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US Air Defense Planning in the CENTAG Region

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The purpose of the study is to propose modified objectives, doctrine, and organization for US air defense forces in the CENTAG NATO region.

The emerging short war concept requires that NATO strategy be reoriented to fight and win a short but intensive first battle. US air defense planning must be modified to optionally support the short war concept and insure that NATO forces can indeed win the first battle.

Two assumptions are made. The first is that the Warsaw Pact will attack in a manner to optimize its 2:1 quantitative advantage in immediately available air power. The second is that the Warsaw Pact main effort will occur in the NORTHAG region, and that NATO air power will be concentrated there to counter the greatest threat. The occurrence of either of these two suppositions will operate to deplete NATO air power in the CENTAG region, and severely strain NATO ability to provide a significant and dedicated air assets for the defense of CENTAG. To counter this situation, US ground based air defense forces in CENTAG must adopt an attrition objective and be utilized to destroy the maximum number of enemy aircraft in the minimum time possible.

Air space utilization procedures must be modified to optimally implement the attrition objective and respond dynamically to the local tactical situation. In this regard, a modular air space utilization system is proposed, whereby the theater air defense commander can assign air space sectors (attrition areas) to the exclusive use of either the Army or the Air Force, based on his assessment of the threat, current requirements, and available assets. This proposal allows for the probable early destruction or neutralization of the communications and control facilities required to dynamically manage the joint and concurrent use of air space. Adoption of the modular air space utilization system will permit the local proliferation or massing of inexpensive attrition weapons, such as REDEYE, for maximum effectiveness with minimum risk to friendly aircraft.

The study concludes:

a. NATO air assets will not be immediately available in significant numbers for the defense of the CENTAG region.

b. US ground based air defense must adopt an attrition objective and be utilized in a rapid and massive pulse to attrit the maximum number of enemy aircraft in the minimum time possible.

c. A modular airspace utilization scheme is required to optimally implement the attrition objective and maximize the effectiveness of both air and ground based air defenses.

d. Current air defense organizational structures should be modified to allow for the enhanced control and proliferation of attrition weapons such as REDEYE.

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SECTION 1 - INTRODUCTION

The purpose of this study is to propose modified objectives and combat organizations for air defense forces in the US portion of the NATO CENTAG region. The study will address the current time frame and will consider only US forces and weapon systems currently deployed or earmarked for commitment in CENTAG.

The requirement to modify air defense planning for the CENTAG region is a response to the emerging "short war" concept. This concept argues that in the event of hostilities in Western Europe, NATO forces must be prepared to decisively win the first battle. The necessity to win the first battle is based on the assumption that the spectre of a strategic nuclear exchange will cause a negotiated truce immediately following the initial round of hostilities. This truce would freeze the final disposition of opposing forces along newly created de-facto political boundaries. Accordingly, NATO strategy must be re-oriented to fight a short but intensive first battle, to decisively check Soviet aggression and establish the most favorable negotiating posture possible.

This study will evaluate the measures required to prepare US air defense forces in CENTAG to win the first battle. Specifically, the study will analyze the Warsaw Pact threat to NATO, and assess the impact of this threat on air defense planning. Based on this threat assessment, the study will propose that to win the first battle, the objective of air defense must be to

exact the maximum attrition of enemy aircraft in the shortest possible time. An airspace utilization system to support the attrition objective will be proposed, and the study will discuss the air defense deployments, organization for combat, and TO&E structural modifications required to optimally implement the attrition objective.

SECTION 2 - THE THREAT AND PLANNING IMPLICATIONS

A detailed discussion of the quantitative and qualitative threat to NATO is beyond the scope and classification of this study. The purpose of this section is to provide an overview of the Warsaw Pact air and ground threat to NATO, and the interactive influences this threat exerts on air defense planning.

Analysis of opposing air capabilities is a complex consideration. Qualitatively, NATO is credited with superiority in sophistication of equipment, capability of air crews, and versatility of aircraft.[1] In the quantitative arena, however, the Warsaw Pact has a significant advantage over NATO M-Day tactical air forces. The precise magnitude and scope of this quantitative lead is unclear. Aircraft have a high degree of tactical and strategic mobility. It is therefore difficult to estimate the quantity of aircraft available for wartime commitment to a specific location, based on their habitual location in peacetime. Additionally, many modern aircraft are multipurpose, and cannot be categorized as dedicated to a single role or mission.

Table 1 depicts the tactical aircraft balance in Central Europe. The relative NATO deficiency is approximately 2.3:1, not including France. The relative deficiency is reduced to 1.6:1, if it is assumed that France will commit her tactical air forces under NATO control.

Table 1

TACTICAL AIRCRAFT BALANCE IN CENTRAL EUROPE

NATO	Squadron holding	Warsaw Pact	Squadron holding
United States	230	Soviet Union	1,250
Britain	130	Czechoslovakia	500
Canada	50	East Germany	320
Belgium	140	Poland	700
Netherlands	140		
West Germany	530		
	1,220		
France	500		
Totals	1,720	Totals	2, 770

Source: The Military Balance, 1973-1974 (London : Institute for Strategic Studies, 1974), p. 95

Table 2 depicts the relative balance, considering the additional contribution of NATO aircraft in Northern Europe (AFNORTH) and Soviet aircraft in Western USSR. US and British aircraft in Great Britain and US aircraft in Spain are also included. The Warsaw Pact contribution does not include the air forces of Hungary, Rumania and Bulgaria, which are believed to be earmarked for commitment in the Mediterranean theatre. The relative NATO deficiency, excluding France, is approximately 2.1:1. Assuming French participation, the ratio is approximately 1.7:1.

Although Table 2 depicts the majority of Warsaw Pact tactical aircraft as "interceptors", many are dual capable as ground attack aircraft. Additionally, recent analyses indicate that the Soviets are departing from their traditional emphasis on air defense and are starting to emphasize the ground attack role, as exemplified by the development of the SU-19 (Fencer) aircraft.[2]

For comparison purposes, table 3 depicts the NATO-Warsaw Pact tactical air balance, as computed by a second, unclassified source. Here the NATO M-Day tactical aircraft deficiency in Central Europe is assessed as approximately 2:1.

Although the Warsaw Pact has an approximate 2:1 advantage in M-Day tactical aircraft, NATO has a larger reserve of total aircraft. Forward deployed NATO air forces represent only 20 percent of its worldwide inventory compared with 40 percent for the Warsaw Pact.[3] The US tactical aircraft inventory alone exceeds that of the Soviet Union by 1500.[4] Accordingly, NATO has the

Table 2

TACTICAL AIRCRAFT BALANCE IN CENTRAL EUROPE
INCLUDING REINFORCEMENT POTENTIAL

Tactical Aircraft in Operational Service	Northern and Central Europe, Spain Great Britain (including US dual based squadrons), and Western USSR		
	NATO	France	Warsaw Pact
Light Bombers	165		250
Fighter/Ground-Attack	1,350	400	1,500
Interceptors	350		2,100
	1,865	400	3,850
Totals	2,265		3,850

Source: Adapted from The Military Balance, 1974-1975 (London : Institute for Strategic Studies, 1974), p. 100.

Table 3

TACTICAL AIRCRAFT BALANCE IN CENTRAL EUROPE,

SECOND SOURCE DATA

Regions	NATO	Warsaw Pact
Northern Region	180	——
Central Region	1,000	2,800
US and British Aircraft in Great Britain, US Aircraft in Spain	600	——
Western USSR	——	800
	1,780	3,600
European USSR (Northern and Central parts)	——	750
	1,780	4,350
France	350	——
Totals	2,130	4,350

Source: Adapted from SIPRI Yearbook 1974, (Stockholm: Stockholm International Peace Research Institute, 1974), p. 48

potential to ultimately achieve quantitative superiority if sufficient time and airfields are available.

