat zone from the corps rear boundary to the brigade rear boundary with minimum danger of collision with high-speed aircraft (see the standard Army aviation flight routes illustration). When the route information is available, it should be included in the Patriot identification process as a safe passage corridor. The size of the corridor should include a buffer to account for navigation and radar inaccuracies.

★ There are two important factors for ADA in connection with standard Army aviation flight routes. *First,* since high-speed aircraft avoid standard Army aviation flight routes, ADA hostile criteria may include provisions that high-speed aircraft within these routes be declared hostile, unless penetration of the coordinating altitude was previously requested and other rules of engagement have been satisfied. This provides for safe passage of friendly high-speed aircraft. *Second,* the weapons control status for ADA units whose engagement ranges intercept an activated standard Army aviation flight route remains at weapons tight for that part of the route. Should it be necessary to change to weapons free, that particular route will be closed by the

commander who established it. Patriot battalions should initialize standard Army Aviation flight routes as weapons tight volumes.

★ STANDARD ARMY AVIATION FLIGHT ROUTES

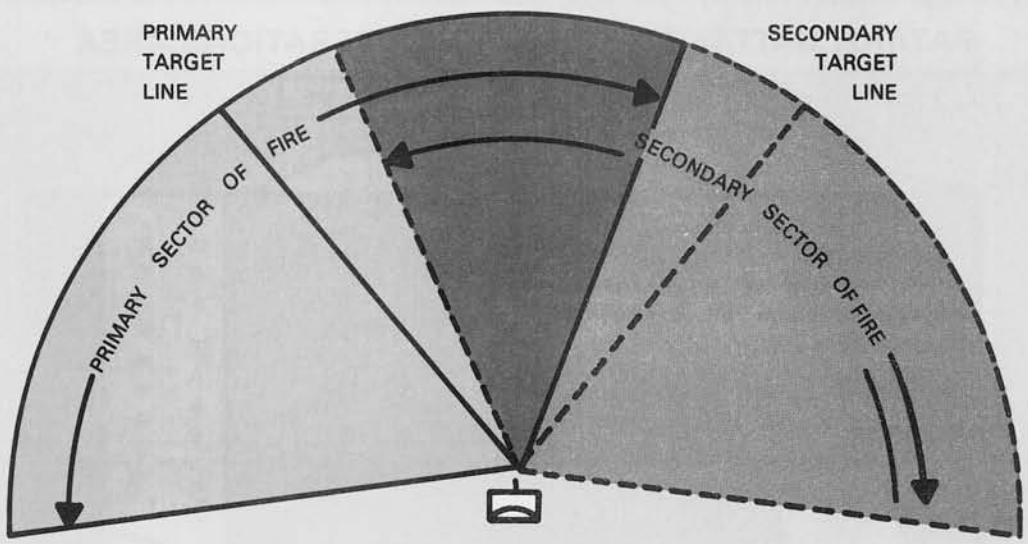


Sectors of Fire and Primary Target Lines

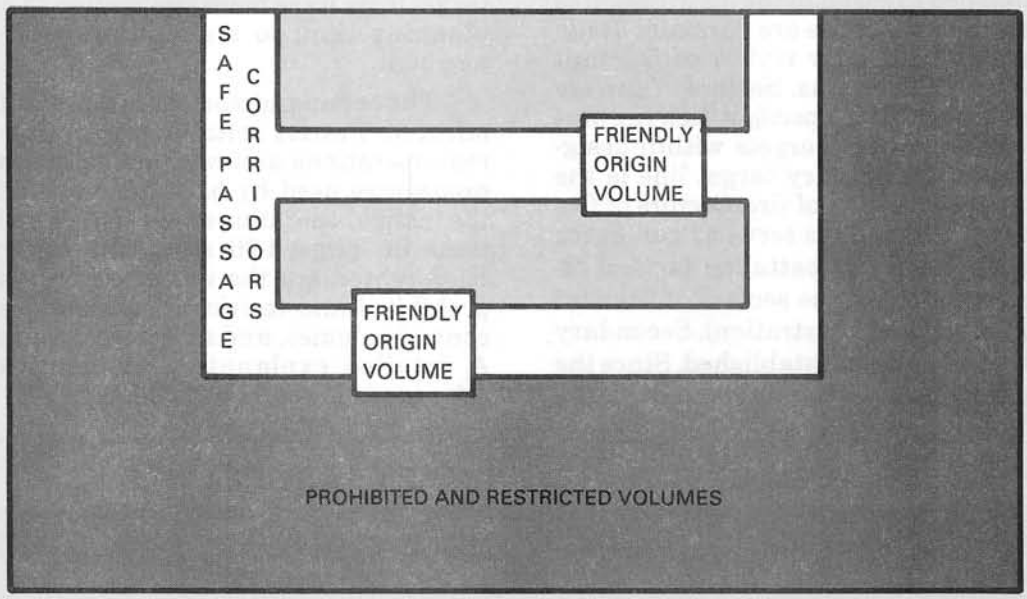
Sectors of fire and primary target lines are established to assist in the distribution of ADA fires. Sectors of fire are normally designated at battalion after review of fire unit radar coverage diagrams. Sectors of fire enable the commander to specify which fire unit is preferred to engage targets within designated areas. The primary target line is the center of a unit's sector of fire. Sectors of fire and primary target lines serve as guides for target assignments by battalion tactical director assistants (see the sectors of fire and primary target lines illustration). Secondary target lines can also be established. Since the engagement decision is automated in the Patriot system, sectors of fire and primary target lines have more application to defense planning than to manual air battle management.

The command and control procedures in effect for Patriot battalions operating in the rear operations area will not be the same as procedures used by battalions operating in the tactical operations area. The two illustrations on page 4-26 show the differences. Highlighted are the use of origin volumes, prohibited and restricted volumes, weapons control volumes, and safe passage corridors. A detailed explanation of identification schemes is found in FM 44-1A.

★ **SECTORS OF FIRE AND PRIMARY TARGET LINES**



★ PATRIOT BATTALION IN REAR OPERATIONS AREA



★ PATRIOT BATTALION IN TACTICAL OPERATIONS AREA