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BRIDGING THE GAP FOR THE OPERATIONAL COMMANDER: HUNTING RELOCATEABLE BALLISTIC MISSILES WITH ADVANCED ATTACK HELICOPTERS

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ARTS AND SCIENCE

by

SHANE M. DEVERILL, CPT(P), USA
B.S., United States Military Academy, 1981

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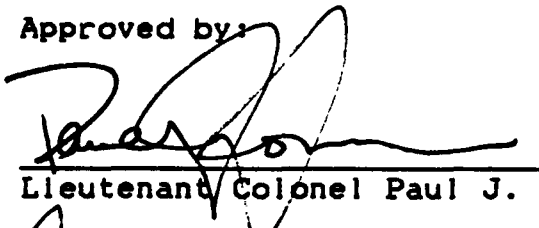

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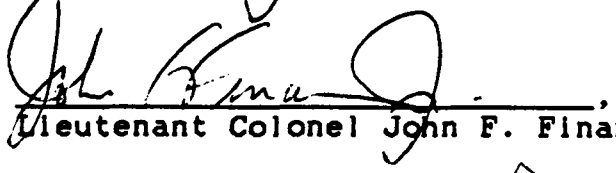

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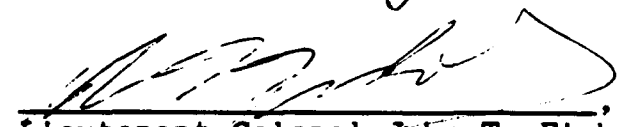

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other government agencies. (References to this study should include the foregoing statement.)

ABSTRACT

BRIDGING THE GAP FOR THE OPERATIONAL COMMANDER: HUNTING RELOCATEABLE BALLISTIC MISSILES WITH ADVANCED ATTACK HELICOPTERS by CPT(P) Shane M. Deverill, USA, 132 pages.

The unplanned significance of Iraq's relocateable ballistic missiles (the Al-Abbas and Al-Hussain) disrupted the campaign tempo of Desert Storm. Consuming 40 percent of air sorties and many of the special operating forces, there is a definite need to examine other viable means to counter this threat. This thesis examines the feasibility of the U.S. Army's advanced attack helicopter to find and destroy relocateable ballistic missiles.

This thesis answers the question: "Can an advanced attack helicopter unit find and destroy relocateable ballistic missiles?" affirmatively. Futher, it refines this question into a hypothesis: "An echelon-above-corps (EAC) aviation brigade, equipped with advanced attack helicopters, can find and destroy relocateable ballistic missiles." and determines that it is possible; however, the EAC can not do this in isolation.

Conclusions and recommendations focus on doctrine. Doctrine must identify and catalog all joint systems capable of detering this threat such as: special operating forces, fixed-wing aircraft, advanced attack helicopters, Patriot missiles, and intelligence systems.

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Lastly, and most importantly, I thank my loving wife and sons: Libby, Matthew, and Hayden. Without their support, this project would never have been completed.

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INTRODUCTION

> There is only one means of preventing decay--never to stop growing, never to become slaves to the present or the past, never to hesitate attempting something new for fear of making a mistake.
>
> J.F.C. Fuller
> April 1927

Purpose

During Desert Storm, Iraq's use of relocateable ballistic missiles disrupted the coalition's campaign tempo. In response to this unplanned threat, fixed-wing aircraft and special operating forces were dedicated to finding and destroying this threat. This research determines the feasibility of an advanced attack helicopter unit to find and destroy relocateable ballistic missiles.[1]

Significance of Armed Helicopters

It appears that Richard Simpkin was correct: the armed helicopter is campaign significant.[2] During Desert Storm, the U.S. Army's fleet of AH-64, Apache, Attack Helicopters demonstrated both campaign and strategic significance.

Initially designed as a gunship in Vietnam, the armed helicopter was highly versatile and successful.[3] Escorting unarmed helicopters and providing close fires for ground units, the gunship's rapid, unimpeded mobility and immense firepower greatly influenced the tactical level of war for the ground units in Vietnam.

With the advent of Active Defense Doctrine in the mid-seventies, the gunship evolved into an anti-armor, atttack helicopter. The Active Defense focused exclusively on the massed armor threat of Warsaw Pact Forces in Europe.[4] Attack helicopters were employed along side tanks to augment tank fires. This employment was reminiscent of U.S. Army's tank employment in early World War II: an infantry support vehicle.[5] Therefore, just as the infantry bridled the mobility of the tank in World War II, the tank bridled the mobility of the attack helicopter in the Active Defense.

In 1982, Airland Battle Doctrine emerged. It recognized operational art and gave birth to deep operations.[6] Organic to the ground commander, attack helicopters were his fastest, direct-fire, means to strike deep against second-echelon threat forces. This employment was significant for it accelerated the tempo for tactical operations and plugged the time-space gap of mechanized forces. However, it was not until Desert Storm that advance attack helicopters showcased unique capabilities to impact operational warfare.

During Desert Storm, three illustrative examples standout as testimonies to the unique capabilities of advanced attack helicopters (AAHs) to find and destroy target sets of campaign significance. These episodes in Army Aviation were: the destruction of early-warning radar in Iraq; the destruction of Silkworm missiles on Faylaka Island; and the Battle of the Causeway.

To open an air corridor, General Norman Schwarzkopf approved a mission for AH-64s to destroy two early-warning radar stations. Early morning of 17 January 1991, two teams of helicopters nicknamed Task Force Normandy crossed the Iraqi border.[7] Each team, comprised of two MH-53, Pave Lows, and four AH-64s, achieved complete surprise.[8] The Apaches fired 27 Hellfire missiles completely destroying both radar sites and creating a corridor for allied aircraft to begin Desert Storms's air operations.[9] Conducted at operational depths, this engagement had campaign significance because it opened an air corridor for coalition air forces to commence air operations on command and control facilities in Baghdad.

Also, on the night of 16 February 1991, two armed OH-58D (Kiowa Warrior) Helicopters conducted armed reconnaissance of Silkworn missile batteries on Faylaka Island.[10] The batteries prevented the Navy Task Force from providing Naval gunfire and mine sweeping operations. Numerous carrier-launched attack aircraft failed to destroy

these Silkworm missiles.[11] Undetected and within range, the OH-58Ds employed Hellfire missiles to destroy one Silkworm and knocked another off its launcher.[12] This engagement had campaign significance because it enabled the Navy Task Force to position ships close to shore to pummel Iraqi positions in Kuwait with naval gunfire.

Finally, on 2 March 1991 (48 hours after the cease-fire) the major battle for the 24th Division occurred with the Hamurabi Division at the Rumalia oil fields: The Battle of the Causeway.[13] Major General Barry McCaffrey employed his aviation brigade to stop vehicle movement north across the causeway. This classical employment of attack helicopters captures the inherent mobility, and exacting lethality of AAHs to quickly respond and interdict a massed-armored formation.

Operational Fires

Indeed, these illustrative examples, of advanced attack helicopter (AAH) employment from Desert Storm are testimonies to their campaign significance. Furthermore, according to TRADOC PAM 11-9, Blueprint of the Battlefield, these examples logically fit the operational fires battlefield operating system (BOS). Designed to achieve a single operational objective, operational fires have major and possibly decisive implications on campaigns or major operations.[14] Operational fires focus on the following:

* Destruction of critical functions and facilities having operational significance.

* Isolation of the battlefield by the interdiction of uncommitted enemy forces and sustaining support.[15]

The advance attack helicopter (AAH) attacks on Iraq's early-warning radar, and Silkworn missiles fulfill the first criterion: destruction of critical facilities having operational significance. The AAH attack in Battle of the Causeway fulfills the second criterion: isolation of the battlefield by the interdiction of uncommitted enemy forces (see Figure 1).[16]

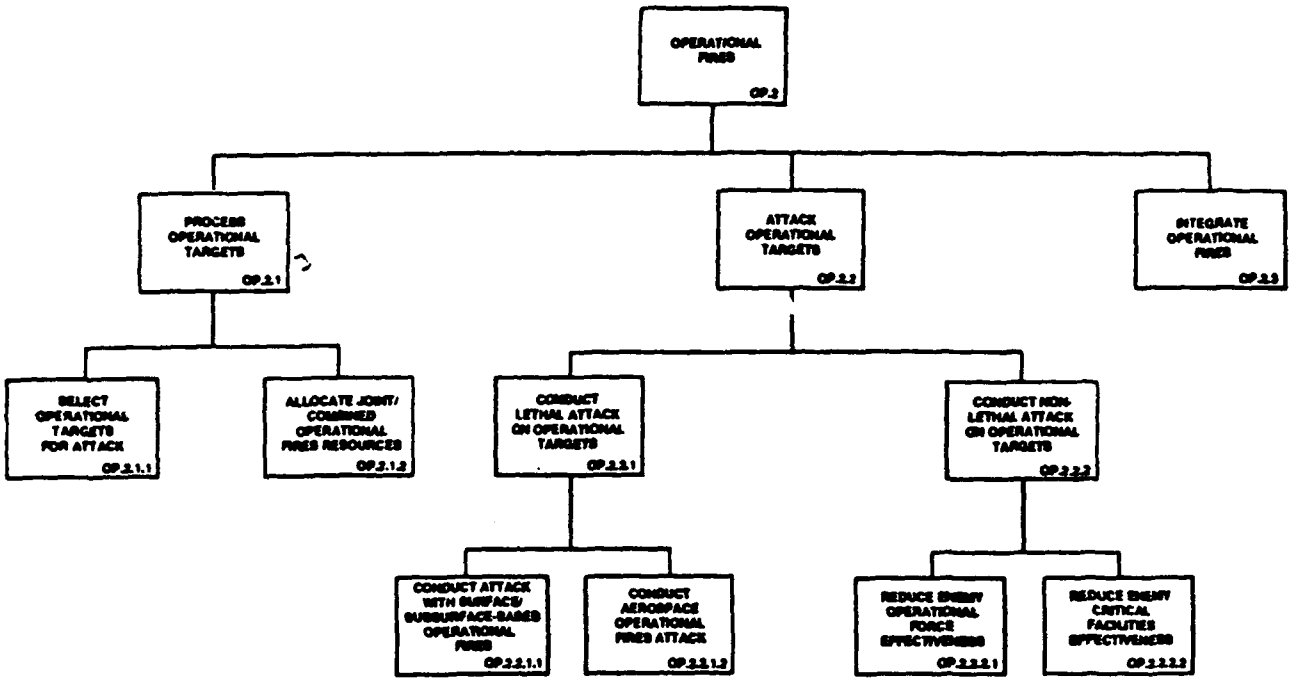

Figure 1. Operational Fires

Desert Storm Overview

Seasoned by ten years of combat during the Iran-Iraq War, Iraq's army was the fourth largest mechanized force in the world.[17] A bully among the Arab nations, this belligerent country directed an unprovoked attack against Kuwait on 2 August 1990.[18] The cause for the attack centered around land and oil disputes.[19] As television news revealed the horror of Iraq's unwarranted aggression, world opinion quickly solidified against Iraq.

From August 1990 to January 1991, as the world (through the herculean efforts of the United Nations) denounced Iraq's occupation of Kuwait, military forces from around the world formed a coalition force to eject Iraq from Kuwait. On 17 January 1991, with the first shots of Desert Storm's air operations, Saddam Hussein quickly realized that his status in the region and future of his army were at risk.

Significance of Relocateables in Desert Storm

In an act of desperation, Saddam Hussein employed Iraq's Al-Hussain and Al-Abbas relocateable ballistic missiles.[20] Armed with high-explosive, chemical, or possibly nuclear munitions, these missiles are Soviet SCUD B derivatives that have 600 and 900 mile range respectively.[21] These modified missiles were unstable in flight, and many failed to reach their intended target. Because they lacked

precision to be militarily significant, these weapons quicky became weapons of terror.[22] Initial attacks focused on major population centers in Saudia Arabia. Lack of precision coupled with the shoot down capability of the Patriot missile quickly degraded this threat. Interestingly enough, all of these missiles were configured with high-explosive warheads. Perhaps Saddam realized that unconventional munitions would excite coalition forces to respond in kind.

Foiled, Iraq aimed to destroy the Arab bond of the coalition. This threatened the unity of the coalition--a vital, political center of gravity. Attacking this political center of gravity was a clever ploy. Firing these missiles on Israel's population centers, Iraq hoped to excite Israeli hostilities to justify a Jihad or Holy war. Fortunately this scenario did not happen. Israeli retaliation might have rallied Iraq's Arab brethern of the coalition to fight a Jihad. Clearly, this possibility threatened to destroy an already tenuous coalition. Strategically significant, this inaccurate weapon of terror quickly became the coalition's warfighting focus to find and destroy. Its unplanned significance interrupted the campaign plan for Desert Storm. In fact, "CENTCOM diverted about 40 percent of its [air] sorties after D+7 (when they had planned to concentrate on ground targets in and near Kuwait) to *SCUD busting*."[23]

Trends

Military strategists may argue that the use of relocateable ballistic missiles is an anomoly. On the contrary, weapons of this type are proliferating. In the Middle East, Africa, Asia, and South America there are 17 countries with these weapons in service or development.[24] In a world of fast-paced, technological developments, it is reasonable to assume that the technology for these weapons will continue to evolve. Simply stated, the range, accuracy, and lethality of these weapons will increase while costs will decrease.

Many nations around the the world manufacture this type of weapon, and that number will certainly grow as countries develop their industrial base. The downfall of the Soviet Union is especially significant. This former superpower is fragmented into bankrupt republics. Many of these republics have stockpiles of these Cold War relics. It is logical to reason that these bankrupt former republics may sell these ballistic missiles to generate badly needed revenue.

Future Concerns

As U.S. doctrine aptly states and as Desert Storm reinforced, future wars will definitely be joint and most likely involve coalition forces.[25] The effect Iraq had in sidetracking the coalition's warfighting effort paints a

clear picture. The possession of a relocatable ballistic missile by a belligerent country with a fledgling military, greatly increases its warfighting capability. Proliferation, accessibility, improved precision and lethality of these weapons threaten tactical, operational, and strategic centers of gravity. Located beyond visual range and highly mobile, these elusive weapons must be identified and destroyed early in a war if the campaign is not to be interrupted.

This reality was not lost on General Frederick Franks. As the VIIth Corps Commander during Desert Storm, and now as the Training and Doctrine Command Commander, he desires an examination of the capabilities of AH-64s to destroy this relocateable threat.

Research Question

Can an advance attack helicopter unit find and destroy relocateable ballistic missiles?

Scope

The inherent capabilities of an advanced attack helicopter (AAH) unit have brought the Army to another threshold in warfighting potential. Indeed, Desert Storm brought to fruition the operational significance of the AAH. Just as mechanization put mobility back into tactics, the aerial vehicle accelerates the tempo of operational art.

This research seeks to determine the feasibility of an advanced attack helicopter (AAH) unit to attack relocatable targets.

Objectives

(1) Trace the warfighting contributions of armed helicopters from the gunship helicopters of Vietman to the AAHs of Desert Storm.

(2) Examine the body of knowledge, and devise a methodology based upon the current doctrine and tactics, techniques and procedures for attack helicopter deep operations.

(3) Demonstrate through three illustrative examples from Desert Storm the unique capabilities of AAHs to find and destroy sets of both stationary and moving targets that are significant to the campaign.

(4) Present and test a case study based on the current Training and Doctrine Command, Southwest Asia, common teaching scenario to determine the feasibility for an AAH unit to find and destroy relocateable ballistic missiles.

(5) From analysis of the case study, determine the impact upon doctrine, organization, materiel.