Implicit in NATO defense plans is the concept that there will be sufficient warning of a possible attack to permit reinforcement to take place.[5] Assuming that this warning time will be available, it is projected that the Warsaw Pact will still enjoy a 2:1 superiority in tactical aircraft, after 30 days of buildup on each side, with the full US potential not mobilized until M+90.[6] The assessment of the US ability to reinforce NATO air power is somewhat optimistic, since it assumes that there will be no other crisis competing for these aircraft, and that reinforcement will occur in an unimpeded manner.

In summary, should the Warsaw Pact initiate hostilities from a surprise attack posture, or should NATO fail either to recognize or respond to the period of political warning, NATO will be faced with an approximate 2:1 inferiority in aircraft in Central Europe. Should the US be forced to reinforce its air capabilities after the onset of hostilities there will be a degree of risk in the success of this operation.[7] NATO airfields may be under repeated air attack and the initial Warsaw Pact air advantage will operate to preclude the orderly buildup of US air power in the NATO theatre.

The Warsaw Pact ground based air defense capabilities exert a strong influence on US air defense planning, particularly with regard to the employment and availability of air power. Figure 1 depicts the air defense equipment and deployment of a typical

WARSAW PACT AIR DEFENSES

23/2 — A total of 114 of these towed 23 mm cannon are deployed within 5 km of the NATO line along each Soviet Army FEBA, and up to km to the rear. They are deployed in 19 batteries of 6 mounts each. Anti-aircraft range of these apons is 1,200 m and firing rate is 2,000 rpm.

U-23-4 — 32 batteries of the 23 mm quad-mon armed *Shilka* AA tank are also deployed by Army air defense units along the 50 km FEBA, ing a total of 128 firing vehicles. *Shilka* showed of to be probably the most lethal low-level AA apons system in the world during the war of Yom pour, pouring out 4,000 rpm from its 4 radar-ected cannon, to an effective range of 2,500 m.

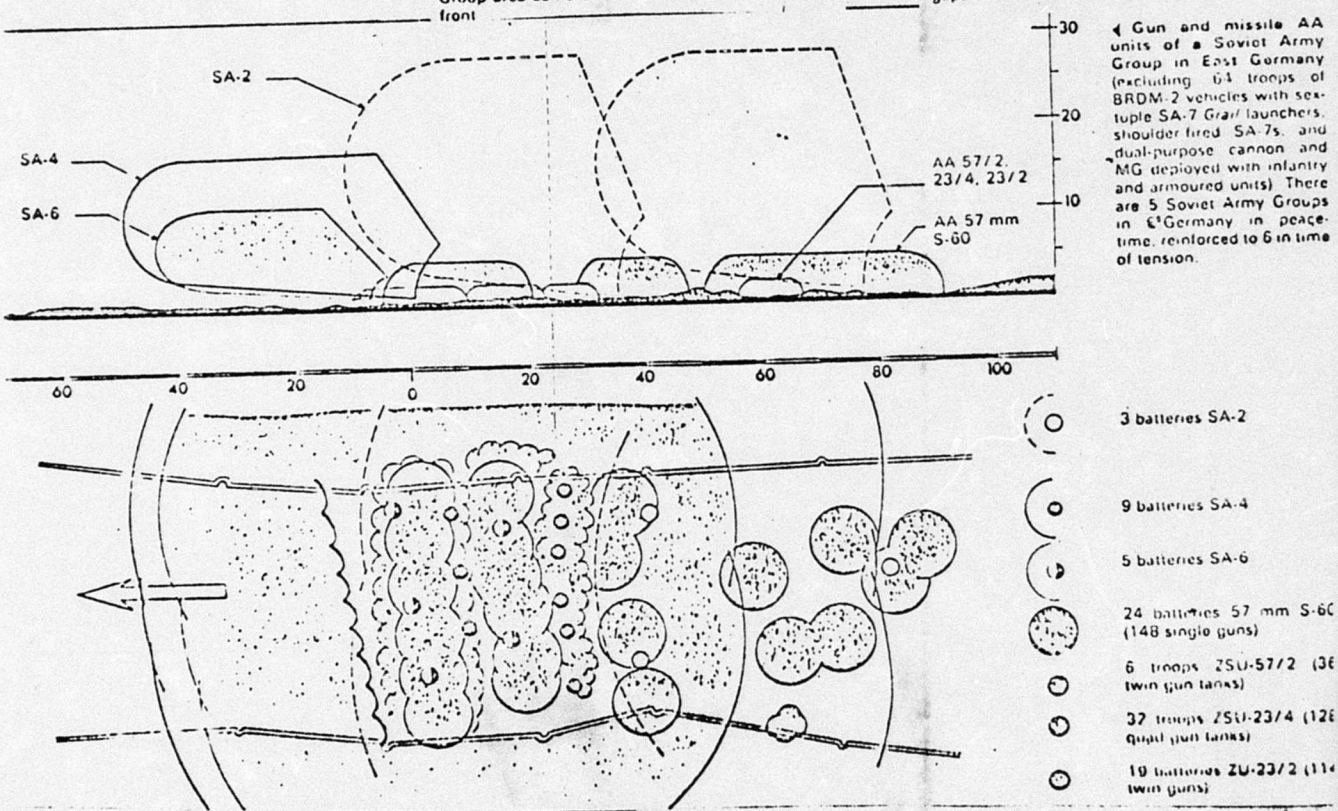
U-57-2 — The twin 57 mm AA tank is deployed smaller numbers through the Army area, with a al of 36 vehicles divided into 6 batteries of 6. The ically controlled cannon have a rate of fire of 0 rpm combined, and are effective to a range of er 4,000 m at high angle (87°).

SA-4 Ganef — 9 mobile SA-4 missile batteries are deployed in the gaps between the SA-6 batteries. Each SA-4 battery has 1 *Pat Hand* fire control radar, 1 loader vehicle and 3 twin launcher vehicles. The leading 3 batteries move at a distance of 10 km behind the Army Group frontal units, reaching up to 50 km into NATO airspace along the length of the front, at the ceiling of about 50,000 ft. The 6 remaining batteries move in a lateral belt 25 km behind the front, backing up the 2 rear SA-6 batteries.

SA-2 Guideline — Three batteries, each of 6 single SA-2 mobile missile launchers, a *Fan Song* fire control radar, and a loader vehicle, are deployed in the Army Group area. The two forward batteries are located 45 km from the Soviet front, beyond which their medium/high altitude coverage extends for about 8 km to a max. ceiling of 66,000 ft increasing to 100,000 ft over the FEBA. The third SA-2 battery is located in the centre of the Army Group area some 80 km back from the advancing front.

S-60 — This single towed AA cannon uses the same 57 mm ordnance as the ZSU-57-2, but in contrast, is radar directed. Rate of fire is 120 rpm and effective range well over 4,000 m. A total of 138 guns are deployed (in 23 batteries of 6) in 3 belts across the breadth of each Soviet Army area. The first belt is about 10 km back from the Soviet FEBA, the second 15 km from the FEBA, and the third about 25 km back.

SA-6 Gainful — 5 batteries of the SA-6 missile system (each consisting of one *Straight Flush* fire control radar vehicle, one loader vehicle, and 3 twin launcher vehicles) move close to the front of the advancing Army Group. 3 batteries are located 5 km from the front line, reaching up to 32 km into NATO airspace at the maximum ceiling of 66,000 ft along the whole 50 km front, up to 10 km into NATO airspace at an altitude of 350 ft along the entire Army front, but with a radius of only 5 km from the launchers against targets at 250 ft. The two remaining batteries are deployed in depth, some 10 km further to the rear, filling the central gaps between the 3 forward batteries.



◀ Gun and missile AA units of a Soviet Army Group in East Germany (excluding 64 troops of BRDM-2 vehicles with sextuple SA-7 *Grail* launchers, shoulder fired SA-7s, and dual-purpose cannon and MG deployed with infantry and armoured units). There are 5 Soviet Army Groups in E. Germany in peacetime, reinforced to 6 in time of tension.

Source: International Defense Review, August 1974 (Geneva, Switzerland 1974), p. 450.

Soviet Army Group, of which there are five currently deployed in East Germany. It is significant to note that the coverage of the SA-6 and SA-4 extend approximately 40 KM into friendly air space for aircraft flying in excess of about 15,000 feet.

The 1973 Middle East War provided an insight into the quality of Soviet air defense systems. These weapons may prove to be even more effective when utilized by Warsaw Pact forces. Although, the US has been concentrating on the development of active and passive air defense countermeasures, it is logical to assume that the Soviets shall correspondingly modify their air defense systems to preclude their nullification:

> In terms of air defense, the Soviets probably gained valuable insights (from the 1973 Middle East War) into how to use the SA-7 more effectively and how to make the Russian-interlaced ZSU-23, SA -2,-3, and -6 air-defense system even more efficient. At the very least, Soviet military experts had the opportunity of witnessing the use of sophisticated American ECM against the Russian supplied system. Therefore, theoretically, Moscow should be able to develop future air defenses even more difficult for American ECM to operate against.[8]

The density and coverage capabilities of the Soviet air defense systems will greatly influence the employment of friendly aircraft. NATO will be faced with the choice of either dedicating aircraft to counter these air defenses, or working around them and accepting high attrition rates. In either case, the net result will be manifest as a dimunition in the number of NATO aircraft immediately available for the air defense role.

The Warsaw Pact ground threat to NATO also exerts a strong interactive influence on air defense considerations. NATO ground

forces in Central Europe are not optimally deployed with regard to terrain. The legacy of post war occupation zones has left the relatively strong US forces deployed in the CENTAG area. This area is geographically well suited for defense. The prime invasion route, across the north German plains, is in the NORTHAG area, defended by relatively weaker NATO forces.[9] Accordingly, based on tactical considerations alone, the main attack in Central Europe should occur in the NORTHAG area.

Should the main attack occur in NORTHAG, it is quite probable that CENTAG air assets will be diverted to counter the more pressing threat. The potential for utilizing CENTAG aircraft in NORTHAG has been facilitated by a recent NATO reorganization which placed all operational air forces in the Central Europe Command (AFCENT), under centralized control.[10] While the centralization of air power is tactically sound with regard to the theatre as a whole, it could result in a significant decrease in the number of aircraft available in CENTAG for air defense and close air support.

The combined Warsaw Pact air and ground threat has serious implications for air defense planning in the CENTAG area. Doctrinally, the air defense of an overseas land area, such as the US CENTAG area, is a joint Army-Air Force effort, with overall responsibility normally assigned to the Air Force.[11] However, for the reasons outlined previously, US air may be temporarily unavailable in significant quantity for the air defense mission in CENTAG. The CENTAG air defense concept must therefore consider the requirement for enhanced Army air defense. Specific objectives

and tactics must be developed to support US ground forces, economically redress the Warsaw Pact quantitative lead in air power, and conserve US air power from prohibitive attrition exchanges.

SECTION 3 - AIR DEFENSE OBJECTIVE - ATTRITION

The doctrinal mission of US air defense artillery in the field, is to destroy, nullify, or reduce the effectiveness of enemy air attack.[12] In an overseas land area (e.g. NATO-CENTAG), air defense artillery forces have the doctrinal objective of limiting the effectiveness of enemy offensive air efforts to a level permitting freedom of action for friendly forces.[13] The doctrinal objective of limiting the effectiveness of enemy air attack is broad in nature, and can be achieved by orienting either on the friendly or enemy force.

When orienting on the friendly force, the effectiveness of enemy air action is reduced by limiting damage to defended assets. Damage limiting is a relatively sophisticated technique, which purpose is to preclude enemy air from effectively delivering ordnance on the defended asset. Ordnance delivery can be precluded by destroying the enemy aircraft (attrition), or by forcing the aircraft to execute evasive maneuvers that result in premature or inaccurate ordnance delivery (virtual attrition). Since the orientation or emphasis is on the preservation of the defended asset, virtual attrition of the enemy is equally effective as actual attrition. Additionally, the damage limiting technique may distinguish between threatening and non-threatening enemy aircraft, and choose to engage only threatening aircraft in an effort to conserve ammunition. A non-threatening aircraft might be one that is within engagement range but either not flying toward the defended asset, or not loaded with ordnance.

When orienting on the enemy, the effectiveness of hostile air attack is reduced by the systematic and unrelenting destruction (attrition) of all enemy aircraft within engagement range. Orienting on the enemy emphasizes the utilization of air defense weapons to attack enemy aircraft as opposed to defend friendly assets. In this regard, little distinction is made between threatening and non-threatening aircraft. Emphasis is placed on engaging as many aircraft as possible, with priority to those engagements with the highest probability of success.

Current air defense doctrine does not specifically emphasize the attrition role for air defense, although it is certainly permissive and implied within the broad requirements of the air defense objective. The attrition objective is also implied in the "area" air defense concept, which purpose is to limit the effectiveness of enemy air over a wide operating area (as opposed to a specific target area). Additionally, current doctrine does provide for special defenses known as "flak traps", which primary objective is to destroy enemy aircraft which are lured or deceived into attacking a real or imaginary target.[14]

If US forces in CENTAG are to win the first battle, air defense artillery must be utilized to destroy the maximum number of Warsaw Pact aircraft, in the shortest possible time. The Warsaw Pact must be placed in a situation where initial aircraft losses are severe enough to inhibit further operations, and place the Pact at a military disadvantage for subsequent political negotiations. A heavy initial attrition rate for enemy air will also function to

lessen the impact of Warsaw Pact quantitative air superiority and support the US Air Force in its counter air mission.

To exact these high attrition rates, US air defense forces in CENTAG must emphasize the attrition objective and orient on the enemy. Air defense must be employed in a massive "pulse" of fire power to maximize the elements of surprise and security. This pulse may be of several hours or days duration, depending on the Warsaw Pact's ability to analyze and counteract the air defense systems. In the interim, however, army air defense must be utilized to the fullest extent to exact maximum attrition while the enemy is most vulnerable. Air defense forces must resist the temptation to conserve ammunition for the long haul. If the air defense battle is conducted at a lower, but more readily sustainable rate (long war oriented), the Warsaw Pact will still develop countermeasures to reduce the effectiveness of the opposing air defense systems, without having first paid the penalty of an initially high attrition rate.