Assumptions

(1) The operational doctrine of Airland Operations will not be radically different from current Airland Battle

doctrine. Airland Battle focused on a U.S.-Soviet conflict in central Europe against a massive, echeloned Warsaw Pact. By contrast, Airland Operations embraces the global possibilities for war. This is especially critical based upon U.S. involvement in "Just Cause" in Panama and "Desert Shield/Storm" in the Middle East. Sagely, with the downfall of the Soviet Union, with the growing instability in the Third World, and with the exploitation of technologies, Airland Operations decribe how the Army must conduct warfare for the 1990's and beyond.[26]

(2) The tactical fundamentals of employing Army attack helicopters in accordance with FM 1-100, FM 1-111 and FM 1-112 will remain valid.

(3) In the foreseeable future, the structure of an advanced attack helicopter (AAH) group will consist of three AAH battalions of three AAH companies. Each company will contain 6 AAHs with 18 AAHs per battalion for a total of 54 for the AAH group.

(4) The Army will continue to control its AAH units.

(5) Future wars will involve relocateable ballistic missiles.

Limitations and Delimitations

Limitations: Since Airland Operations is still being refined, this research is limited to current Airland Battle Doctrine. Since this proposes a totally new concept for

AH-64 employment, there is no first-hand experience to analyze, nor is there access to models or mock ups. Analysis is limited to only open source material. It focuses on the U.S. Army's advanced attack helicopter (AAH): AH-64 Apache. This research will not consider divisional AAH battalions because divisions fight exclusively at the tactical level of war. This research involves analysis of alternatives to AAH employment during Desert Storm.

Delimitations: Focused at the operational level of war, the research examines AAH units assigned to any non-divisional aviation brigade. The scenario is a contingency operation fought against a Training and Doctrine Command approved threat in a mid-to-high intensity conventional conflict. The scenario is restricted to the relatively featureless desert of Southwest Asia.

The research intends to demonstrate that an AAH unit can be employed to attack relocateable targets. Furthermore, this study seeks to develop a conceptual framework that will assist operational planners in a contingency operation to understand the necessary conditions to employ an AAH unit against relocateable targets.

Significance of the Study

This study is departure from the traditional attack helicopter operations which are focused at the tactical

level of war. It offers an examination of attack helicopter employment at the operational level of war for which there is no doctrine! If feasible, this study will certainly influence Army operational warfighting and impact joint aspects of warfighting as well. Hopefully, this research will be substantial enough to support future requirement documents. It may well influence Army aviation related issues in regard to doctrine, training, organization, materiel, and leadership. If validated, the result of this subjective assessment will serve as a model for the operational employment of advanced attack helicopter (AAH) units against relocatable targets. The Army can then test and adjust these concepts to develop this shortfall in operational doctrine.

Preview

Chapter One is an introduction. It provides theoretical and historical significance of armed helicopters in warfighting. It shows the evolution of armed helicopters from the gunships of Vietnam to the AAHs of Desert Storm. Through three illustrative examples, chapter one demonstrates the operational significance of AAHs and how these examples logically relate to the operational fires battlefield operating system. It identifies and describes the threat of relocateable ballistic missiles during Desert Storm and their implications in future wars. Finally, it

defines objectives, assumptions, limitations, and delimitations of this research.

Chapter Two is a review of literature and methodology. The review of literature examines the body of knowledge that exists about the hypothesis. This effort is designed to capture and define the research. It details necessary enabling concepts. The methodology builds upon these concepts; it states what methods and criteria that will be used to collect, analyze, and interpret evidence. The criteria is largely developed from the Corps Deep Operations Handbook. Further, this chapter examines three illustrative examples of advanced attack helicopter (AAH) employment during Desert Storm. These examples were briefly profiled in Chapter One. The purpose, of this examination, is to glean any observations that would enhance the analysis of the case study developed and tested in Chapter Three.

Chapter Three presents and tests a hypothetical case study. This case study seeks to determine the feasibility for an AAH unit to find and destroy relocateable ballistic missiles.

Chapter Four presents conclusions. It categorizes these by doctrine, organization, materiel.

Chapter One Endnotes

(1) Coined by General Franks during a warfighter seminar in November 1991, a relocateable is the latest word in Training and Doctrine Command's lexicon. By definition, relocateables are mobile and therefore elusive targets. During Desert Storm, Iraq's relocateables, the Al-Abbas and Al-Hussain ballistic missiles, were high payoff targets of campaign significance for coalition forces.

(2) Richard Simpkin, Antitank: An Airmechanized Response to Armored Threats in the 90s (New York, NY: Brassey's Publishers Limited, 1982), 187-188.

(3) Howard A. Wheeler, Attack Helicopters, (Baltimore, MD: The Nautical and Aviation Publishing Company of America, 1987), 57-61.

(4) U.S. Army, FM 100-5, Operations, (Washington D.C.: U.S. Government Printing Office, 29 April 1977), 2-22.

(5) Martin Alexander and Brian Bond, "Liddell Hart and De Gaulle: The Doctrines of Limited Liability and the Mobile Defense," Makers of Modern Strategy from Machiavelli to the Nuclear Age, Ed. Peter Paret (Princeton, New Jersey: Princeton University Press, 1986), 607-622.

(6) U.S. Army, FM 100-5, Operations, (Washington D.C.: U.S. Government Printing Office, May 1986), 27-28 (hereafter cited as FM 100-5).

(7) U.S. Army Aviation (After Action Report), "Aviation in Desert Shield/Storm," (Fort Rucker, AL: U.S. Army Aviation Center Print Plant, 30 June 1991), 4.1 (hereafter cited as "Aviation in Desert Shield/Storm").

(8) Ibid.

(9) Special Report: "The U.S. Army in Operation Desert Storm," (Arlington, VA: The Institute of Land Warfare, June 1991): 12.

(10) "Aviation in Desert Shield/Storm," 5.2.

(11) Ibid.

(12) Ibid.

(13) Burt S.Tackaberry, "24th Aviation Brigade:

'Battle of the Causeway,'" Army Aviation Volume 40 (No. 7). (West Port, CT: Army Aviation Publications, 31 July 1991): 20 (hereafter cited as "24th Aviation Brigade: 'Battle of the Causeway'").

(14) U.S. Army, TRADOC Pamphlet 11-9, Blueprint of the Battlefield, (Andover, MA: Dynamics Research Corporation, February 1991), 6-6 (hereafter cited as TRADOC PAM 11-9).

(15) Ibid.

(16) Ibid, 6-5.

(17) Bob Woodward, The Commanders, (New York: Simon & Schuster, 1991) 222.

(18) Ibid, 223.

(19) Ibid.

(20) Barbara Starr, "Ballistic Missile Proliferation: A Basis for Control," International Defense Review, (March 1990): 265.

(21) Ibid, 265-267. The SCUD is a single-stage missile with a selection of high explosive (HE), chemical, or nuclear warheads. Mounted on a (8X8) wheeled chassis, this transporter-erector-launcher (TEL) vehicle fires this missile vertically from the rear of the vehicle to a maximum range of 300 kilometers.

(22) John F. Stewart, Jr. "Desert Storm the Military Intelligence Story: A View from the G-2 3D U.S. Army," (Riyadh, Saudia Arabia: After Action Report, 27 April 1991), 18.

(23) Ibid.

(24) Starr, 266.

(25) FM 100-5, 161.

(26) U.S. Army, TRADOC PAM 525-5B Airland Operations, (Washington D.C.: U.S. Government Printing Office, 13 June 1991), 1-7.

CHAPTER TWO

REVIEW OF LITERATURE AND METHODOLOGY

REVIEW OF LITERATURE

Introduction

Chapter One introduced the research question and defined the scope of this research. Also, Chapter One identified the operational significance of relocateable ballistic missiles in Desert Storm and their implications for future conflicts. The illustrative examples from Desert Storm briefly profiled the unique capabilities of advanced attack helicopter (AAH) units that might prove valuable in countering this threat.

Chapter Two examines the research question: can an advance attack helicopter (AAH) unit find and destroy relocateable ballistic missiles? First, it fully describes relocateable ballistic missiles, what countries have them, and how these weapons might be employed. Second, it examines techniques used to find and destroy these relocatables. Third, since these relocateables are campaign significant, it defines the operational level of war and addresses the military organizations and command relationships from the operational perspective. Fourth, it

describes the attack of relocatable ballistic missiles as operational fires. Fifth, Chapter Two examines the organization and equipment of an advanced attack helicopter (AAH) unit. Six, it examines existing operational and tactical doctrine for employment of an AAH unit. Seven, a deep operations scenario illustrates the tasks that an AAH unit would perform to attack relocateables. The intent of these seven steps is to refine the research question into a hypothesis and test the hypothesis by case study in Chapter Three. Finally, this chapter develops the methodology. It is based on three critical tasks that an AAH unit performs for a deep operation: planning, intelligence, and comand, control, communications (C^3). This methodology is applied in hypothetical case study in Chapter Three.

Relocateables

Relocateable ballistic missiles are mobile and therefore elusive targets that can be employed as single-entities on the battlefield. During Desert Storm, Iraq's relocateables, the Al-Abbas and Al-Hussain ballistic missiles, were high payoff targets of strategic importance (see Chapter One). These unsophisticated relocateables were militarily insignificant because they were unable to strike their intended targets with any accuracy. The circular error probability was 1,600 to 4,800 meters.[1] However, in assessing Iraq's relocatable threat, the after action review

by Brigadier General John Stewart, "Operation Desert Storm the Military Intelligence Story: A View from the G-2 3D U.S. Army," details the operational significance that Iraq's relocateables had in sidetracking the coalition's air operation. After D+7, CENTCOM diverted 40 percent of its sorties to destroy these relocateables.[2] Since Iraq had this success with its unsophisticated relocateables, what is the impact of a more reliable, precise, and lethal system?

Clearly, sophisticated relocateable ballistic missiles, present a major threat to strategic, operational, and tactical centers of gravity. Indeed, "the intelligence community is now scrambling to update threat assessments to take account of the spread of missile technology."[3] In determining the future significance of this threat, the April 1990 issue of International Defense Review has an article that depicts 17 countries from Africa, Middle East, Asia, and South America with ballistic missiles and large rockets (see Figure 2).[4] Since these geographical areas represent locations where America's interests are at stake, it is logical to assume that America will have to confront this reality in future conflicts. It was sobering to realize that over 50 percent of these countries are supplied by the former Soviet Union.[5] In light of the cash shortage among these former Soviet republics, exports of this type weapon may increase exponentially.[6] These trends coupled with Iraq's success in disrupting the coalition's

warfighting effort were critical in establishing the significance of relocatable threat.

Country	Payload	Range	C.E.P.	Supplier	Status
Egypt					
FROG-7	450kg HE	65km	400m	USSR	In service
Scud-B	500kg HE	300	900	USSR	In service
Badr-2000	450kg HE	800	N/A	Egypt & Argentina	Development
Iran					
Scud-B	500kg HE	300	900	USSR & Korea	In service
Iran-130	N/A	130	N/A	Iran & China	In service
Iraq					
Scud-B	500kg HE	300	900	USSR	In service
Al-Hussain	N/A	600	1600-3200	USSR	In service
Al-Abbas	N/A	900	3200-4800	USSR	In service
Condor II	450kg HE	800-965	N/A	Argentina	Development
Israel					
Jericho	100kg HE	650	N/A	Israel	In service
Lance	270kg HE	130	365	US	In service
Libya					
FROG-7	450kg HE	65km	400m	USSR	In service
Scud-B	500kg HE	300	900	USSR	In service
Syria (same as Libya)					
India					
Pothvi	1000kg HE	240	N/A	India	Development
Agni	N/A	2400	N/A	India	Development
North Korea (same as Libya)					
Taiwan					
Sky Horse	HE	1000	N/A	Taiwan	Development
Argentina					
Condor I	400kg HE	100	N/A	Argentina	Development
Brazil					
MB/EE-150	500kg HE	145	N/A	Brazil	Development

Figure 2. Ballistic Missiles and Large Rockets

Hunting Relocatables

The body of knowledge about hunting relocateable ballistic missiles is understandably scant. It was not until Desert Storm that relocateables became a threat of campaign importance. Therefore, what is written is found in periodicals and after action reviews about Desert Storm.

There is no material about advanced attack helicopter (AAH) units employed to find and destroy relocateable ballistic missiles. However, an article entitled "USAF F-15Es Lead Night Attack Effort Against SCUD Launchers" in the February 18, 1991 issue of Aviation Week & Space Technology provides clues to hunting these elusive targets. Armed with pictures of SCUD launchers, F-15E pilots were to recognize these targets.[7] During daylight hours, Iraq quickly realized their relocateables had to find cover to avoid detection. In a featureless desert this was a challenge. Positioned under bridges and in built-up areas, relocateables were difficult to find. F-15E pilots would focus on these areas that were typically used by relocateable launchers.[8] Directed by Joint Surveillance Targeting Attack Radar System (JSTARS), the F-15Es were positioned to destroy launchers that just fired.[9] These are valuable clues that may help develop techniques for advanced attack helicopters (AAHs) to attack relocateables.

Army aviation after action reviews (AARs) from Desert Storm provide three illustrative examples that demonstrate the ability of advanced attack helicopters (AAHs) to successfully attack both stationary and moving target sets. This is significant because stationary and moving define the two states of nature of relocateables. These illustrative examples from Desert Storm: the Battle of the Causeway, the attack on Iraq's early-warning radar, and the attack on Silkworm missiles provide clues to hunting relocateables.

Battle of the Causeway: Supporting General Schwarzkopf's operational objective to destroy Iraq's military, the aviation brigade of the 24th Division in a little more than five hours executed unprecedented lethal attacks on Iraqi forces as they fled Basrah.[10] This tactical battle, better known as the Battle of the Causeway, clearly illustrated the inherent mobility, and exacting lethality of Army aviation. These capabilities are especially critical when developing the situation in a cease-fire.

"On 2 March (forty-eight hours after the cease-fire) the major battle for us took place with the Hamurabi Division at the Rumalla oil fields."[11] The mission was to stop the movement of vehicles north across the causeway.[12] In a hour from mission receipt, D Troop, an air cavalry unit, makes contact with vehicles crossing the causeway. Hovering to view the situation, D Troop Commander is

instructed to fire warning shots.[13] This warning action did not stop vehicle movement. To futher develop the situation, the lead vehicle on the dike is engaged; it was an ammunition truck that exploded and stopped the movement of vehicles across the causeway.[14]

Meanwhile, 1-24th (AH-64) Battalion, occupied battle positions approximately four miles away from the targets.[15] Destroying four vehicles at the choke point, the AH-64s prevented vehicles from crossing the causeway.[16] In four hours, two AH-64 companies fired 107 hellfire missiles with five misses.[17] "Intelligence had it from a captured Iraqi tank commander that when the first vehicle exploded, they looked around and couldn't find out what was killing it."[18]

Analysis: This episode of Army aviation captures the versatility of the AAH employment. In terms of time, the air cavalry was on the scene and made enemy contact within one hour of notification. The ability to rapidly traverse the battlefield and respond to fluid situations is an advantage of the helicopter. Because of the political necessity to abide by the cease-fire, the situation must be assessed before an attack is sanctioned. "One of the most important and enduring requirements for combat commanders is to 'see' the battlefield before decisive engagement."[19] The ability to hover at survivable standoff distances, fire

warning shoots, observe the enemy's response is unique to advanced attack helicopters (AAHs).

As hostilities ensued, 1-24th attacked the target set with impunity: as evidenced by the initial destruction of the four vehicles at the choke point which prevented enemy movement across the causeway. Denying the Iraqis an escape route, attacked a vital enemy center of gravity. They were stuck. Futhermore, the Iraqis were demoralized because they could not discern what was destroying them. This frustration caused many Iraqis to flee their vehicles. Firing 107 Hellfire missiles with five misses resulted in an impressive 95 percent hit.[20] With an unbroken view of the target set, the AAH battalion was able to destoy Iraqi vehicles as personnel escaped. This minimized casualties while accomplishing General Schwarzkopf's objective of destroying Iraq's military capability. Recorded on gun camera tapes, the politcal payoff of this compassionate attack is clear.