Adoption of the attrition objective does not imply that air defense will not function to limit damage to critical assets. It is a matter of emphasis and perspective. Attrition is the ultimate means of achieving damage limitation. In the final analysis, all enemy aircraft are threatening to the force as a whole. Enemy aircraft are only transiently non-threatening, when they are flying to or from their specific targets. Engagement of enemy aircraft on the non-threatening portions of their mission profiles ultimately precludes ordnance delivery over all the target areas. Enemy aircraft that are destroyed while entering or egressing the battle

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area will not be able to threaten specific targets on subsequent missions. Additionally, the attrition objective insures that enemy aircraft will be engaged by the maximum number of air defense forces, thereby increasing the probability of their destruction.

Acceptance of the "short war" concept implies a decrease in the criticality of limiting damage to target complexes that do not function to immediately influence or contribute to winning the first battle. Once hostilities begin, emphasis must be placed on destroying enemy aircraft while providing collateral defense for frierdly combat elements actively engaged in the conduct of the first battle.

SECTION 4 - AIRSPACE UTILIZATION

Implementation of the attrition objective requires the creation of attrition areas in which air defense artillery can function to maximize the destruction of enemy aircraft while minimizing the probability of damage to friendly aircraft. While the creation of attrition areas is a doctrinal extension of the existing "flak trap" concept, special airspace utilization procedures must be developed to implement the attrition objective in a joint Army-Air Force theatre of operations.

Based on the threat and planning implications discussed in Section 3, the airspace utilization concept must be based on the assumption that the majority of high performance aircraft operating over the CENTAG area in time of war will be hostile.

Additionally, the airspace utilization procedures should be simple, with minimal dependence on equipment and technological sophistication. In fact, the airspace utilization procedures must be designed on the assumption that the majority of the Army air defense and Air Force control and communications facilities currently deployed in CENTAG can be destroyed or neutralized at the outset of hostilities. Finally, the airspace utilization procedures must be dynamically responsive to local variations in the threat and friendly operational posture.

To meet these requirements, a modular bulk management airspace utilization system is indicated. An airspace utilization module is defined as a bulk of airspace allocated to the exclusive use of either the Army or Air Force. At the extremes, one utilization module will permit the free use of airspace over a

given area by Army air defense, and the other the free use of airspace by the Air Force. Within these two extremes, a spectrum of variants is possible, wherein portions of airspace over a given area are subdivided by altitude or recognizable land features, for concurrent but non-intermingled use by the Army and the Air Force. An example of this would be to allocate to the Air Force all the airspace over a given area, above the maximum altitude of divisional air defense weapons.

Inherent in the modular bulk utilization approach, is the concept that once a particular module is activated, the weapons systems allocated to the module will function completely uninhibited ("full on"), and that the weapons systems proscribed from use of the airspace will enter or use the airspace at a recognized level of risk. In this manner, the modular airspace utilization system can be used to create attrition areas in which air defense artillery can function "full on" in the attrition role, with minimum risk of misidentification and engagement of friendly aircraft. Correspondingly, air defense artillery can be turned off in those areas where use of tactical air is more advantageous or necessary. Airspace utilization modules can be activated or changed by electronic and/or verbal instructions, or in a less responsive manner by application of preplanned patterns which can be disseminated as CEOI items.

The bulk management utilization concept is favored for several reasons. First, it is doubtful that either aircraft or air defense artillery systems will ever achieve their full

performance potential when they must concurrently use the same airspace. If the first battle is to be won, the attrition objective must be optimized with respect to both the Army and Air Force contribution. It is also doubtful whether many of the Army and Air Force control facilities required to manage the concurrent use of airspace will long survive or function on the modern battlefield. These facilities are relatively easy to detect and will be prime targets for destruction or electronic neutralization.

A second significant consideration is that the modular concept permits airspace utilization to be tailored to the local tactical situation. As discussed in Section 3, the main Warsaw Pact effort will probably occur in the NORTHAG area. If the bulk of CENTAG air assets, under centralized NATO control, are diverted to this high threat area, modules allocating bulk airspace to Army air defense can be activated in CENTAG to take up the slack. Within CENTAG itself, various tactical demands will compete for limited air assets. Priorities will be established to manage the allocation of air assets in time. In this situation, appropriate modules can be activated in the areas receiving air support which optimize Air Force effectiveness, while conversely, modules favoring air defense optimization can be activated in these areas not receiving such support.

Modular airspace management procedures can be orchestrated to compound the enemy's countermeasures programs. If, at the outset of hostilities, enemy air primarily encounters ground based air defenses, the aggressor will concentrate on developing

optimum countermeasures and equipment loads against this threat. At this point, the modular approach can be implemented to emphasize the use of US air against enemy air. In this situation, the aggressor will be suddenly confronted by a threat which he is not equipped to optimally counter. In a cyclic manner, the modular approach can be implemented to prevent the enemy from ever developing optimal countermeasures, while giving US air and ground based air defenses alternating periods of rest in which to re-arm, re-fit and adjust tactics and techniques.

SECTION 5 - AIR DEFENSE DEPLOYMENT PRINCIPLES

Air defense deployments must optimize the accomplishment of the attrition objective while providing US forces in CENTAG with an effective air defense umbrella. The purpose of this section is to highlight the doctrinal air defense deployment principles that are particularly applicable in the CENTAG area, and which will contribute significantly to the accomplishment of the attrition objective and the survival of the US air defense artillery units.

The deployment of US air defense artillery units in CENTAG should emphasize the principles of proliferation, defense in depth and all around defense. Air defense weapons must be proliferated. The battle area should be saturated with air defense systems, deployed to cover as much area as possible, within established priorities. The air defense weapons should be positioned to deny the enemy a preferred attack option with respect to both avenue of approach and flight altitude. Enemy aircraft should be subject to continuous attack at all altitudes, from the security zone (initial battle area) to the greatest depth possible. The highest density of air defense weapons should be located in the forward battle area to insure the early engagement of enemy aircraft which penetrate friendly airspace and to provide maximum collateral defense for the friendly combat forces located therein.

While the battlefield may be initially arrayed in a linear manner, air defense deployment must emphasize all around defense. All around defense provides a degree of security against the

possibility of the catastrophic failure of the air defense systems in adjacent unit areas. The provision for all around defense will be especially critical at the US and German Corps boundaries in the CENTAG area. In the German Corps areas, the NIKE HERCULES and HAWK air defense systems are organic to the Air Force, not the Army as in the US Corps areas. Accordingly, differences in doctrinal deployment concepts and defense objectives may create gaps at the flanks which enemy aircraft can exploit. The German Army is currently equipped with different air defense systems than is the US Army, thereby creating another condition for possible enemy exploitation. While NATO standardization agreements may provide the ultimate solution to this problem, current realities dictate adoption of a posture of all around defense as a security hedge.

While proliferation is essential, deployments must not violate the principles of mass and mix. Air defense weapons must be deployed in significant quantities to accomplish the mission and provide for overlapping and mutually supporting fires wherever possible. In the division area especially, the temptation must be resisted to defend too many assets by spreading the air defense weapons thin. CHAPARRAL, VULCAN, and REDEYE are most effective when deployed in mass. The creation of mass is particularly essential in air defense attrition areas. The principle of mix recognizes that no single air defense weapon is capable of optimal performance over the entire spectrum of threat conditions. Air defense weapons must be deployed in mixed packages or families

of complementary weapons systems. Deployment of air defense families insures that the capabilities of one system offset the limitations of another. Mixed air defense packages also compound the enemy's countermeasures effort. Attacking aircraft will be forced to load countermeasures equipment against mixed radar-infrared, infrared-visual, or radar-radar weapon systems, rather than optimally load against a single weapon system.

Deployed air defense units must be dispersed to enhance their survival and reduce the probability of collateral detection. Dispersion is particularly critical to relatively large and expensive air defense units, such as IMPROVED HAWK. HAWK units are relatively easy to detect electronically and are vulnerable to enemy air attack by direct or stand off means. Units such as these should organize for combat in a manner that emphasizes dispersion.

Air defense systems will have to move frequently in order to decrease the probability of detection. Movement to survive is critical to the radar directed air defense systems as they are relatively easy to detect by electronic techniques. Air defense units should organize for combat in a manner that enhances their mobility. Mobility is particularly essential to the ability to mass air defense weapons in dynamically changing attrition areas.

SECTION 6 - US AIR DEFENSE SYSTEMS IN CENTAG

The purpose of this section is to provide an overview of the organization and general capabilities of the air defense systems currently deployed with US forces in the CENTAG area. A detailed description of each system is beyond the scope and classification of this study. The information presented here is designed to provide the reader a basis for evaluating specific organizational modifications which will be subsequently proposed in Section 7.

US air defense systems in the CENTAG area are deployed at theater and division level. Theater level forces are organized into an Air Defense Command, consisting of NIKE HERCULES, IMPROVED HAWK, and CHAPARRAL/VULCAN groups (figure 2). Divisional air defenses forces consist of CHAPARRAL/VULCAN battalions and REDEYE sections (figure 3).

NIKE HERCULES.

NIKE HERCULES is a radar guided, long range, medium to high altitude missile system, capable of engaging aircraft at altitudes up to 100,000 feet and 75 miles range. The systems lethality at high altitude forces aircraft to operate at lower altitudes, where they can be engaged by IMPROVED HAWK and divisional air defense weapons. NIKE HERCULES is nuclear capable and therefore well suited to engage enemy aircraft in large formations. The system has very limited capability at low altitude and is vulnerable to direct air attack. NIKE HERCULES has a mobility capability, but its heavy equipment and relatively long march

Figure 2

THEATER ARMY AIR DEFENSE ORGANIZATION
IN CENTAG

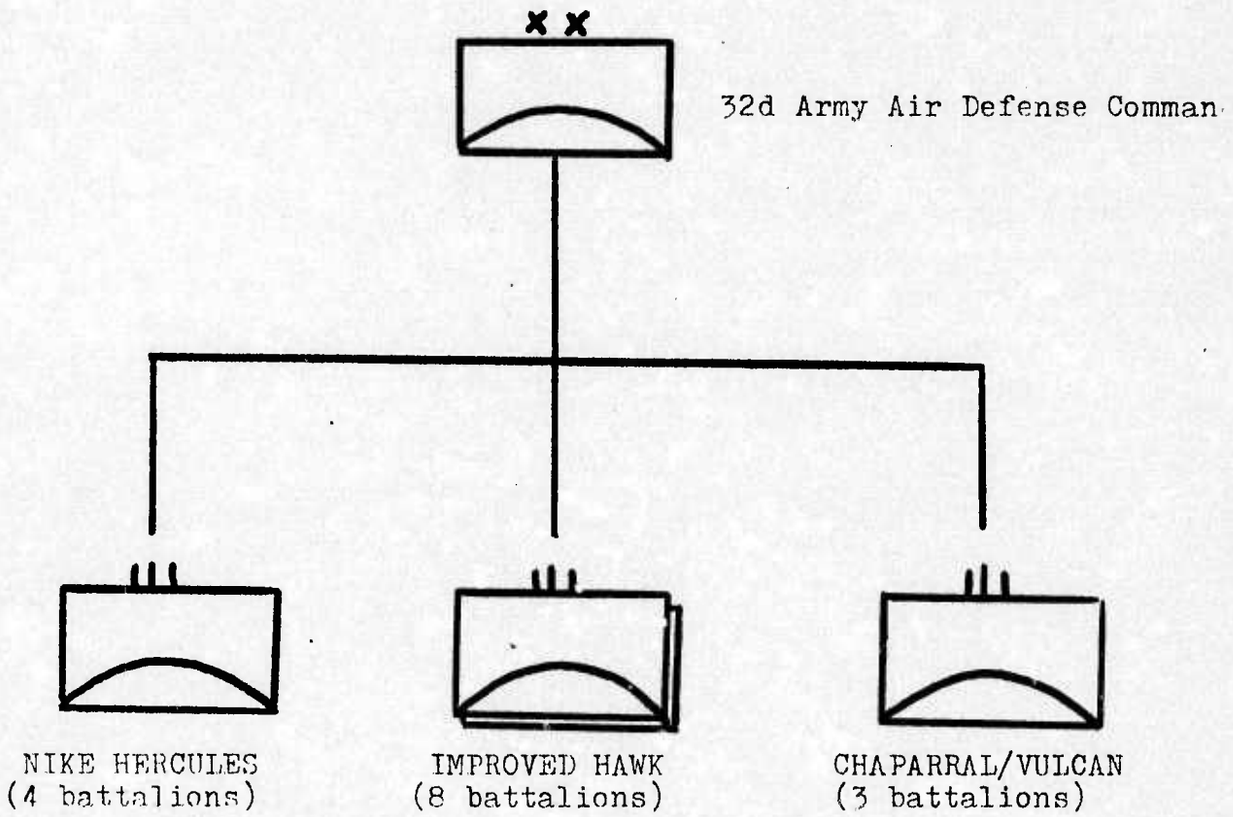
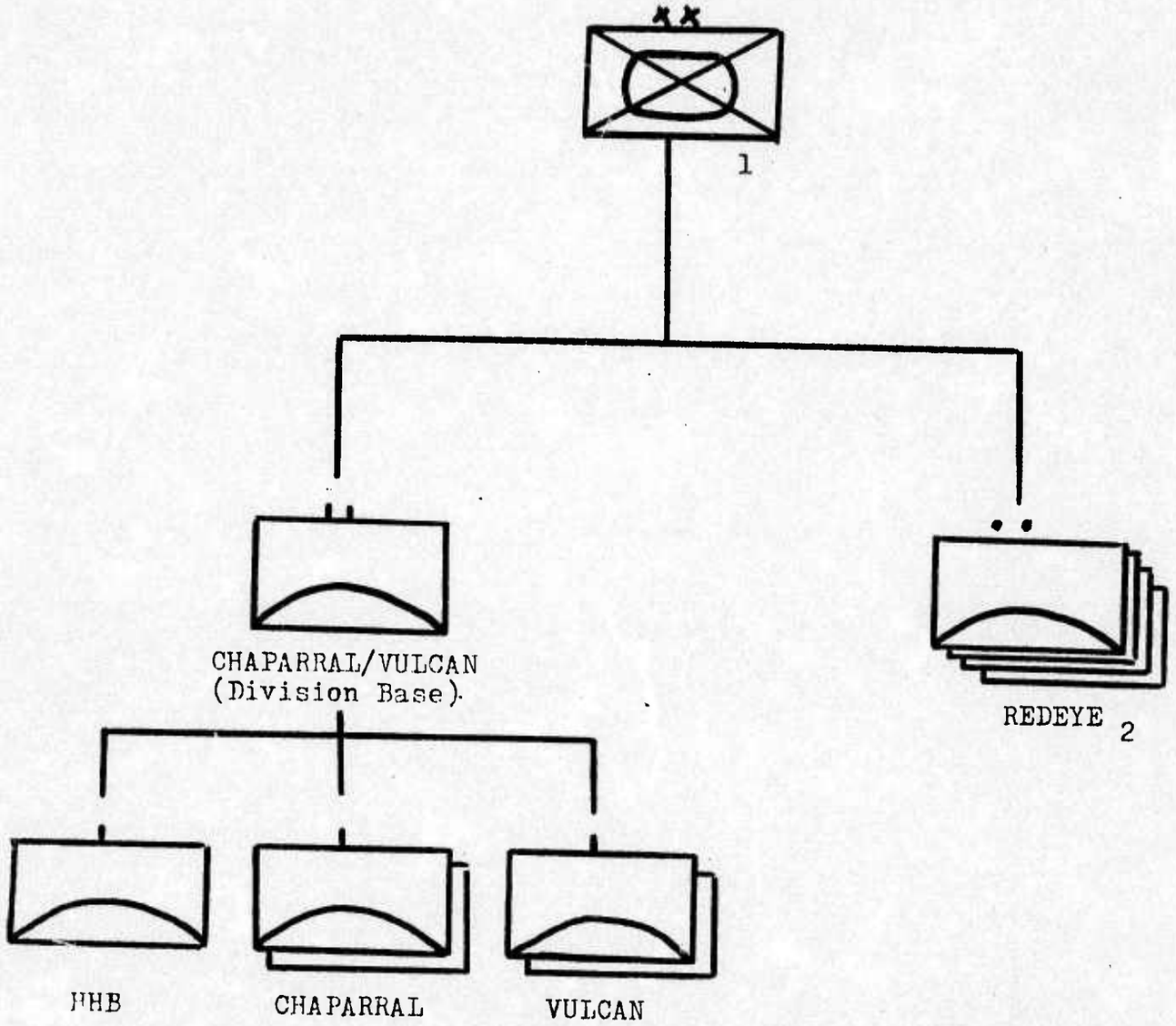