By contrast, fixed-wing aircraft can arrive at the scene faster; however, they lack the ability to develop the situation. Because of their high-speed flight, fixed-wing aircraft have a brief view of the target. They must circle the target to remain in contact. Each pass requires fixed-wing aircraft to break contact and reacquire the target to develop the situation. This technique is not condusive to survivability. Therefore, fixed-wing aircraft

can not be expected to accomplish a mission where the target set must be assessed and probed before attack is justified.

AH-64 Attack of Iraq's Early-Warning Radar: Iraq had a credible air defense umbrella that had to be defeated before air attacks on Baghdad commenced.[21] To open an air corridor, General Schwarzkopf approved a mission for AH-64s to destroy two early-warning radar stations.[22]

> At precisely 2:20 Saudi time Jan. 17, two teams of helicopters nicknamed Task Force Normandy--each with 2 CH-53 Pave Lows and 4 AH-64's--crossed the Iraqi border. Flying with night vision equipment, the teams zig-zagged around bedouin camps to avoid being heard, ducked into wadis to fly under Iraqi radar coverage, and weaved through a maze of Iraqi observation posts.[23]
>
> Achieving complete surprise, the Apaches fired 27 Hellfire missiles completely destroying both radar sites and creating a corridor for use by the allied aircraft to begin Desert Storms's air campaign. In addition to Hellfire missiles, the Apaches fired 2.75 rockets and 30mm ammunition on a mission that took 15 hours and covered 950 nautical miles round trip. All eight Army helicopters completed their mission with no damage.[24]

Because of the campaign importance of this mission, Task Force Normandy consisted of two MH-53HJ (Pave Low III) Helicopters, eight AH-64 (Apache) Helicopters, and several special operating force (SOF) soldiers. Using its forward looking infrared (FLIR) visionics, inertial navigation system, and new doppler navigation system, terrain-following radar, and terrain-avoidance radar the Pave Lows provided

long-range, low-level, precise navigation.[25] Also, the Pave Lows provided the long-range, secure communications for the Task Force.[26] Delivered to their battle positions by the Pave Lows, The AH-64s destroyed the target set: the radar sites and associated communications facilities. The SOF dismounts verified the destruction of the target set.

OH-58D Attack of Silkworm Missiles: Iraq positioned Silkworn missile batteries on Faylaka Island and along the northern coast of Kuwait.[27] This naval threat precluded mine sweeping and naval gunfire support operations.[28] After attacking these missiles with numerous carrier-launched attack aircraft, battle damage assessment confirmed by an unmanned aerial vehicle (UAV) revealed that no Silkworm missiles were destroyed.[29]

On the night of 16 February 1991, to verify what the UAV saw, two armed OH-58Ds, Kiowa Warriors, conducted armed reconnaissance of the island.[30] Under the cloak of darkness, these aircraft confirmed the UAV report. Undetected and within range, the OH-58Ds were told by the Navy Task Force commander to attack the Silkworm missiles.[31] One OH-58D launched two Hellfire missiles and destroyed one Silkworm and knocked another off its launcher.[32] This tactical engagement had campaign significance because it provided this Navy Task Force freedom to pummel Iraqi positions in Kuwait with naval gunfire.

In conclusion, the Battle of the Causeway demonstrated the unique abilities of the advanced attack helicopter (AAH) unit to assess, record, and systematically attack (with a 95 percent probability of hit) a moving target set with complete impunity. The Iraqi early-warning radar attack is proof that an AAH unit can find and destroy a stationary target set at night at an operational depth of 475 nautical miles. Finally, the Silkworm missile attack is proof that AAHs have a unique ability to find and destroy stationary ballistic missiles at night. Collectively, these examples reason that AAHs have the capability to find moving relocatable missiles at operational depths at night. Furthermore, each of these illustrative examples was operationally significant.

Operational Level of War

There are three levels of war: strategic, operational, and tactical. The strategic level establishes the national or alliance security objectives, sequences initiatives, and defines the use of military and other instruments of power: economic, political, and informational.[33] Operational level of war is the employment of military forces to achieve the strategic objectives in a theater of war.[34] "Its essence is the identification of the enemy's operational center-of-gravity--his source of strength or balance--and the concentration of superior combat power against that

point to achieve a decisive success."[35] Operational art coherently links the strategic objectives to tactical means through a campaign plan.[36] The tactical level involves battles and engagements to accomplish military objectives.[37]

By recognizing and defining the operational importance of relocateables in future conflicts, it begs the question: how does the military employ advanced attack helicopters to defeat this threat? It begins with a campaign. A campaign is: "A series of related military operations aimed to acccomplish a strategic or operational objective within a given time and space."[38] These military operations may involve the synchronized support of ground, air and naval operations that optimize the use of all available combat, combat support, and combat service support forces to achieve the requirements of the campaign plan.[39] A campaign is the vehicle a theater commander-in-chief (CINC) uses to transform broad strategic guidance into incisive instructions. Furthermore, a campaign is the CINC's vision for the war from the beginning through its phases to achieve the strategic objective and desired end state (see Figure 3).[40]

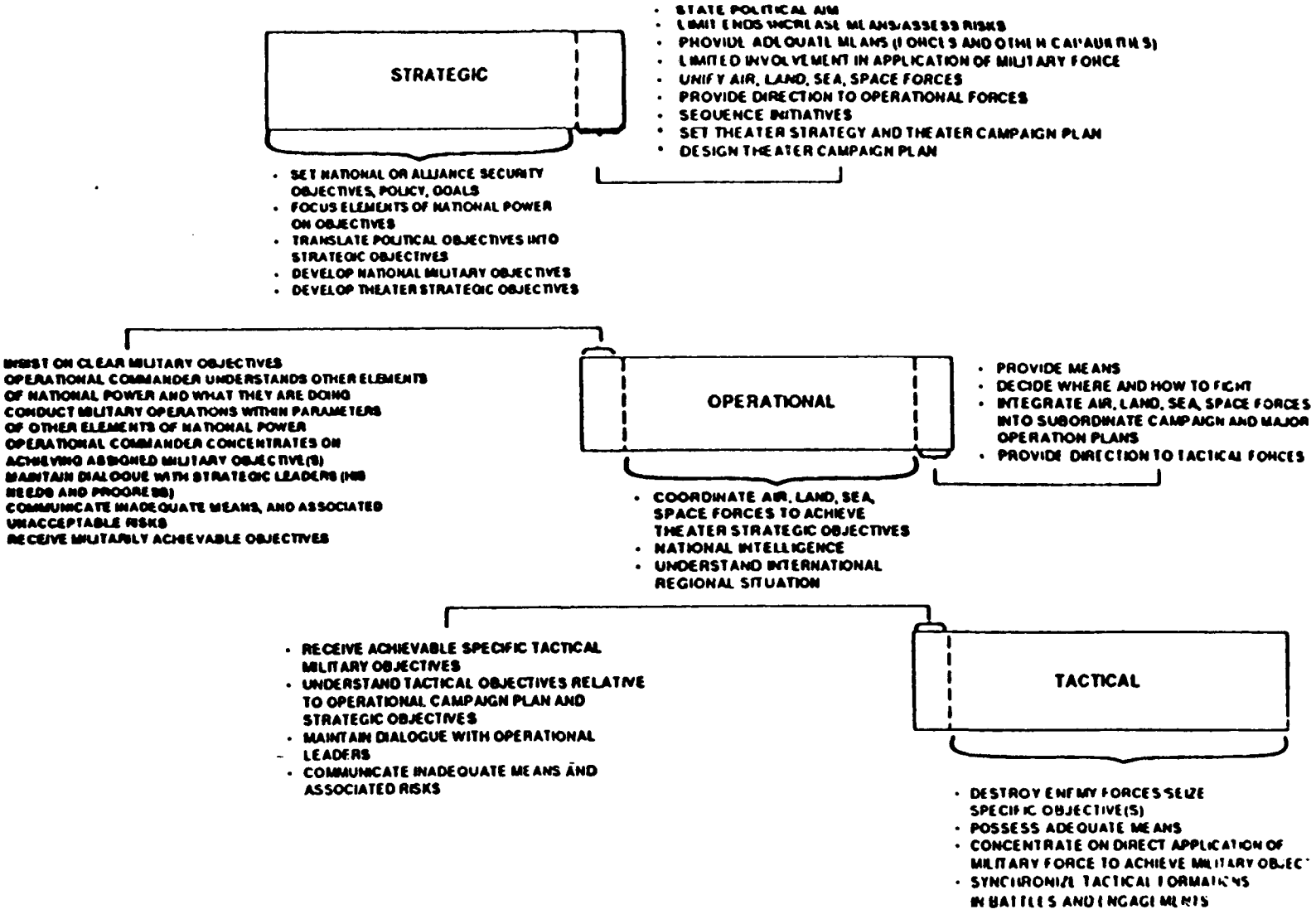

Figure 3. Levels of War

By way of illustration, General Schwarzkopf (the theater of war commander-in-chief in Desert Storm) had to devise a campaign plan that satisfied four rigid criteria (strategic guidance) as developed by the coalition governments. "First--It had to eject Iraqi forces from Kuwait; Second--It should remove the strategic capability for Iraq to forcefully meddle in its neighbors' affairs; Third--If at all possible, it should avoid destroying Kuwaiti cities or industry, or injuring Kuwaiti civilians; Finally--the war had to be over quickly, with low friendly casualties."[41]

To achieve that criteria, General Schwarzkopf developed a four-phased campaign plan consisting of air and ground operations.

> Phase One would be an air attack on Iraqi command control and communications, attempting to sever Hussein from his forces in Kuwait. Simultaneously, air power would destroy the Iraqi Air Force and air defense system. In addition, Phase One included attacks to destroy Iraqi chemical, biological, and nuclear weapons facilities.
>
> Phase Two would be a massive, continuous air bombardment of Iraqi supply sites, and transportation infrastructure designed to cut off the Iraqi forces from their supplies.
>
> Phase Three would be an air attack on the Iraqi ground forces of 430,000 men, and on the Republican Guard.
>
> Phase Four was the ground assault to eject the Iraqi Army from Kuwait and destroy Iraq's capability to destabilize the region with ground forces.[42]

These instructions coordinated the military effort for General Schwarzkopf's subordinate commanders and allowed them to develop their supporting plans.[43] In Desert Storm, General Schwarzkopf chose to organized U.S. military forces as service component commands (see Figure 4).[44]

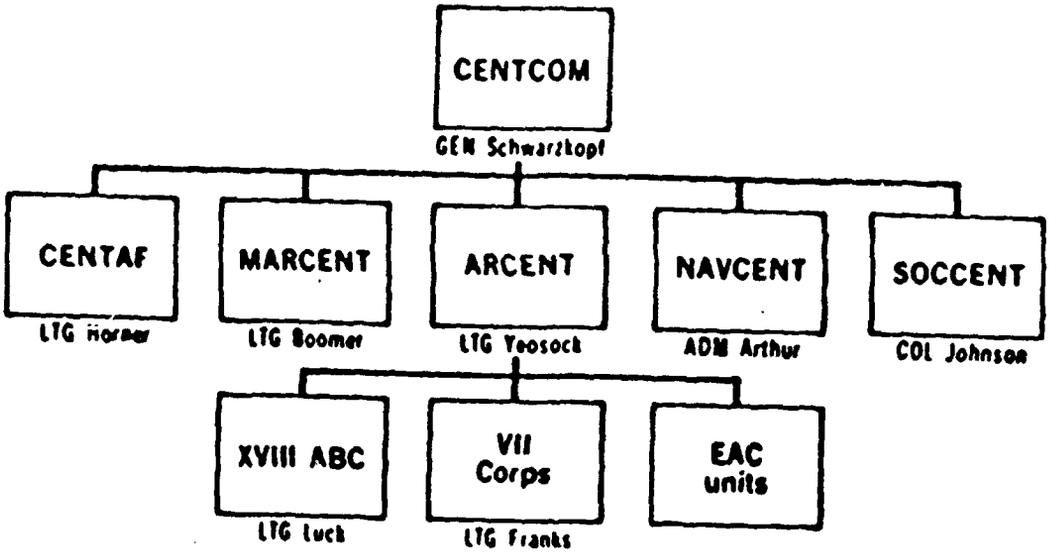

Figure 4. Central Command: Command and Control

"Third Army formed EAC units when a requirement existed for specific missions and functions outside the corps' tactical warfighting capabilities or when functional organizations were needed to coordinate or supplement existing corps capabilities."[45] The echelon above corps (EAC) units include an aviation brigade (see Figure 5).[46] Finding and destroying relocateable ballistic missiles are unique and operationally significant. Therefore, if an advanced attack helicopter unit is assigned this mission, perhaps the logical placement for this unit is in this EAC structure.

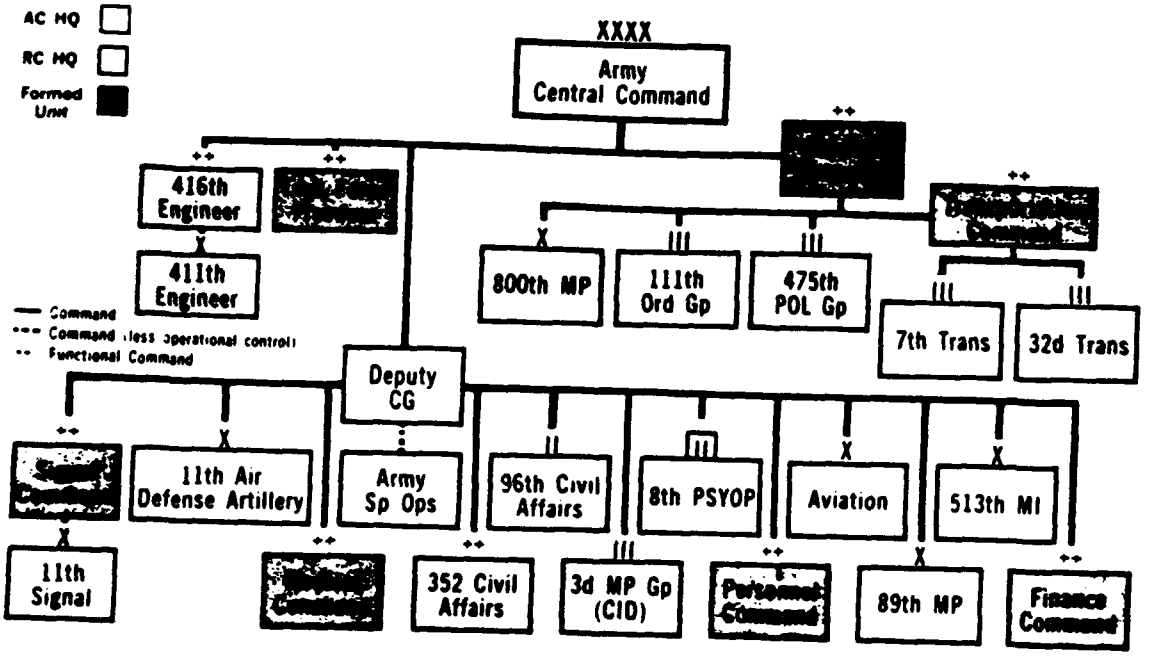

Figure 5. EAC Command and Control

Operational Fires

Since operational planning concentrates on design of campaigns, it begs still another question: what is considered operational? Fortunately, there is a definitive manual that addresses that very issue. TRADOC PAM 11-9, Blueprint of the Battlefield, states that in the operational blueprint there are six operating systems: operational movement and manuever, operational fires, operational protection, operational command and control, operational intelligence, and operational support (see Figure 6).[47]

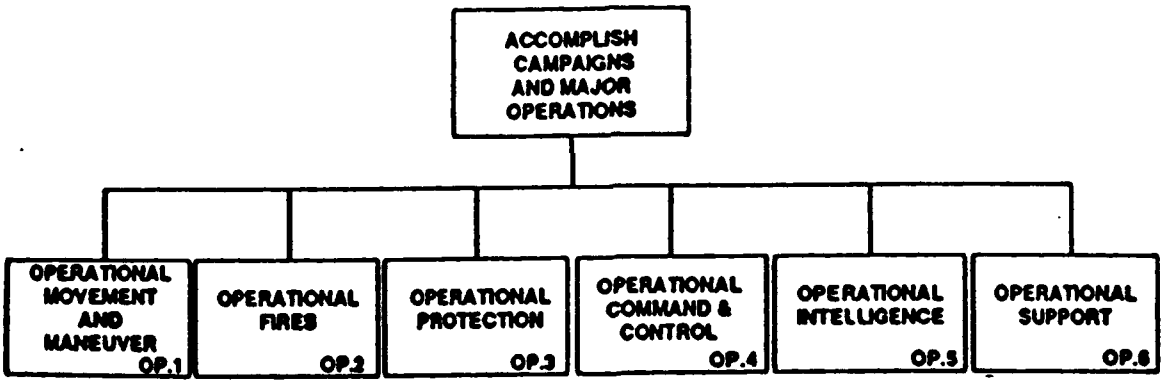

Figure 6. Operational Level of War Operating Systems

Of these six operating systems, advanced attack helicopters (AAHs) logically fit the operational fires operating system as described in TRADOC PAM 11-9 (see operational fires in chapter one). "Operational fires include processing land, air and sea targets whose attack will have a major impact on a campaign or major

operation."[48] Typically, these land, air and sea targets are located deep within enemy territory. For instance, the AH-64 attack on Iraqi early-warning radar sites occurred 475 nautical miles deep. There are three means that to prosecute operational fires: Army Tactical Ballistic Missiles (ATACMs), air interdiction (AI), and attack helicopters.

The ATACMs has an unclassified effective range of 150 kilometers.[49] It is fired from the same vehicle as the multiple launched rocket system. There are three types of munitions. Block one is antipersonnel and antimateriel munition designed to kill lightly armored, stationary targets.[50] It is not a smart munition because it does not employ sensors.[51] Block two is a smart terminally guided submunition designed to engage moving armored targets, but it is not fully fielded.[52] There is a preplanned product improvement munition to engage enemy surface-to-surface missile systems (see Figure 7).[53]

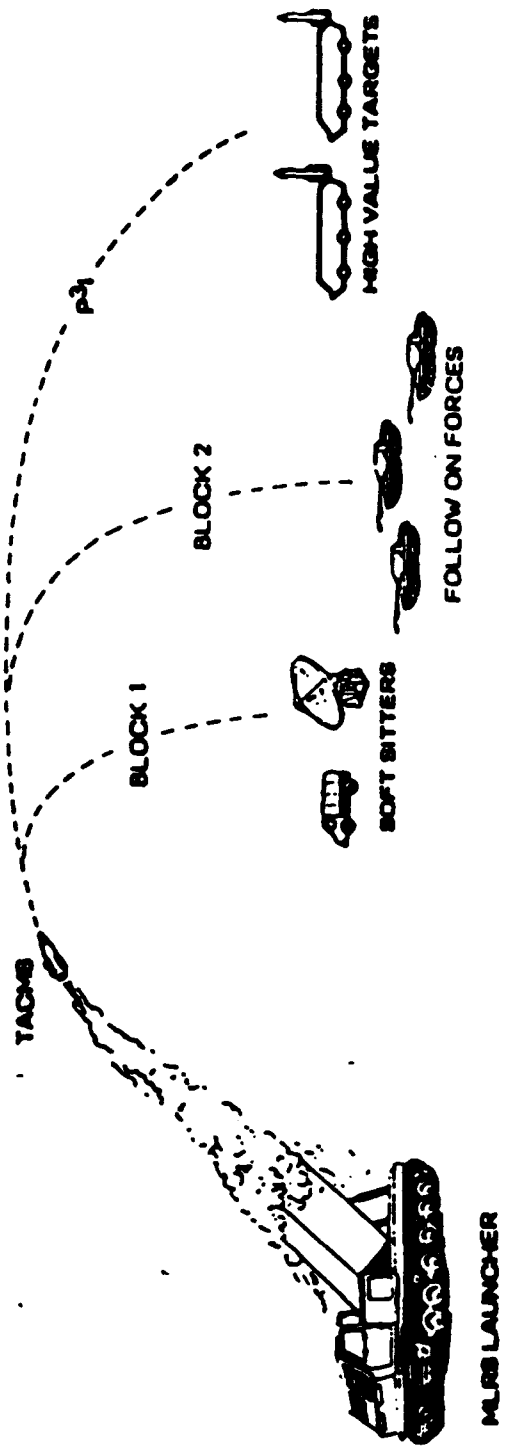

Figure 7. U.S. Army Tactical Missile System

Air interdiction (AI) is air attack to destroy, neutralize, or delay enemy potential before it can influence friendly forces.[54] By its nature the targets are at such a distance that detailed coordination with fire and maneuver of friendly forces is not required.[55] Since there are a multitude of aircraft and munitions available to do this mission, the planning cycle varies from 8 to 36 hours which allows the air commander to fully plan for the attack.[56]

As demonstrated during Desert Storm, advanced attack helicopters (AAHs) are campaign significant and are clear players in operational warfare. The illustrative examples from Desert Storm prove that AAH units have defined importance not only to the land component but to the air, and sea components as well. Directly affecting the warfighting capabilities of the land, sea and air components, it is logical to assume that AAH units should be a significant factor in a theater commander-in-chief's (CINC) campaign design.

Organization and Equipment of an Advanced Attack Helicopter Battalion

These battalions may be assigned to all three types of aviation brigades: division, corps, and echelon-above-corps. Divisional aviation brigades are structured with one or two advanced attack helicopter (AAH) battalions; corps aviation brigades are structured with one or two attack

groups comprised of two or three AAH battalions each; echelon-above-corps aviation brigades may consist of two AAH battalions.[57] The organization of an AH-64 equipped attack helicopter battalion (ATKHB) is the same for all AH-64 battalions regardless of assignment (see Figure 8).[58]

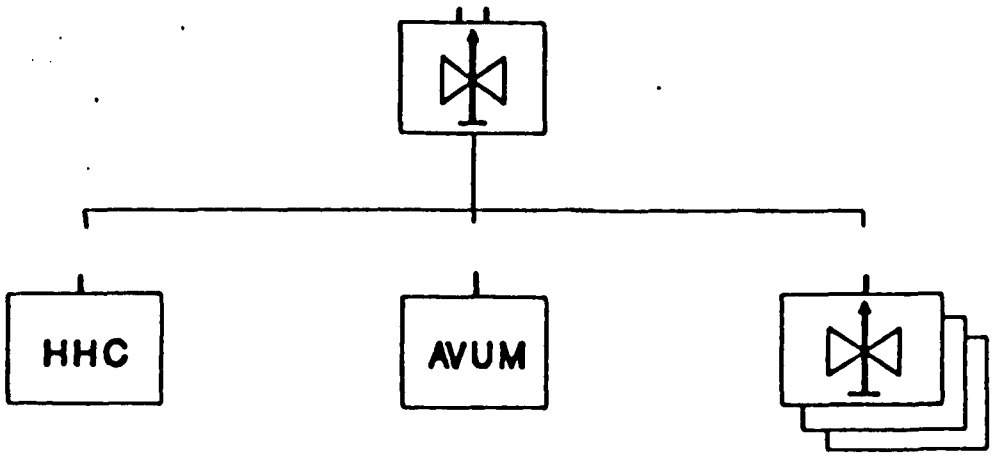

Figure 8. Organizational Structure of an ATKHB

The headquarters and headquarters company provides the command and control, logistical support, and ground maintenance support for the battalion, and the aviation unit maintenance company provides unit-level aviation maintenance for battalion aircraft.[59] The three attack helicopter companies provide antiarmor, antipersonnel, antimateriel, and air-to-air destruction capabilities for the battalion.[60]

Equipped with 18 AH-64s, 3 UH-60, and 13 OH-58s, the attack helicopter battalion's best helicopter to find and destroy relocateable ballistic missiles is the AH-64. By definition the AH-64 is an attack helicopter that can be armed with 1200 rounds of 30 millimeter gun ammunition, 8

Hellfire missiles, and (38) 2.75-inch FFARs (folding-fin aerial rockets).[61] The number of Hellfire missiles may be doubled by deleting the rocket load. Similarly, the 2.75-inch rockets may be doubled by deleting the Hellfire load (see Figure 9).[62]

* PNVS: Pilot's Night Vision System
  * Allows night flight with no illumination
  * Uses infrared energy for image
* TADS: Target Acquisition and Designation System
  * Three sensors:
  * FLIR: [forward looking infrared] up to 36 power magnification
  * TV: up to 126 power magnification (Day only)
  * DVO: Direct View Optics, up to 18 power magnification (Day only)
  * Laser designator and range-finder
  * Video recording capability
* AGM [antitank guided missile] 114-C Hellfire Missile
  * Maximum range of 8 kilometers
  * Defeats all known armor
  * May be employed autonomously or by a remote designator
  * High hit/kill probabilities (classified) [63]

Figure 9. AH-64 Apache: Advanced Attack Helicopter

The Army is developing the Longbow System for the AH-64. Longbow incorporates a millimeter-wave radar that sees through adverse weather and electro-optical countermeasures.[64] "The FCR [Fire Control Radar] enables the Longbow Apache to classify targets (i.e., tracked, wheeled, air defense, hovering, flying), prioritizes them, and then conduct multiple engagements with RF [radio frequency] Hellfire missiles...."[65] It has two search

modes: a 360 degree air search and a 90 degree ground search.[66] "The FCR also has a ground mapping mode which the Apache's pilot can use for terrain avoidance and obstacle detection while flying in poor weather conditions."[67] This capability will greatly enhance the ability for Longbow equipped aircraft to find and destroy relocateable ballistic missiles (see Figure 10).[68]

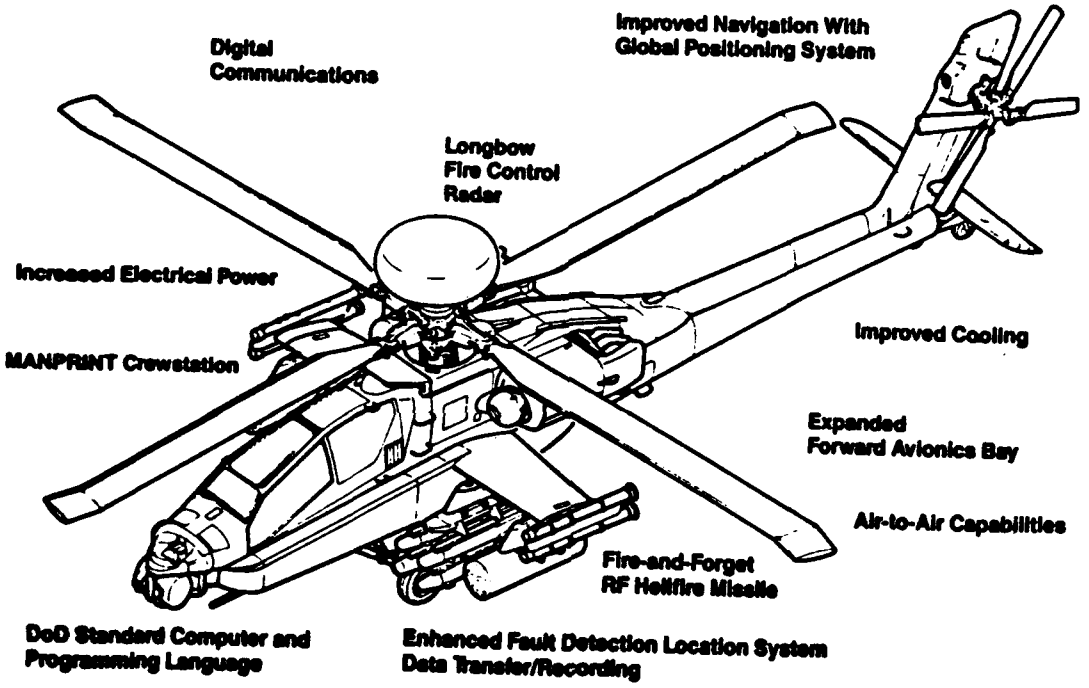

Figure 10. Longbow Apache

By contrast, the UH-60 is by definition a utility helicopter that is designed to haul personnel and cargo. In the attack helicopter battalion (ATKHB), the UH-60 serves as a command and control platform and logistics transport.[69] The UH-60 may be armed with two 7.62 caliber machineguns in each cargo door; however, it does not have an advanced

optical capability. Also, the OH-58C is an observation or scout helicopter. Unlike the OH-58D, Kiowa Warrior, the OH-58C is not armed nor does it have any enhanced optical capability.[70]

Employment of Advanced Attack Helicopters

Operational Employment: Having examined joint and Army doctrine alike, there exists no specific material about the operational employment for attack helicopter units. However, interpreting the operational doctrine in FM 100-5, Operations there are important precepts that apply to an advanced attack helicopter (AAH) unit. Operational warfare seeks to identify and attack enemy centers of gravity to achieve strategic objectives.[71] These centers of gravity are attacked by the operational commander's campaigns.

Desert Storm was testimony to the operational value of advanced attack helicopter (AAH) employment in both air and ground operations. This value coupled with the combat power of an AAH unit is campaign significant. This concept has not been articulated in doctrinal manuals.

"Air Attack on the Modern Battlefield" is a conceptual paper which addresses an important concept: command and control of an advanced attack helicopter (AAH) unit. An assigned combat element of a corps, an AAH unit is an extension of ground combat power. Therefore, AAHs are not apportioned or allocated; they are controlled by the Army.[72]

Further, this white paper addresses the two most important factors that help the decision for employing attack air; these factors equally apply to the operational employment of an AAH unit:

* The flexibility of attack air to strike crucial targets across the depth and breadth of the battlefield.

* Concentration of attack air to achieve results will have the greatest effect.[73]

Tactical Employment: The Corps Deep Operations Handbook and the deep operations appendixes of Field Manuals 1-111 and 1-112 are the only doctrinal sources for employing AAHs deep. These sources only discuss deep operations for a corps aviation brigade. An unpublished paper by Lieutenant Colonel Patrick Bennett, a former AH-64 squadron commander, provides substantive techniques from his experience in conducting corps-level, deep operations. His paper entitled "AH-64 (Apache) Battalion 'Deep Attack' Tactics, Techniques, and Procedures" articulates planning, intelligence, command and control requirements. These documents meld doctrine and experience to serve as a benchmark in developing a methodology.