Figure 3

DIVISIONAL AIR DEFENSE ORGANIZATION



1 Mech or Armor

2 REDEYE Section of 4-6 teams, 6 missiles each, organic to each maneuver and cannon artillery battalion and armored cavalry squadron

order and emplace times inhibit the frequency and speed with which it can displace. Because of its long range and high altitude capabilities, but limited battlefield survivability, NIKE HERCULES main contribution is peacetime deterrence and airspace surveillance.

A NIKE HERCULES battalion is organized into a headquarters battery and four firing batteries. The headquarters battery provides an electronic command, control and communications facility that can centrally control the fires of the batteries and exchange digital information with other theater air defense command and control systems. The NIKE HERCULES system is therefore capable of and responsive to centralized electronic control.

IMPROVED HAWK

IMPROVED HAWK is an all weather radar guided air defense missile system, capable of engaging aircraft at medium altitudes to a range of about 40KM. IMPROVED HAWK also has very good capability at low altitude, although its range is extremely sensitive to the effects of local terrain on the systems radar. In the relatively extreme relief conditions prevalent in the FULDA area of the CENTAG region, IMPROVED HAWK coverage at low altitudes would be restricted to a nominal range of about 15KM.

The IMPROVED HAWK battalion organization is shown in Figure 4. The Headquarters Battery provides an electronic command, control, and communications system that can centrally control the fires of the four batteries and exchange digital information with other theater air defense command and control systems. The HAWK system is therefore capable of and responsive to centralized electronic control.

Each firing battery is organized into two separate firing sections, one of which (Assault Fire Section) is capable of operating completely independent from the battery (figure 5). A HAWK battery can therefore be organized as a single entity of two sections under battery control (figure 6a), or one section under battery control and one section independent (figure 6b).

Figure 4

IMPROVED HAWK BATTALION

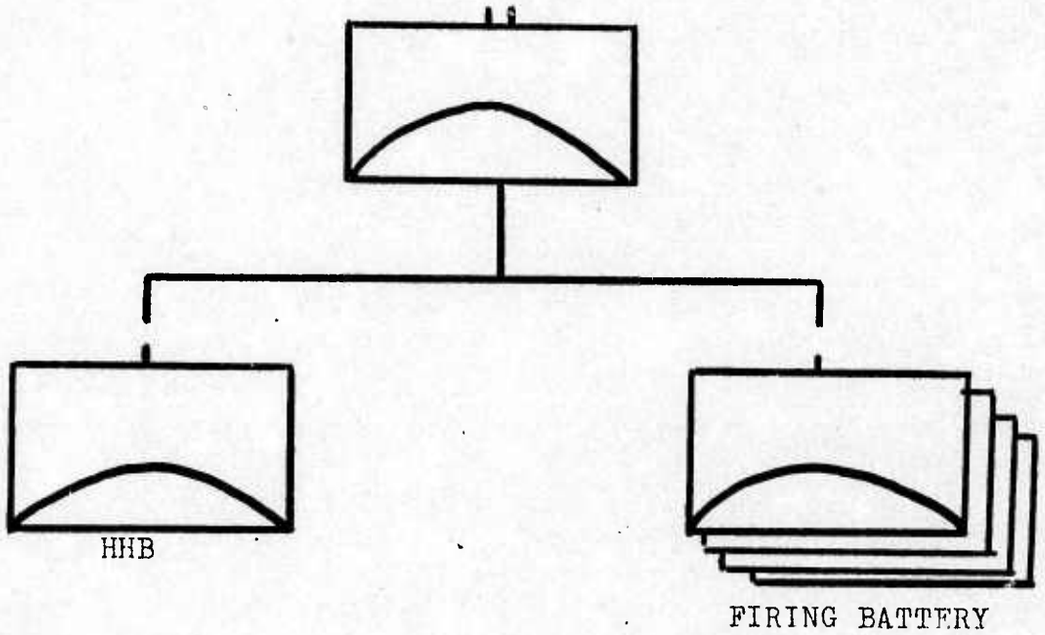


Figure 5

IMPROVED HAWK BATTERY

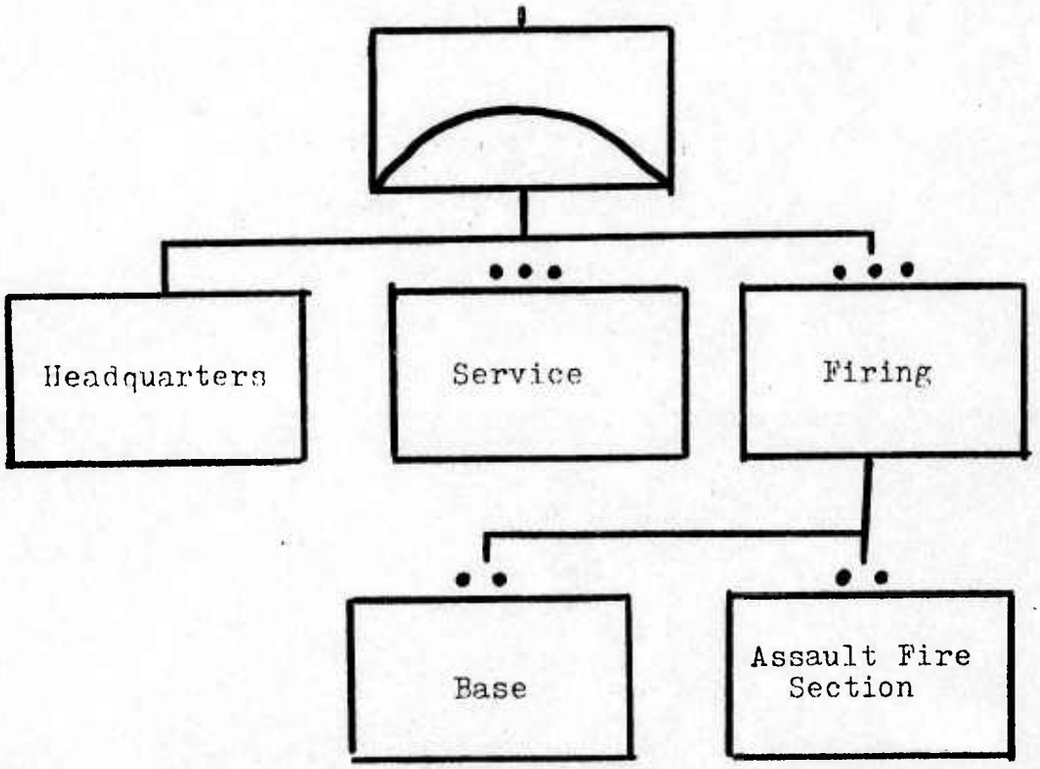
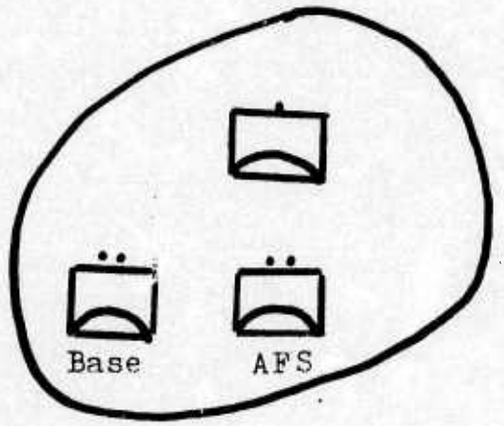