General Crosbie Saint and Major General Walter Yates pioneered corps deep operations with advanced attack helicopters (AAHs). In the July 1988 issue of Military Review, they coauthored "Attack Helicopter Operations in the

Airland Battle: Deep Operations". Their article provides lessons learned through experience in planning and executing deep operations in III Corps. They cite the day-night, limited visibility ability of AAHs to find and destroy moving target sets as a great capability that battlefield air interdiction can not match.[74] To understand the time and distance factors of employing AAHs deep, General Saint and Major General Yates developed a AH-64 mission profile chart (see Figure 11).[75]

Time Distance Factors

Distance	Speed	Ingress Time	Station Time	Egress Time
100 KM	120 KTS	LOW LEVEL/ CONTOUR 26 MINS	NOE 60 MINS	LOW LEVEL/ CONTOUR 26 MINS
120 KM	120 KTS	LOW LEVEL/ CONTOUR 33 MINS	NOE 46 MINS	LOW LEVEL/ CONTOUR 33 MINS
150 KM	120 KTS	LOW LEVEL/ CONTOUR 43 MINS	NOE 26 MINS	LOW LEVEL/ CONTOUR 43 MINS
*300 KM	120 KTS	LOW LEVEL/ CONTOUR 86 MINS	NOE 36 MINS	LOW LEVEL/ CONTOUR 86 MINS
**450 KM	120 KTS	LOW LEVEL/ CONTOUR 129 MINS	NOE 46 MINS	LOW LEVEL/ CONTOUR 129 MINS

Figure 11. AH-64 Mission Profiles

* Note: During Desert Storm AH-64s attached a 230 gallon auxiliary fuel tank to the right wing store on the inboard hard point. This increased AH-64 endurance by 96 minutes.

This increased range costs one wing store of ammuntion: (4) Hellfire missiles, or (19) 2.75 rockets.[76]

** Note: This is accomplished by adding another 230 gallon auxilary fuel tank to the left inboard wing store. This increased range costs another wing store of ammuntion: (4) Hellfire missiles, or (19) 2.75 rockets.

General Saint authored another article "Central Europe Battlefield 2000: the Combat Helicopter" in Army Avaition that examines the value of the aviation brigade to the corps commander. To him, the aviation brigade is a corps maneuver force to maintain the initiative and to shape developing operations.[77] Indeed, it is the corps force with the greatest capability to maneuver combat power over large distances in the least time.[78] This comment coupled with his earlier discussion about the limits of battlefield air interdiction lends credibility to countering arguments that fixed-wing aircraft can do a better job finding and destroying relocateables.

Finally, all of these clues help to understand the operational employment possibilities of advanced attack helicopter (AAH) units. However, to grasp the realm of operational possibilities, one must understand the tactical employment of an AAH unit.

Deep Operations Scenario

Deep Operations as executed by a U.S. corps AAH battalion closely parallel the probable techniques and procedures to attack relocateable ballistic missiles. In

this scenario, the corps commander wants to attack the second-echelon tank division of the 28th Combined Arms Army. Attacking enemy follow-on-forces is an appropriate mission for an attack helicopter group of a corps aviation brigade.[79] Advanced attack helicopters (AAH) normally attack at night and require 24 to 48 hours of planning time.[80] There are several key processes in deep operations: intelligence, planning, command, control and communications (C^3), supression of enemy air defenses (SEAD), and the attack.

Intelligence: To support aviation operations, the corps intelligence preparation of the battlefield (IPB) must include terrain analysis to determine the effects of terrain on friendly and enemy operations. Enemy dispositions should be templated to reflect the situation at the time of the attack.[81] Named areas of interests are developed to indentify enemy courses of actions.[82] Targeted areas of interests become the engagement areas for the attack helicopters, and decision points are selected based on friendly response times and enemy movement rates.[83] Especially critical to Army aviation are weather and illumination because they impact night vision devices and Hellfire missile effectiveness .[84]

To ensure success, analysis of relative combat power must be developed. This is a comparison of combat power of

the attack helicopter battalion (ATKHB) to a tank regiment.[85] A tank regiment has about 150 combat vehicles.[86] If this regiment has a 90 percent operational ready vehicles, it can fight 135. Attacking the tank regiment with 192 Hellfire that has a hypothetical probability of hit of .6, the ATKHB can expect to destroy 115 vehicles.[87] This is a quick means to measure attack helicopters success (see Figure 12).[88]

TANK REGIMENT	150 CBT VEH	X (0.9) (OR RATE)	= 135 CBT VEH
ATKHB	192 HELLFIRE	X (0.6) (Ph)	= 115 CBT VEH
		REMAINING TANKS	= 20 CBT VEH

Figure 12. Relative Combat Power

Planning: Planning occurs concurrently with intelligence preparation of the battlefield. Based on experience gained from Lieutenant Colonel Bennett in III Corps, a deep attack mission planning begins at the Corps Collateral Operations Center, where the corps staff along with the corps aviation brigade representatives identify potential deep attack targets based on the corps commander's guidance.[89] "Initial route planning is completed and issued as the Air Coordination Order, which is published every 8 hours."[90] Initial route planning may include holding areas, passage points along the front line of troops, battle

positions, engagement areas, forward assembly area, and forward arming and refueling points.[91]

Upon receipt of the warning order, the battalion establishes a new forward assembly area (FAA) and forward arming and refueling points (FARPs) to locations that best facilitate the accomplishment of the anticipated mission.[92] The FAA and FARPs should be positioned at night to enhance security and positioned outside the range of enemy medium artillery for protection.[93] Figure 13 depicts route planning measures.[94]

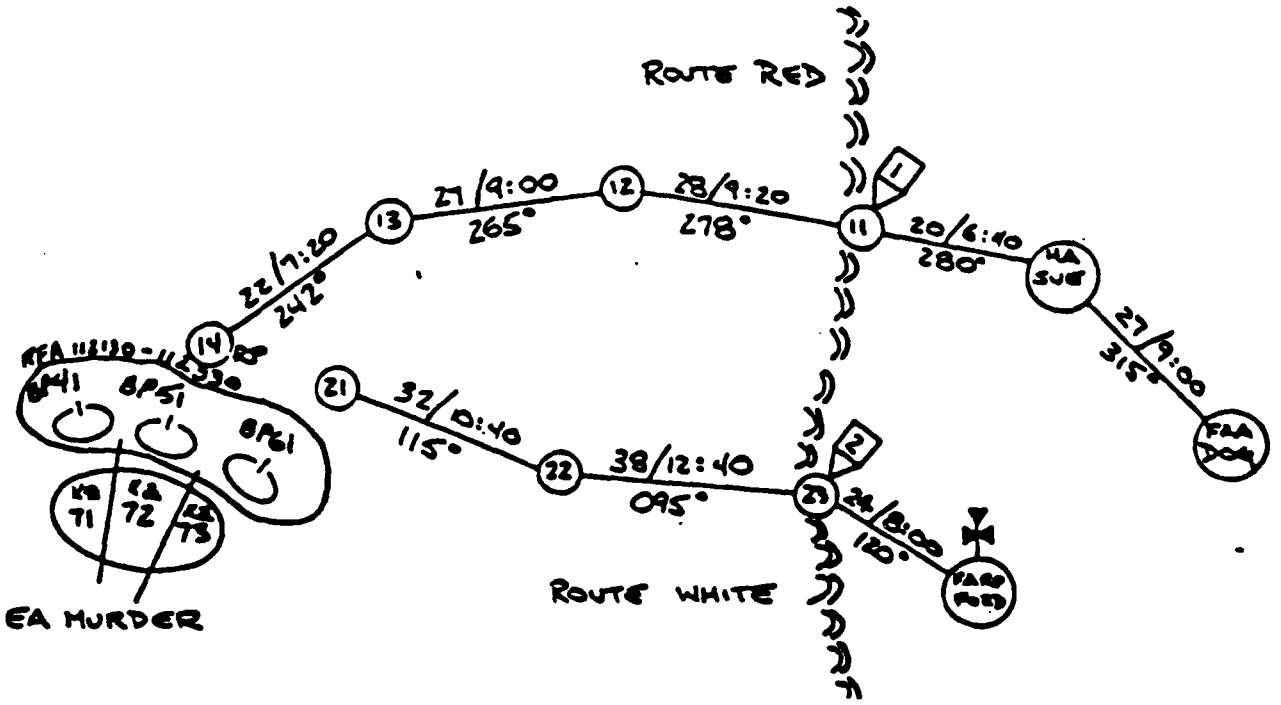

Figure 13. Sample Route Planning Sketch

Command, Control, and Communications (C^3): For deep operations, the aviation brigade should locate its tactical command post three to five kilometers from the corps

tactical operations center (CTOC).[95] To expedite C^3, the advanced attack helicopter (AAH) group locates a tactical comand post in proximity of the forward assembly area.[96] Depending on the size of the mission, the AAH group commander may command and control the operation from an airborne tactical command post (UH-60).[97]

The battalion commander serves as the on-scene commmander. Therefore, he must be positioned in the flight to best command and control the attack. Based on the actual deep operations flown by Lieutenant Colonel (LTC) Bennett, command and control during execution is best from a specially equipped UH-60.[98] LTC Bennett states that the AH-64A is ill-suited to command and control the Deep Attack because the high cockpit task load and poor organic radio range associated with the Apache dictate that the squadron commander utilize a UH-60.[99] Modified with a turret-mounted, forward looking infrared (FLIR) system, a portable Automatic Target Handover System (ATHS), and the AN/ASC-15B Command and Control console, the UH-60 greatly enhances command, control and communications.[100] The FLIR enables the UH-60 crew to fly when low light levels limit night vision gogles (NVGs), and it allows the commander to view and film the battle.[101] The ATHS provides digital communications between ground and air systems.[102] The Command and Control console provides additional long-range, multimode radio capability.[103]

In deep operations, communication with forward-deployed AAHs and command posts is a great challenge. The necessity to have real-time, combat information requires the AAH battalion commander to constantly communicate. Without a AN/ASC-15B Command and Control console, the Guardrail V can relay using UHF radio intelligence updates from the corps tactical operations center to the advanced attack helicopter (AAH) group and battalion commander.[104] Figure 14 illustrates the communications architecture.[105]

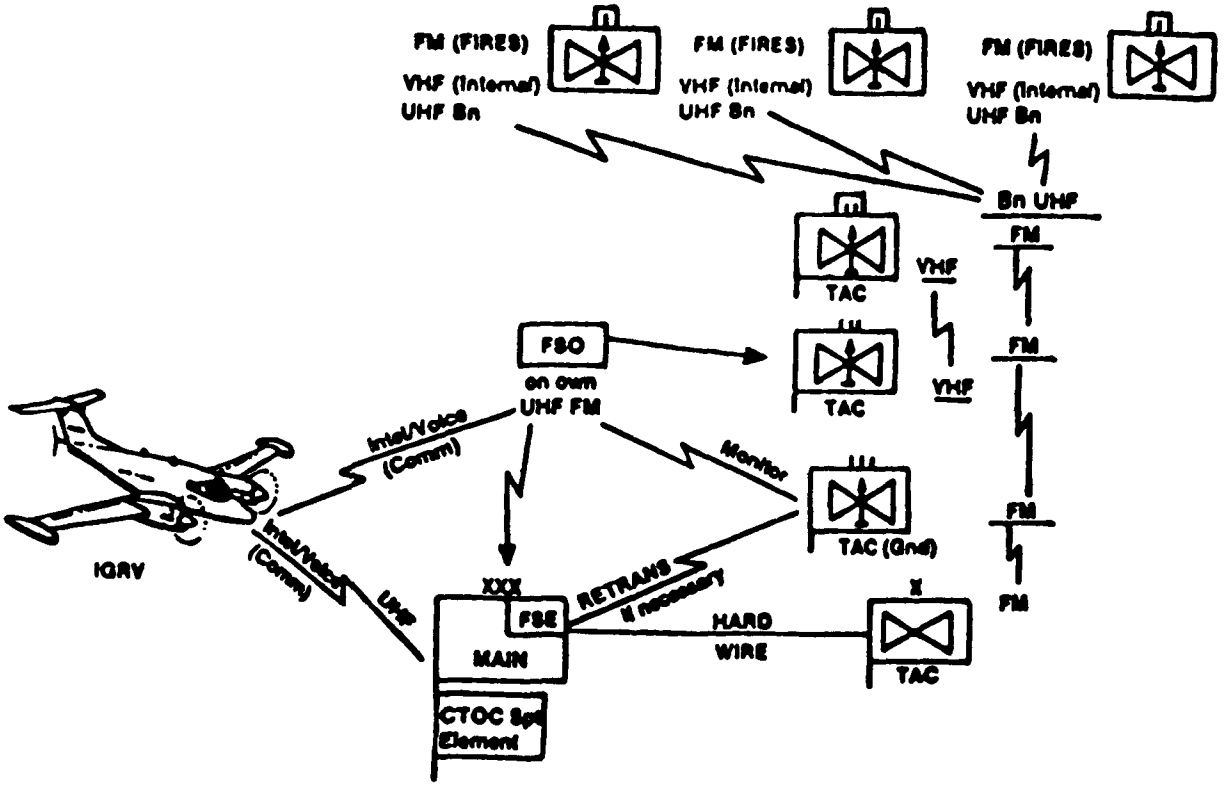

Figure 14. Aviation Communications

Suppression of Enemy Air Defenses (SEAD): SEAD involves both the lethal and nonlethal means of suppressing enemy air defense.[106] An effective SEAD plan requires the corps staff to conduct a thorough intelligence preparation

of the battlefield to determine the number, type, and location of air defense systems that pose a threat to the advanced attack helicopters' (AAHs) movement along their ingress and egress routes and at their battle positions at the time of the operation. Next, the corps staff determines what assets are capable and available at the time of the deep operation to suppress these enemy air defense systems.

The Attack: The attack represents the point of the spear which is the essence of a deep attack. It ivolves three distinct actions: intelligence collection at the objective, target engagment, fire distribution and control.[107] Intelligence collection at the objective requires all sensors to report to the advanced attack helicopter (AAH) battalion as it arrives in the battle position.[108]

Target engagement is best initiated by using AAH remote fires because they surprise and confuse the enemy which allows the commander to assess the target set.[109] Then the forward team of AAHs designators may fire autonomously to destroy any threats to the AAHs. If complete suprise exists, the remote AAHs should move forward and join the designators. This allows all the AAHs to fire autonomously which reduces the total engagement time.[110]

Fire distribution and control prevent multiple shots on the same target. The engagement area should be divided into

kill zones for prepositioning of the AAH's Target Acquisition and Designation System (TADS).[111] These boundaries should correspond to easily identifiable terrain features (see Figure 15).[112]

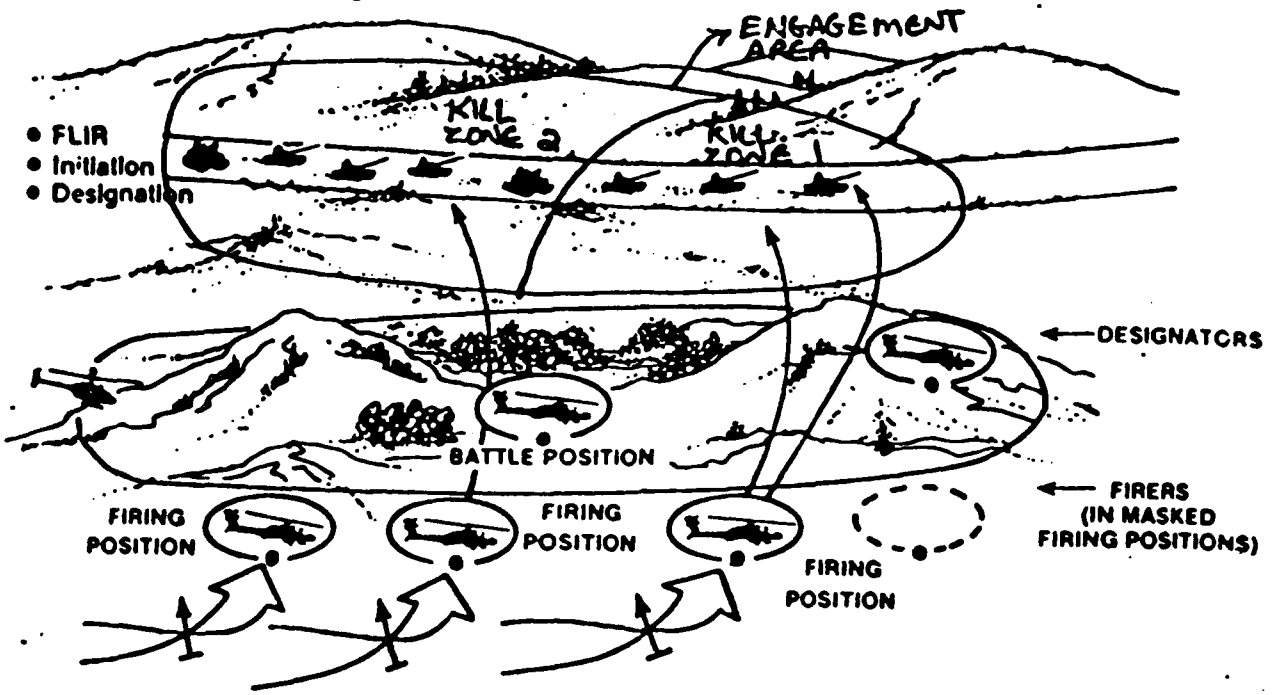

Figure 15. Target Engagement and Fire Distribution

Conclusion

In conclusion, relocateable ballistic missiles continue to evolve and clearly represent a future threat of campaign significance. Performing operational fires during Desert Storm, advanced attack helicopter (AAH) units had defined importance to the air, land, and sea components warfighting capabilities. Collectively, doctrine and Desert Storm experience reason that AAHs have the capability to find moving relocatable missiles at operational depths at night.

The echelon-above-corps (EAC) structure is designed to support specific missions and functions outside the corps' tactical warfighting capabilities. Certainly, finding and destroying relocateable missiles qualifies as such a mission. Therefore, the echelon-above-corps aviation brigade, equipped with AAHs, is a theater asset that the commander-in-chief (CINC) could employ to find and destroy relocateable missiles.

Hypothesis

An echelon-above-corps aviation brigade, equipped with advanced attack helicopters, can find and destroy relocateable ballistic missles.

Methodology

Developed from the tactical doctrine set forth in the Corps Deep Operations Tactics, Techniques and Procedures - (1990), LTC Bennett's unpublished white paper, and articles written by General Saint and Major General Yates, the methodology is a kluge of doctrine and experience. The methodology consists of three essential tasks that must be performed for a echelon-above-corps (EAC) aviation brigade to conduct deep operations of this nature. They are: planning, intelligence, command, control and communications (C^3). Since these tasks are explained in the deep

operations scenario, the methodology will consist of abbreviated subtasks for each task.

Planning

* Coordinate areas for forward assembly areas, forward arming and refueling points, and holding areas
* Refine and relay the intelligence estimate
* Ensure logistical support is sufficent for the mission
* Perform initial coordination with SEAD agencies (Artillery, electronic warfare, Air Force, etc.)
* Perform initial coordination with ground units.[113]

Intelligence

* Can we get to and from the target area?
  - What is the air defense threat at the passage points?
  - What is the air defense threat along the route?
  - Are there any chemically contaminated areas along the route?
  - Are there significant obstacles along the route?

* Can we find the target?
  - Where is the target right now?
  - Where will the target be and when will it be there?
  - Where else might the target be?
  - What will be the target's disposition?
  - What is the cover and concealment of the engagement area?
  - How will the Electro-Optical forecast affect our ability to find the target?

* Can we kill the target?
  - Will the target have an escape route?
  - Will the target employ false target generators or multi-spectral smoke?
  - What will be the air defense threat in the engagement area?[114]

Command, Control and Communications

* How will the mission be controlled?
* What is the mission chain of command?
* What is the abort criteria?

* What radio nets will be used?
* What are the lost communications instructions?
* What are the IFF [information friend or foe] control measures? [115]

These tasks serve as litmus tests applied to a hypothetical case study that is designed to test the hypothesis. Analysis focuses on the doctrine, organization, and materiel of echelon-above-corps aviation brigade as it pertains to its ability to find and destroy relocateable ballistic missiles.

Chapter Two established the body of knowledge as it related to the research question. It defined the operational significance of relocateable ballistic missiles and examined the techniques that currently exist to counter this threat. From tested deep operations doctrine for a corps aviation brigade and Desert Storm experience, advanced attack helicopters (AAHs) appear well-suited to find and attack relocateable ballistic missiles. This development allowed the research questioned to be refined into a hypothesis. Experience and doctrine served as the basis for the methodology that will be applied to a hypothetical case study.

Chapter Three is a hypothetical case study that is designed test the hypothesis. To be plausible and impartial, this case study is developed from Training and Doctrine Command's current, common teaching scenario. This scenario is based on a Middle East threat that is similar to

Desert Storm. The only alteration will be the addition of the relocateable ballistic missile threat.

Chapter Two Endnotes

(1) Barbara Starr, "Ballistic Missile Proliferation: A Basis of Control," International Defense Review (April 1990): 265-267. The circular error probability (CEP) is an indicator of accuracy. It is a radius of a circle within which half of the projectiles are to fall.

(2) John F. Stewart Jr, "Operation Desert Storm the Military Intelligence Story: A View from the G-2, Third U.S. Army," A U.S. Army Desert Storm After Action Review (April 1991): 18.

(3) Starr, 265.

(4) Ibid, 266.

(5) Ibid.

(6) Ibid.

(7) Jeffery M. Lenorovitz, "USAF F-15Es Lead Night Attack Effort Against SCUD Launchers," Aviation Week & Space Technology (February 18, 1991): 60.

(8) Ibid.

(9) Major Leonard Samborowski, interviewed by author, Fort Leavenworth, KS, 6 February 1992. Major Samborowski is an Army aviator who served as a crew member aboard a Joint Surveillance Attack Radar System (JSTARS) aircraft during Desert Storm. A resident expert, he witnessed the employment of JSTARS in detecting Iraq's Al-Hussain and Al-Abbas missiles.

(10) Burt S. Tackaberry, "24th Aviation Brigade: 'Battle of the Causeway,'" Army Aviation (July 31, 1991): 22.

(11) Ibid.

(12) Ibid.

(13) Ibid, 23.

(14) Ibid.

(15) Ibid, 24.

(16) Ibid.

(17) Ibid.

(18) Ibid.

(19) Rudolph Ostovich, "Kiowa Warrior: A Success Story," Army Aviation (July 31, 1991): 8.

(20) Tackaberry, 24.

(21) U.S. Army Aviation [After Action Report], "Aviation in Desert Shield/Storm," (Fort Rucker, AL: U.S. Army Aviation Center Print Plant, 30 June 1991), 4.1 (hereafter cited as "Aviation in Desert Shield/Storm").

(22) Ibid.

(23) Ibid.

(24) Special Report: "The U.S. Army in Operation Desert Storm," (Arlington, VA: The Institute of Land Warfare, June 1991), 12.

(25) U.S. Army, Student Text 100-2, U.S. Air Force Basic Data, (Fort Leavenworth, KS: U.S. Army Command and General Staff College Print Office, May 1991), E-13.

(26) Ibid.

(27) "Aviation in Desert Shield/Storm," 5.2.

(28) Ibid.

(29) Ibid. An UAV is by definition a pilotless aircraft. It incorporates a video data link to provide the user a real-time picture of what the UAV sees. It, like JSTARS, was extremely valuable to commanders in Desert Storm by verifying enemy activities.

(30) Ibid.

(31) Ibid.

(32) Ibid.

(33) U.S. Army, TRADOC Pamphlet 11-9, Blueprint of the Battlefield, (Andover, MA: Dynamics Research Corporation, February 1991), 2-2 (hereafter cited as TRADOC PAM 11-9).

(34) Ibid, 4-1.

(35) U.S. Army, FM 100-5, Operations, (Washington D.C.: U.S. Government Printing Office, May 1986), 10 (hereafter cited as FM 100-5).

(36) TRADOC PAM 11-9, 4-6.

(37) Ibid, 4-1.

(38) Joint Chiefs of Staff, JCS PUB 3-0, Doctrine for Unified and Joint Operations, (Washington D.C.: U.S. Government Printing Office, January 1990), IX.

(39) FM 100-5, 28.

(40) TRADOC PAM 11-9, 4-7.

(41) "Aviation in Desert Shield/Storm," 4.1.

(42) Ibid.

(43) John J. Yeosock, "Army Operations in the Gulf Theater," Military Review Volume LXXI (No. 9), (Fort Leavenworth, KS: U.S. Army Command and General Staff College, September 1991): 4.

(44) Yeosock, 4.

(45) Ibid, 10.

(46) Ibid, 12.

(47) TRADOC PAM 11-9, 6-1.

(48) Ibid, 6-4.

(49) U.S. Army, FM 6-20-10, The Targeting Process, (Washington D.C.: U.S. Government Printing Office, 29 March 1990), B-6.

(50) U.S. Army Material Command, Smart Munitions, (Chicago: GACIAC IIT Reasearch Institute, 15 July 1989), 32 (hereafter cited as Smart Munitions).

(51) Ibid.

(52) Ibid.

(53) Ibid.

(54) U.S. Army, FM 90-28, Tactical Air Planning and Employment in Support of Ground Operations, (Washington

D.C.: U.S. Government Printing Office, 11 December 1990), Glossary-1.

(55) Ibid.

(56) U.S. Army, FM 100-15, Corps Operations, (Washington D.C.: U.S. Government Printing Office, September 1989), 3-11.

(57) U.S. Army, FM 1-112, Attack Helicopter Battalion, (Washington D.C.: U.S. Government Printing Office, 21 February 1991), 1-4.

(58) Ibid.

(59) Ibid.

(60) Ibid.

(61) U.S. Army, TM 55-1520-238-10, Operator's Manual for Army AH-64A Helicopter, (Washington D.C.: U.S. Government Printing Office, 28 June 1984), 4-47.

(62) Patrick J. Bennett and Kevin G. Sherrer, "AH-64 (Apache) Battalion 'Deep Attack' Tactics, Techniques, and Procedures," (Fort Hood, Texas: 1st Squadron, 6th Cavalry Brigade (AC), 25 June 1990), 3-4 (hereafter cited as "Bennett, 'Deep Attack'").

(63) Ibid.

(64) Major Donald Mark Ferrell, interviewed by author, Fort Leavenworth, KS, 25 February 1992. An expert on the LONGBOW System, Major Ferrell is an Army aviator who served as an Army LONGBOW project officer from June 1989 to June 1991. LONGBOW has the capability to detect and classify 16 stationary or moving vehicles at a time. Incorporating millimeter wave radar and a high-speed, fire control computer, detection and classification are accomplished rapidly in comparison to the current manual techniques.

(65) Ibid.

(66) Ibid.

(67) Ibid.

(68) Ibid.

(69) Captain Shane M. Deverill, expertise of the author. As an Army aviator, my knowledge and experience satisfy statement about the UH-60's design and capabilities.

(70) Captain Shane M. Deverill, expertise of the author. As an OH-58 pilot, my knowledge and experience satisfy statement about the OH-58's design and capabilities.

(71) FM 100-5, 29.

(72) U.S. Army, TRADOC White Paper, "Air Attack on the Modern Battlefield," (Fort Monroe, VA: Headquarters TRADOC, 21 August 1989), 2.

(73) Ibid, 4.

(74) Crosbie E. Saint and Walter H. Yates Jr, "Attack Helicopter Operations in the Airland Battle: Deep Operations," Military Review Volume LXVIII (No. 7), (Fort Leavenworth, KS: U.S. Army Command and General Sraff College, July 1988): 5.

(75) Ibid, 6.

(76) "Aviation in Desert Shield/Storm," 4.7.

(77) Crosbie E. Saint, "Central European Battlefield 2000: The Combat Helicopter," Army Aviation Volume 40 (No.1), (Westport, CT: Army Aviation Publications, 31 January 1991): 5.

(78) Ibid.

(79) U.S. Army, FM 1-111, Aviation Brigades, (Washington D.C.: U.S. Government Printing Office, August 1990), J-1 (hereafter cited as FM 1-111).

(80) Ibid, J-2.

(81) Ibid.

(82) Ibid.

(83) Ibid.

(84) Ibid, J-3.

(85) Ibid, J-19.

(86) Ibid.

(87) Ibid.

(88) Ibid.

(89) Bennett, 'Deep Attack,' 6.

(90) Ibid.

(91) Ibid, 7.

(92) Ibid.

(93) Ibid.

(94) Ibid, 11.

(95) FM 1-111, J-20.

(96) Ibid.

(97) Ibid.

(98) Bennett, 'Deep Attack,' 17-18.

(99) Ibid, 18.

(100) Ibid.

(101) Ibid.

(102) Ibid.

(103) Ibid.

(104) FM 1-111, J-20.

(105) Ibid.

(106) Joint Chiefs of Staff, JCS PUB 1, Department of Defense Dictionary of Military and Associated Terms, (Washington D.C.: U.S. Government Printing Office, 1 June 1987), 356.

(107) FM 1-111, J-36.

(108) Ibid.

(109) Ibid.

(110) Ibid.

(111) Ibid.

(112) Ibid, J-37.

(113) Bennett, 'Deep Attack,' 7.

(114) Ibid, 5-6.

(115) Ibid, 10.

CHAPTER THREE

HYPOTHETICAL CASE STUDY

Introduction

Chapter Two established the body of knowledge as it related to the research question: can an advanced attack helicopter (AAH) unit find and destroy relocateable ballistic missiles? It defined relocateable ballistic missiles, explored their future implications, and the current techniques that exist to counter this threat. Focusing on three illustrative examples from Desert Storm and the corps deep operations doctrine, Chapter Two demonstrated that AAHs appear to have the capacity to find and attack moving relocatable missiles at operational depths at night. Furthermore, it established that finding and destroying relocateable ballistic missiles is an operational mission that is beyond the scope of corps' tactical warfighting focus and logically belongs to an echelon-above-corps (EAC). This development refined the research questioned into a hypothesis: an EAC aviation brigade, AAH equipped, can find and destroy relocateable ballistic missles. Finally, Chapter Two melded experience

and doctrine to form the methodology. This methodology is applied to a hypothetical case study.

Chapter Three is a hypothetical case study that is designed to test the hypothesis. Adhering to the methodology, analysis focuses on the doctrine, organization, and materiel of an echelon-above-corps (EAC) aviation brigade as it pertains to its ability to find and destroy relocateable ballistic missiles. To be plausible and impartial, this case study is developed from the current Training and Doctrine, Southwest Asia, common teaching scenario. The threat portrayal is a 1995 projection. The only alteration is the addition of the relocateable ballistic missile threat.

Focusing on 14th Aviation Brigade (an EAC brigade), the development of the hypothetical case study begins with a background of Middle East activities that lead to United States' involvement in the region. Next, the political situation is discussed to define the strategic guidance which guides the formulation campaign plan. In sequence, the military situation addresses both enemy and friendly forces. Because of the threat that the Al-Hussain and Al-Abbas posed to coalition unity during Desert Storm in 1991, the campaign plan has a stated objective to destroy these relocateable ballistic missiles. To assist the theater commander-in-chief (CINC), the army force (ARFOR) commander is assigned the specific mission to find and

destroy relocateable missiles that exist within the ARFOR's area of operations. This mission is assigned to the ARFOR's EAC aviation brigade.