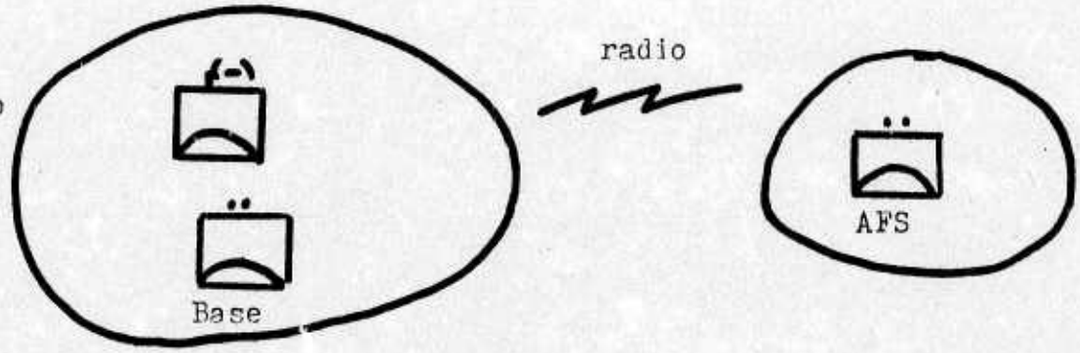
Figure 6

IMPROVED HAWK BATTERY ORGANIZATIONS

6a



6b



The Assault Fire Section (AFS) can exchange digital data with the battalion command and control facility, so that a relatively high degree of centralized command and control is maintained. The Assault Fire Section is also linked by voice radio to its parent battery.

CHAPARRAL/VULCAN

CHAPARRAL is a fair weather, short range, low altitude, visually aimed, passively guided, infrared missile. The missile has a range of about 5 KM. It has almost no capability against approaching jets, due to the reduced infrared signature presented by the nose aspect of the aircraft. CHAPARRAL does have some head on engagement capability against helicopters and other piston engine aircraft. The CHAPARRAL system does not have an organic IFF capability, and the gunner must visually detect and identify the target. CHAPARRAL capability is severely reduced during periods of low visibility. The CHAPARRAL system is mounted on a tracked M 730 carrier. The basic load is 16 missiles; 12 of which are carried on board, four in a firing configuration on a slewable mount. Because CHAPARRAL is a "shoot and forget" missile (passive homing), high rates of fire can be achieved. The four missiles on the mount can be fired off in a matter of seconds, although the crew must then reload under combat conditions.

VULCAN is a fair weather, short range, low altitude, visually aimed gun. The gun system is a six barrel 20 mm Gatling gun, mounted either on a M 113 chassis or a trailer towed by a M 561 1¼ ton vechicle. It has an effective range of about 1.5 KM. The VULCAN system does not have an organic IFF capability, and the gunner must visually detect and identify the target. VULCAN capability is severely reduced during periods of low visibility.

The CHAPARRAL and VULCAN systems are organized into divisional and non-divisional battalions. The divisional

battalions contain two pure VULCAN and two pure CHAPARRAL batteries, of 12 weapons each. Some degree of cross attachment is usually affected when organizing for combat. The non-divisional battalions are organized into three cross attached batteries of eight CHAPARRALS and eight towed VULCANS. These battalions are currently assigned airbase or depot defense type missions.

REDEYE

REDEYE is a man portable, fair weather, short range, visually aimed, low altitude, infrared guided air defense missile. The missile has a range of about 3 KM, and is subject to the same visibility and engagement constraints as CHAPARRAL. REDEYE sections of from four to six teams, six missiles each, are currently organic to maneuver and cannon artillery battalions, and armored cavalry squadrons (divisional and non-divisional).

FORWARD AREA ALERTING RADAR (FAAR)

The FAAR is a lightweight early warning radar which is mounted on a Gamma Goat vechicle/trailer combination. The radar is designed to electronically transmit, via FM data link, gross early warning and identification information to CHAPARRAL, VULCAN, and REDEYE systems. The radar has a nominal range of about 20 KM. The radar must be emplaced relatively close to the battle area, due to its short range. A FAAR platoon of eight radars is organic to each divisional and non-divisional CHAPARRAL/VULCAN battalion.

SECTION 7 - ORGANIZATION FOR COMBAT AND TO&E MODIFICATIONS

The purpose of this section is to propose specific combat organizations and conceptual TO&E modifications required to optimize HAWK, CHAPARRAL, VULCAN, and REDEYE for the attrition objective. NIKE HERCULES will not be discussed since its primary contribution is peacetime deterrence and surveillance. Moreover, there are indications that NIKE HERCULES battalions might be eliminated from the CENTAG force structure in FY 77.[15]

IMPROVED HAWK

Emerging air defense doctrine prescribes that an IMPROVED HAWK battalion be placed in direct support of each committed division. HAWK will provide the division with responsive and effective area coverage at medium altitude, and low altitude coverage in the immediate vicinity of the deployed HAWK units. As described in Section 6, the HAWK battalion organization is flexible. HAWK battalion organization for combat can be readily tailored to support the attrition objective, while retaining the capability to respond to centralized control.

For the conduct of attrition operations, the two section deployment shown in figure 6b, is recommended. The two section deployment is in consonnance with the principles of proliferation and dispersion, and significantly increases the attrition capability, coverage, and survivability of the battery.

HAWK low altitude coverage is essentially terrain restricted.

Organizing the battery for combat as sections minimizes this limitation by providing the capability to deploy a section beyond restrictive terrain surrounding the battery position. If a nominal 15 KM low altitude range capability is assumed, a HAWK battery, with both sections collocated, could cover about 700 KM^2. If the same battery is deployed as two sections, each at least 15 KM apart, approximately 1400 KM^2 could be covered at low altitude. If the sections are deployed to provide mutually supporting coverage, with 2/3 range overlap (sections deployed 5 KM apart), approximately 850 KM^2 could be covered at low altitude.