Regional Background

On 15 May 1993, the Iraqi government announced a coup which resulted in Saddam Hussein's death.[1] Claiming responsibility was the Hizbirr party (Shiite Moslems) which announced a popular election with pre-positioned Shiite candidates for June 1993.[2]

In 1994, the United States realized that General Fazid Izmal of Iraq played a pivotal role in Saddam's demise, and that his new government would be pro-Iranian to promote the same Shiite-based revolution that Iran had promoted since 1975.[3] Concerned about possible regional instabilities, the United States conducted a Joint and Combined exercise Desert Return in Saudi Arabia in the winter of 1994.[4]

On 12 June 1995, after two terrorist attacks on the holy cities of Mecca and Medina by Iran, Saudi Arabia formally closed these cities to Iranian pilgrims until the situation is successfully resolved.[5] On 15 June 1995, Tehran radio denounced the Saudi action and demanded the surrender of these cities to a joint Arab League that would govern these cities as a new nation.[6] That same day intelligence reported the movement of Iranian and Iraqi militaries into assembly areas along the Euphrates River.[7]

Closely following these activities, the Commander-in-Chief, India Command (CINCINCOM) sent a message to the Chairman, Joint Chiefs of Staff announcing the start of crisis planning procedures.[8]

Political Situation

Threatened by the Iran and Iraq Coalition (IIC), Saudi Arabia requested support from the United Nations to repel a possible attack. On 15 August 1995, after political negotiations fail, the President of the United States stated the strategic objectives formulated by the coalition governments of Britain, Egypt, France, Kuwait, Saudi Arabia, and United States:

* Repel military forces of the Iran-Iraq Coalition (IIC) from the sovereign territory of member states of the Gulf Cooperation Council (GCC).

* Defeat the warmaking potential of the IIC to ensure the future security and stability of the moderate states of the region.

* Work in concert with the United Nations and the GCC to establish a moderate government in Iraq and, in addition, conduct nation-building and post conflict operations to enhance the future security, stability, and cooperation of the GCC and other friends of the United States in the region.[9]

This strategic guidance serves as the framework for the campaign plan developed by the Commander-in-Chief, India Command. This, coupled with the military resources available, shapes the campaign plan.

India Command Campaign Plan

To achieve the strategic guidance articulated by the President of the United States, the Commander-in-Chief India Command (CINCINCOM) developed a four-phased campaign plan consisting of air and ground operations.

> Phase One is an air attack on IIC's command control and communications, attempting to sever General Izmal from his forces. Simultaneously, air power destroys the IIC's air forces and air defense systems. In addition, Phase One includes attacks to destroy Iraqi Al-Abbas and Al-Hussain relocateable ballistic missiles.
>
> Phase Two is a massive, continuous air bombardment of IIC supply sites, and transportation infrastructure designed to cut off these forces from their supplies.
>
> Phase Three is an air attack on the IIC's ground forces focusing on the Republican Guard.
>
> Phase Four is a ground assault to eject the IIC's forces from Kuwait and Saudi Arabia. Finally, destroy the IIC's capability to destabilize the region with ground forces.[10]

In Phase One, CINCINCOM identifies the AL-Hussain and Al-Abbas relocateable ballistic missiles as a major threat that must be eliminated early in the campaign. This is in response to the unexpected threat that these missiles posed during Desert Storm in 1991. In Desert Storm, coalition air forces and special operating forces played a major role in finding and destroying these missiles; however, this effort was at great expense. Indeed, this mission consumed 40

percent of the air sorties.[11] Therefore, the Commander-in-Chief India Command (CINCINCOM) wants to maximize his resources that are capable of destroying this threat.

Recognizing the battle-proven, versatility of the Army's advanced attack helicopter (AAH) during Desert Storm, CINCINCOM assigns the Army Force (33d Army) Commander the mission to find and destroy these missiles that exist within 33d Army's area of operations. Because this mission is operational, 33d Army assigns the mission to its echelon-above-corps (EAC) aviation brigade: the 14th Aviation Brigade.[12]

14th Aviation Brigade

Like all EAC aviation brigades, the 14th performs maneuver, combat support (CS), and combat service support (CSS) functions based on the operational requirements of the theater of operations.[13] The 14th conducts integrated joint and combined maneuver operations in support of theater campaigns; also, it provides support to theater special operations forces.[14] However, like other EAC aviation brigades, the 14th primarily provides command, control, communications and intelligence (C^3I) enhancement, CS, and CSS air movements for theater army operations.[15] This is important to understand because 33d Army has assigned the 14th Aviation Brigade a unique mission (see Figure 16).[16]

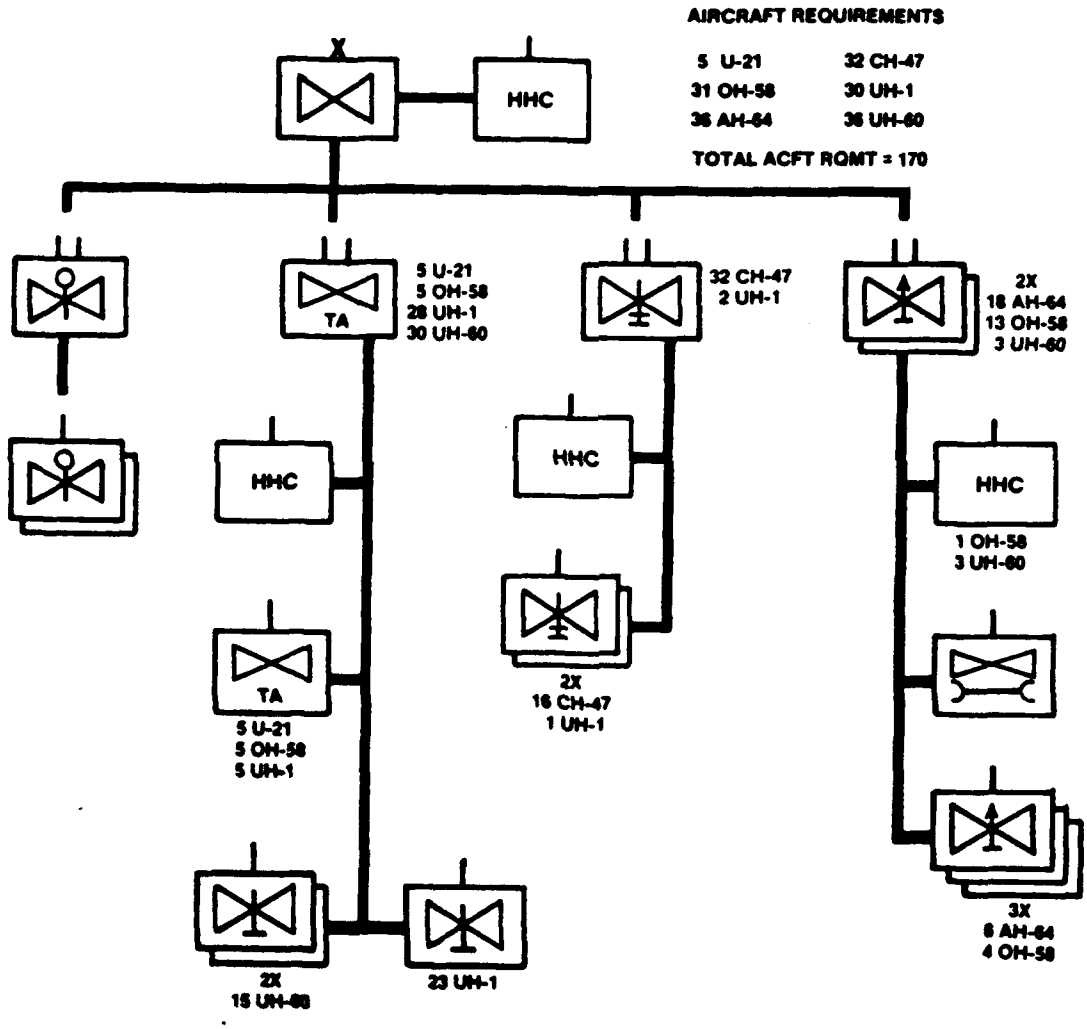

Figure 16. 14th Aviation Brigade Organization

Situation

Enemy Forces: The Iraq-Iran Coalition (IIC) has 20 divisions committed in the salient, 4 division form the operational reserve at the Euphrates River, and 16 divisions form the strategic reserves located in northern Iran and Iraq.[17] Within 33d Army's area of operations, Al-Abbas and Al-Hussain relocateable ballistic missiles are reported operating in and around major population centers.

Friendly Forces: 33d Army prepares to attack in zone with three corps abreast no later than 23 October 1995. Initially the army reserve, 2d (US) Corps later conducts a supporting attack as the army right flank, passing through the 1st Saudi Corps to penetrate the initial defensive belt to fix and then defeat remaining forces in zone.[18] 21st (US) Airborne Corps is the main attack, in center zone, to penetrate first and second defensive positions and exploits deep to defeat the operational reserve of the Iraq and Iran Coalition (IIC) south of the Euphrates River.[19] The French/British Corps conducts a supporting attack on the army left flank to penetrate initial defensive positions and defeat forces in zone.[20] 230th Separate Armor Brigade follows and supports the French/British Corps.[21] The 110th Motorized Brigade is the tactical combat force (see Figure 17).[22]

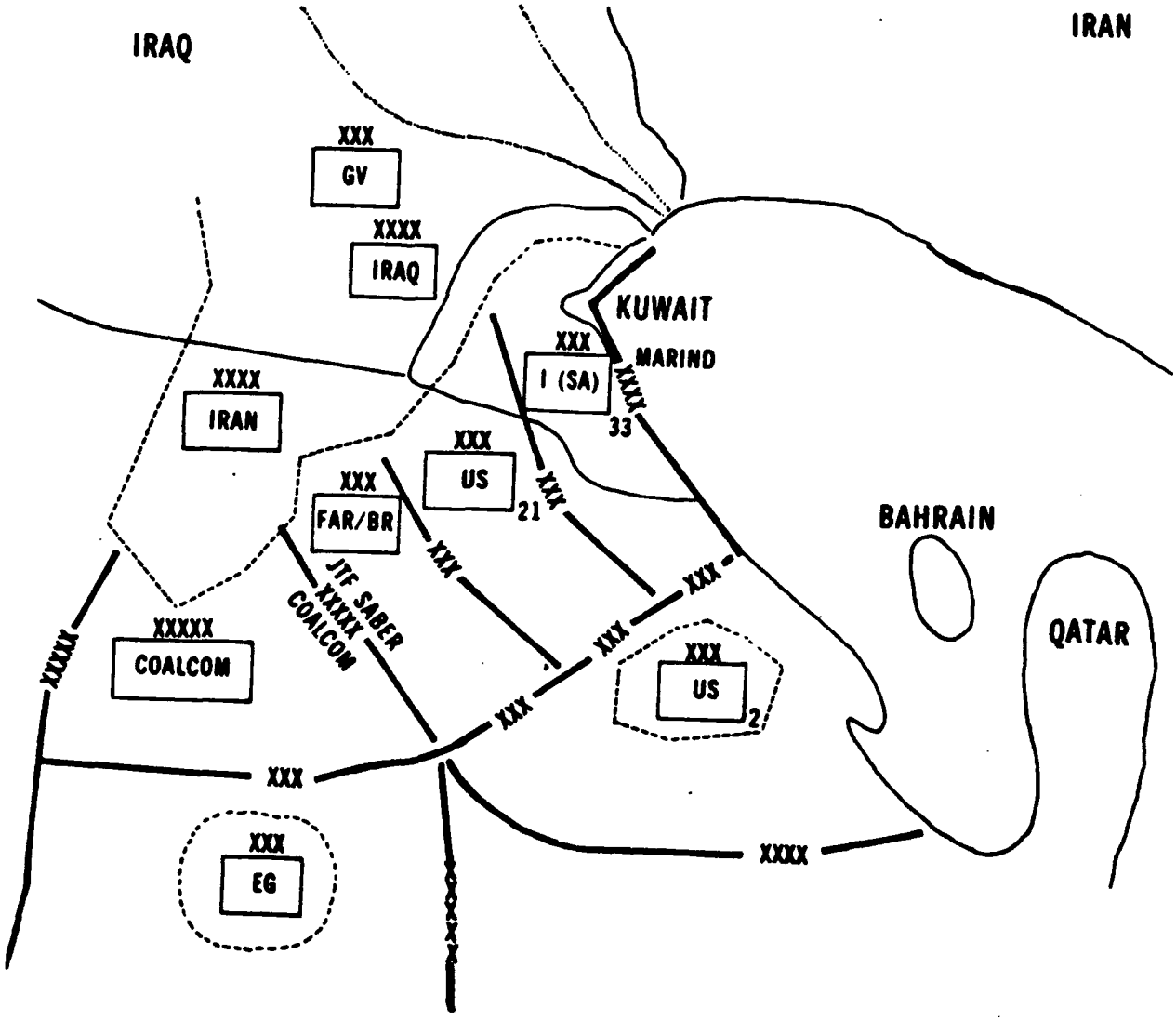

Figure 17. Situation Map

Mission: 33d Army

No earlier than H-Hour, 10 October 1995, 33d Army attacks to find and destroy Al-Abbas and Al-Hussain relocateable missiles that are located within 33d Army's area of operations.

Intent: 33d Army Commander

The purpose of mission is to assist India Command in defeating Iraq's ability to employ these weapons of terror. By employing special operating forces, advanced attack helicopters, and fixed-wing aircraft as my means of attack, I intend to find, with sensors, and destroy, with my attack means, these Al-Hussain and Al-Abbas missiles. The end state is to defeat Iraq's capability to employ these missiles in 33d Army's area of operations.

Mission Analysis

Mission analysis is the first step in the decision making process. It consists of command and staff actions to: gather facts, make assumptions, analyze higher mission and intent, and issue the commander's guidance.[23] Because this mission is unique, 33d Army Commander requests the 14th Aviation Brigade Commander and S-3 (operations officer) assist 33d Army in mission analysis.

Facts

1. The 14th Aviation Brigade is at 95 percent strength personnel and 100 percent equipment.

2. Iraq has the Al-Abbas and Al-Hussain missiles; they have a maximum range of 900 and 600 kilometers respectively.[24]

3. To avoid detection, these missiles hide during the daylight in built up areas.[25]

4. To strike intended targets, Iraq employed these missiles at night from surveyed launch sites.[26]

5. Missile employment was predictable in method but erratic in execution. The method: emerging from hide positions these relocateables moved directly to a launch site and fired. After firing, the mobile launchers moved to a resupply area and then back to hide in built up areas.[27]

6. The maximum range for the AH-64, equipped with two external fuel tanks, is 450 kilometers with 46 minutes station time (see Figure 11, Chapter 2).

7. The survivability of the AH-64 is greatly enhanced when employed during the hours of darkness.[28]

Assumptions

1. Iraq will employ the Al-Hussain and Al-Abbas missiles as they did in Desert Storm.

2. Since the exact organization for combat of Iraq's Al-Hussain and Al-Abbas missiles is unclear,

intelligence sources assume these missiles are similarly organized to the Afghan SCUD Brigade[29] (see Figure 18).[30]

3. Because of the campaign importance of this mission, 14th Aviation Brigade has priority fill of personnel and materiel by 33d Army and, if necessary, by India Command.

4. 14th Aviation Brigade will not be assigned any other missions until it is released from this mission.