The two section deployment model provides a collateral benefit of increasing the number of CHAPARRAL and VULCAN assets available for commitment in the division forward area. By coordinating the positioning of the HAWK sections to provide low altitude coverage for rear area assets (e.g. support areas, artillery, reserves) CHAPARRAL and VULCAN systems can be released from rear area commitments and be made available for use in the forward division area.

HAWK survivability is increased by the section deployment mode. Section dispersion significantly reduces the probability of losing an entire battery in a single air strike. Section position area requirements are less than that for a battery. Therefore, a given battle area should contain more potential section sites than battery sites. These two factors should operate to decrease the probability of visual detection and enhance mobility and flexibility.

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The two section deployment model has the disadvantages of degraded coverage at medium altitude, decreased rates of fire, and increased ground defense and logistical support requirements.

The Assault Fire Section does not have dedicated mediom altitude search radar. Only one such radar is assigned to the battery, and it is retained for use within the main battery area with the base firing section. Accordingly, to engage medium altitude threats, the Assault Fire Section must utilize supplemental digitized data received from the battalion command and control facility.[16] This method of engagement is normally less efficient and responsive than when operating as an integral battery utilizing wholly organic radar means. If the battalion-section data links are disrupted, the section will be denied all supplemental information, and be forced to revert to an even less efficient method of medium altitude engagements.

While aircraft at medium altitude do not pose an immediate threat to most division resources, the degraded coverage at these altitudes can be offset by the application od modular airspace utilization procedures. In this situation, the Air Force could be given unrestricted use of the airspace in a given region, above a specified altitude corresponding to the HAWK section's capability limits.

A HAWK battery, with both sections collocated can engage two targets simultaneously. A HAWK section, however, can engage only one target at a time. This limitation adversely affects the section's capability to defend itself against direct

attack by multiple aircraft. This limitation can be somewhat offset by positioning the sections to provide mutually supporting overlapping fires. Additional close in air defense protection against direct air attack can be provided by substituting caliber .50 machineguns for the battery's current TO&E 7.62 mm M-60 machineguns.

The section's ability to defend itself against direct air attack can also be increased by a modest augmentation with REDEYE weapons. Battery personnel can be trained for REDEYE qualification, and man these weapons once the section is emplaced. Although REDEYE has minimal capability against head-on jet attack, the REDEYE teams could be positioned along likely low altitude approaches to the section position. A further refinement on the augmentation concept is to provide full time dedicated REDEYE support by creating an organic REDEYE section at HAWK battery/ battalion level. Some of the spaces required for the REDEYE section could be created by converting non essential support TO&E spaces to REDEYE authorizations.[17]

Section deployments compound the ground defense problem by increasing the total perimeter length to be defended by the battery personnel and diluting the available fire power. This problem can be offset by coordinating the positioning of the sections to be within the defensive areas or mutually supporting range of rear area elements such as artillery or reserve forces. The caliber .50 machinegun TO&E substitution will also enhance the section's ground defense capability.

REDEYE CENTRALIZED CONTROL

The division REDEYE sections should be placed under the centralized control of the CHAPARRAL/VULCAN battalion. Centralized control of REDEYE will provide for more responsive resource allocation, and will provide the capability to mass these weapons in critical threat areas for self defense, or in attrition areas created by the modular airspace utilization system.

It may be desirable to compromise on the degree of REDEYE centralization, and leave residual organic REDEYE teams in maneuver cannon artillery and armored cavalry squadrons, to provide these formations a responsive and dedicated self defense capability. If this is done, additional REDEYE spaces can be created in the CHAPARRAL/VULCAN battalion by converting some support spaces to REDEYE authorizations.[18] In this manner, a compromise is achieved, with the CHAPARRAL/VULCAN battalion exercising centralized control over REDEYE elements for commitment in either the attrition or self defense role, and the maneuver battalions retaining an organic and dedicated (but somewhat reduced) REDEYE element for self defense. Maneuver battalion REDEYE elements can also contribute to the attrition objective, when they are situated in attrition areas.

CHAPARRAL/VULCAN BATTALION

Whenever possible, the air defense assets of the CHAPARRAL/VULCAN battalion should be organized for commitment as composite platoons. These platoons should consist of VULCAN, CHAPARRAL, REDEYE, and the Forward Area Alerting Radar (FAAR). The precise mix of these assets will be determined by the threat and friendly

operational posture. The composite platoon concept assures a gun-missile mix, and provides an organic early warning and identification assistance capability by inclusion of the FAAR. Since there are currently eight FAAR radars in the CHAPARRAL/VULCAN battalion, sufficient assets should normally be available for creation of a composite platoon for each commited maneuver battalion.

The FAAR should be under the operational control of the composite platoon leader. He should be responsible for positioning the radar, based on his analysis of the threat and terrain. Whenever possible, he should coordinate his position requirements with the FAAR platoon leader.

The REDEYE element organic to the maneuver battalion should be placed under the operational control of the composite platoon leader (in addition to the platoon's organic REDEYE element). The composite platoon leader should also be responsible for planning the air defense utilization and integration of the maneuver battalion's organic automatic weapons.

AMMUNITION STOCKAGE

Air defense ammunition stockage procedures must be modified to support the attrition objective. Theatre reserve stockage levels must be decreased, and unit basic loads correspondingly increased, to insure a readily available supply of ammunition in anticipation of high initial expenditure rates. It may be necessary to augment air defense unit TO&Es to provide the capability to carry the increased ammunition loads. This augmentation is necessary to eliminate the risks involved in depending on doctrinal ammunition resupply procedures under wartime conditions. The ammunition augmentation capability could be provided from a centralized transportation pool at theatre level, prior to the onset of hostilities. The transportation resources could be incrementally returned to centralized control as the unit ammunition loads are depleted.

NOTES

1. The Military Balance, 1974-1975 (London : Institute for Strategic Studies, 1974), p. 100.

2. Laurence Doty, "NATO Reshaping Tactical Air Posture", Aviation Week and Space Technology, March 3, 1975, pp. 12-13.

3. John Newhouse and others, US Troops in Europe, (Washington, D.C. The Brookings Institution, 1971), p. 58, citing the Congressiona Record, daily ed., Oct. 14, 1970, pp. S 17994 and S 18011-13.

4. The Military Balance, 1974-1975, p. 100.

5. Ibid, p. 97.

6. Newhouse, pp. 59-60.

7. Ibid

8. Dale R. Tahtinen, The Arab-Israeli Military Balance Since October 1973 (Washington, D.C., American Enterprise Institute for Public Policy Research, 1974, Foreign Affairs Studies, No. 11), p. 42.

9. The Military Balance, 1974-1975, p. 96.

10. Doty, Avaition Week and Space Technology, pp. 12-13.

11. JCS Pub. 8, Doctrine for Air Defense From Overseas Land Areas, (Washington, D.C., The Joint Chiefs of Staff, May, 1964) p. 7.

12. FM 44-1, US Army Air Defense Artillery Employment, (Washington, D.C., Department of the Army, C1, October 13, 1972), p. 2-1.

13. JCS Pub. 8, p. 11.

14. FM 44-1, p. 7-3.

15. "Europe Missile Cut?", The Army Times (Washington, D.C.) March 12 1975, p. 2.

16. FM 44-101, Procedures and Drills for HAWK Missile Battery (IMPROVED), (Washington, D.C., Department of the Army, 20 March 1974), pp. 8, 10, 12.

17. An example might be to eliminate battery and battalion mess sections and utilize contractor mess support during peacetime. In wartime, and assuming adoption of the "short war" concept, batteries would subsist on combat rations.

18. same as 17 above.