5. Weather and electro-optical forecasts support AH-64 employment.

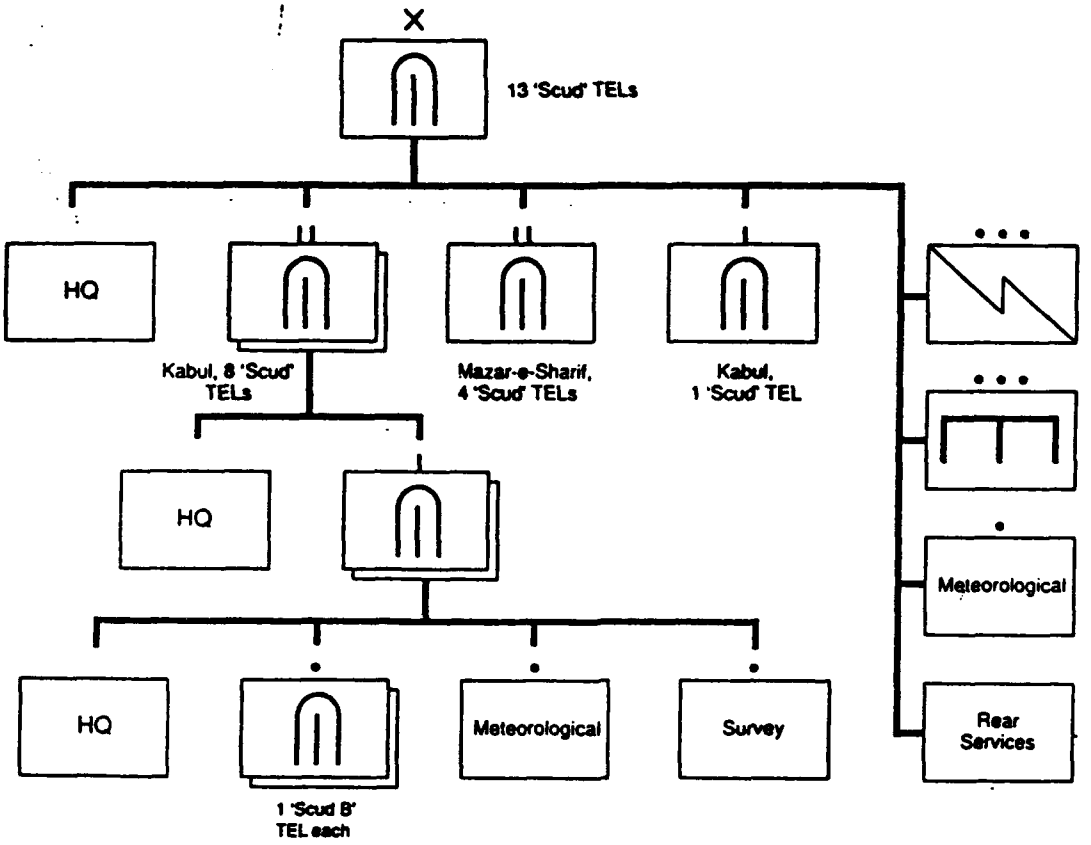

Figure 18. Relocateable Missile Brigade

Analysis of 33d Army's Mission and Intent: The mission assigned to 33d Army by India Command (INCOM) is to find and destroy relocateable ballistic missiles in 33d Army's area of operations. 33d Army's area of operations stretches 600 kilometers deep into the Iraqi Theater of operations. The intent is to identify the locations of these missiles and target their destruction using the most appropiate attack means: special operating forces, advanced attack helicopters (AAHs), or fixed-wing aircraft. For AAH

employment, 33d Army and 14th Aviation Brigade developed the following employment criteria:

Employment Depth: To range the 33d Army's entire zone, advanced attack helicopter (AAHs) would have to refuel in Iraq, and refueling in enemy territory is a high risk. To reduce this risk, 33d Army Commander negotiates a 450 kilometer route limit for AH-64 employment with India Command. 450 kilometers corresponds to the maximum range of an AH-64 with two external fuel tanks (see Figure 11, Chapter 2).

Time Factors: AH-64 employment at any depth, along this 450 kilometer route, must be sensitive to target exposure time. Target exposure time is how long these relocateables presents themselves for engagement. There are three components to exposure time: (1) movement time from hide position to launch site, (2) set up, launch, and tear down time at launch site, and (3) movement time from launch site to hide position.

Similarly, AAHs have a response time. That time equates to the time it takes the AAHs from notification to arriving and engaging the relocateables. Like relocateable exposure time there are three components to AAH response time: (1) time from notification to lift off (readiness condition)[31] (2) flight time to search area, (3) search time in the search area. Therefore, if the target is estimated

to be exposed longer that it takes AAHs to respond, AAHs can be employed (see Figure 19. AH-64 Time-Distance Planning Template).

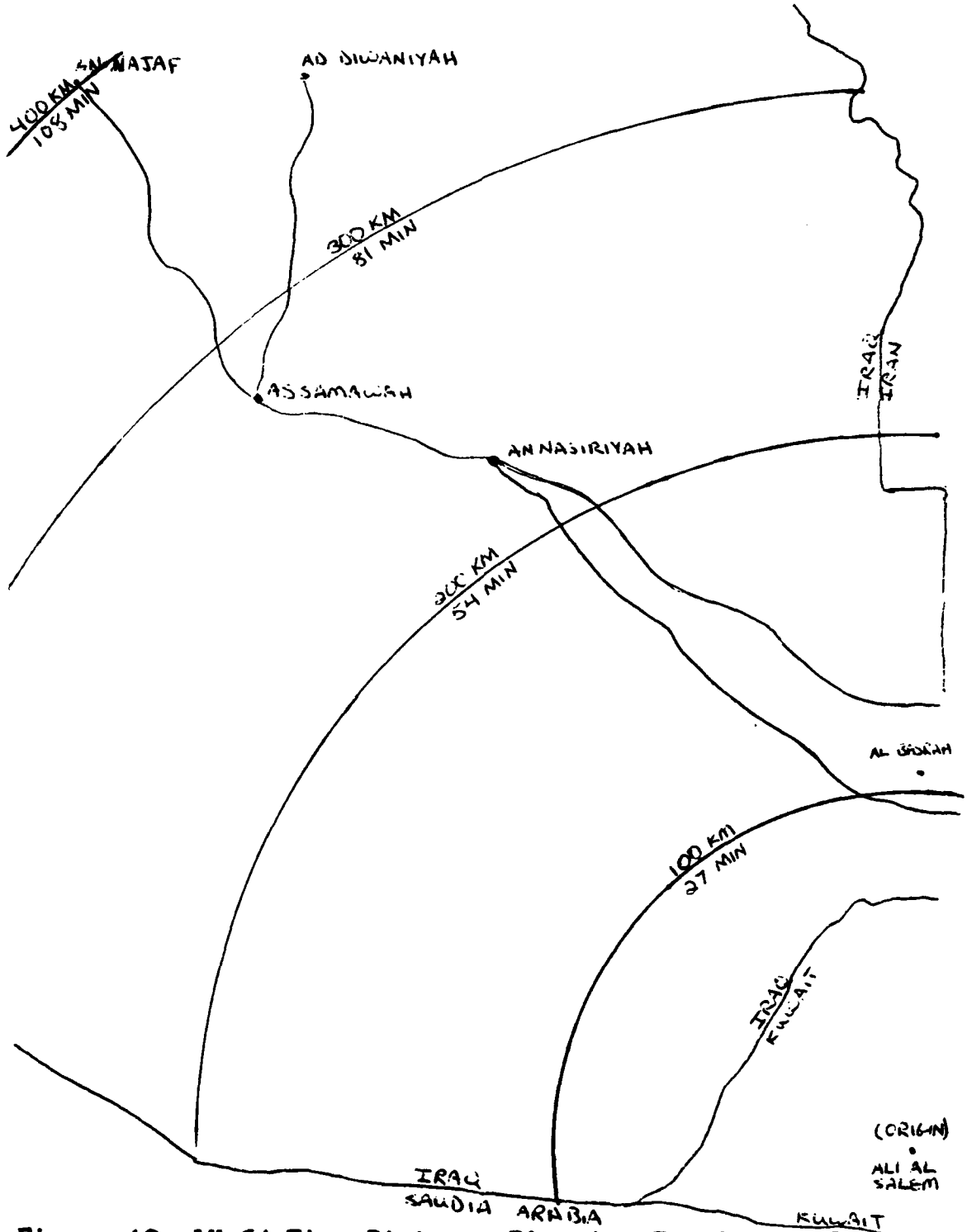

Figure 19. AH-64 Time-Distance Planning Template (120 Kts)
*Source: Bahrain, Iran, Iraq, Kuwait, Qatar, Saudia Arabia, United Arab Emirates, Series ONC, Sheet H-6, Edition 6-GSGS. Scale 1:1,000,000, 1985.

Target Size: Committing advanced attack helicopters (AAHs) deep is not without considerable risk and planning. Therefore, risk must be commensurate with the payoff. In defining this payoff, the 33d Army Commander stipulates that AAH employment is limited to battalion-sized relocateable missile units and larger. As illustrated in Figure 18. Relocateable Missile Brigade, a battalion is comprised of four to eight relocateable missiles.

Intelligence Assets: This mission is too broad and challenging for 33d Army's intelligence systems to handle alone. To find targets at this depth requires intelligence assets beyond the organic capability of 14th Aviation Brigade or 33d Army.[32] To find these elusive targets, 33d Army requests the Joint Surveillance Targeting Attack Radar System (JSTARS). JSTARS has an unmatched capability, to any system in 33d Army, to detect and track moving targets hundreds of kilometers deep.[33] Taking pictures with a synthetic aperture radar (SAR), JSTARS can identify these deep targets.[34] The most capable intelligence systems in 33d Army are organic to 14th Aviation Brigade (see Figure 20. Acquisition Assets[35], and Figure 21. Planning Ranges for Acquisition Assets[36]).

ASSET	CAPABILITY
Airborne SIGINT:	
RU-21 Guardrail	VHF intercept and direction finding
RV-1D Quicklook	Noncommunications intercept and direction finding
RC-12 D/G Improved Guardrail V	Communications intercept and DF (replaces RU-21 in some units)
RC-12K Guardrail common sensor	Communications intercept and DF (to replace RU-21 or RV-1D in selected units)
Airborne IMINT:	
OV-1D Mohawk (SLAR)	Moving-target indications
OV-1D Mohawk	Photoimagery
UAV	(To be fielded)

Figure 20. Acquisition Assets

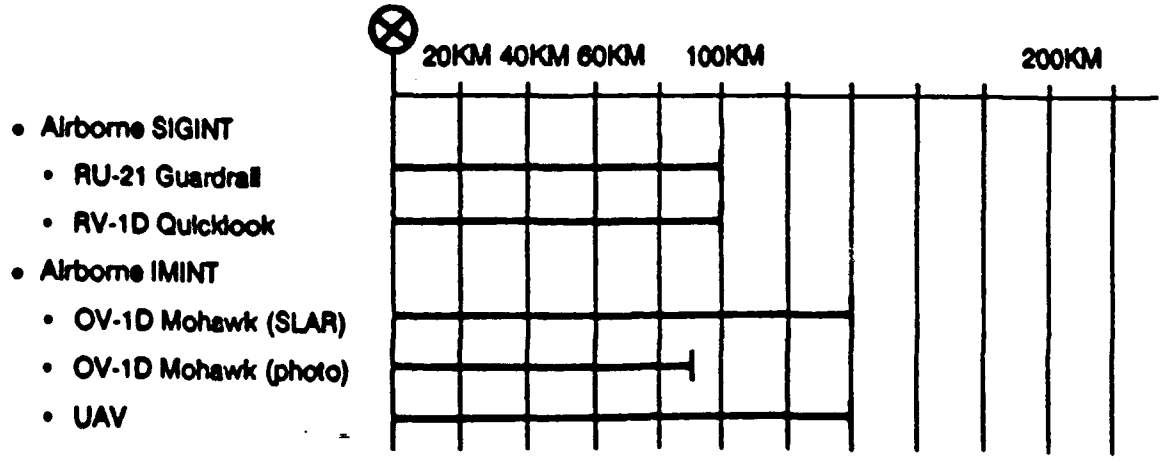

Figure 21. Planning Ranges for Acquisition Assets

Doctrinal Template: The doctrinal template depicts an Iraqi ballistic missile battalion. It depicts dimensions for four battery-sized launch sites and probable operating distances from hide positions (see Figure 22. Search Area: Doctrinal Template).

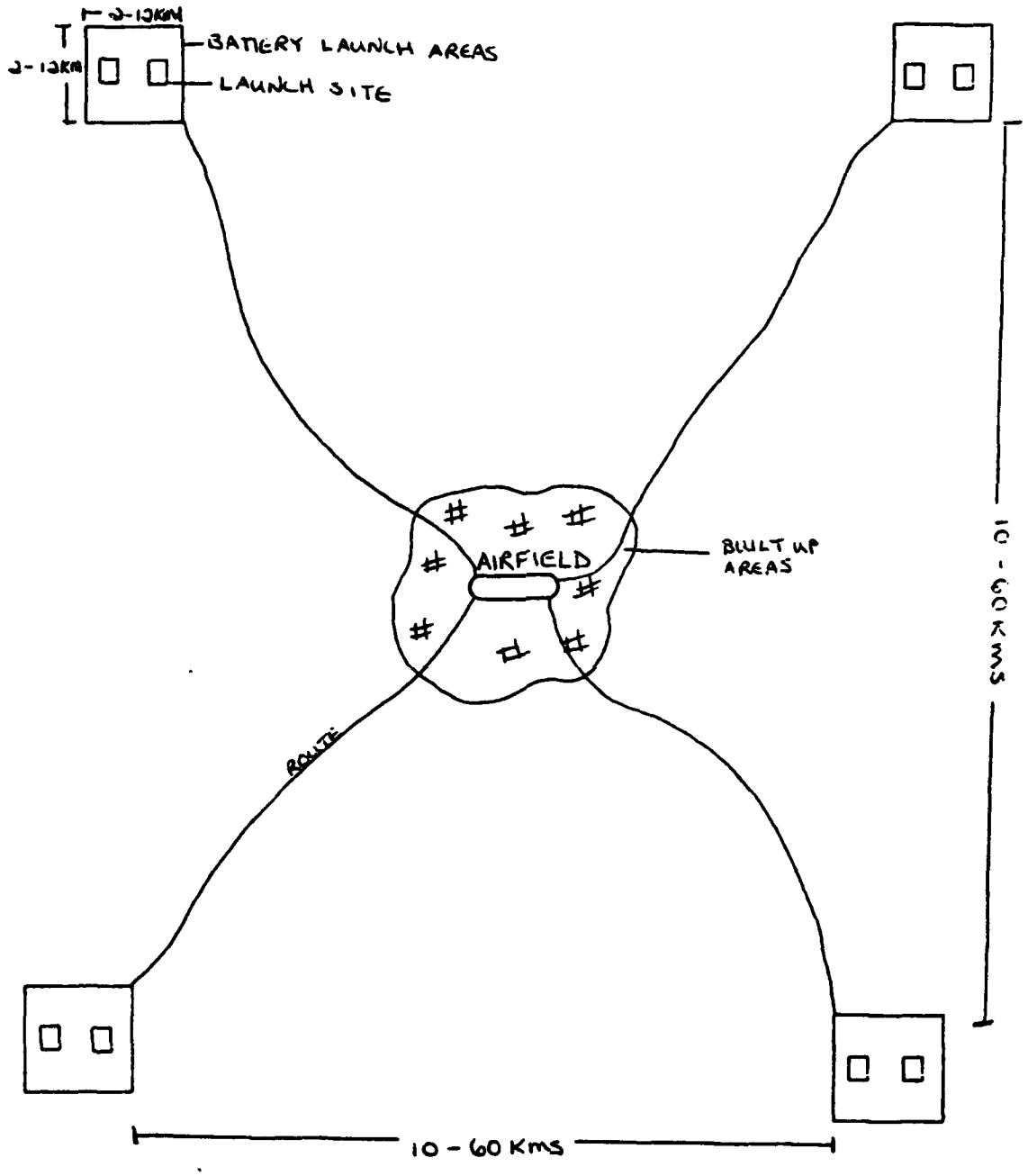

Figure 22. Search Area: Doctrinal Template

Situation Template: The situation template adjusts the doctrinal template to terrain and other environmental factors. This particualer situation template is developed for the city of An Najaf, Iraq (see Figure 23). This particular area is known for sanctuaries and other areas where collateral damage must be minimized. This is an important priority information requirement for the G-5 and civil affairs unit to answer. This information will aid the commander in developing his decision support template.

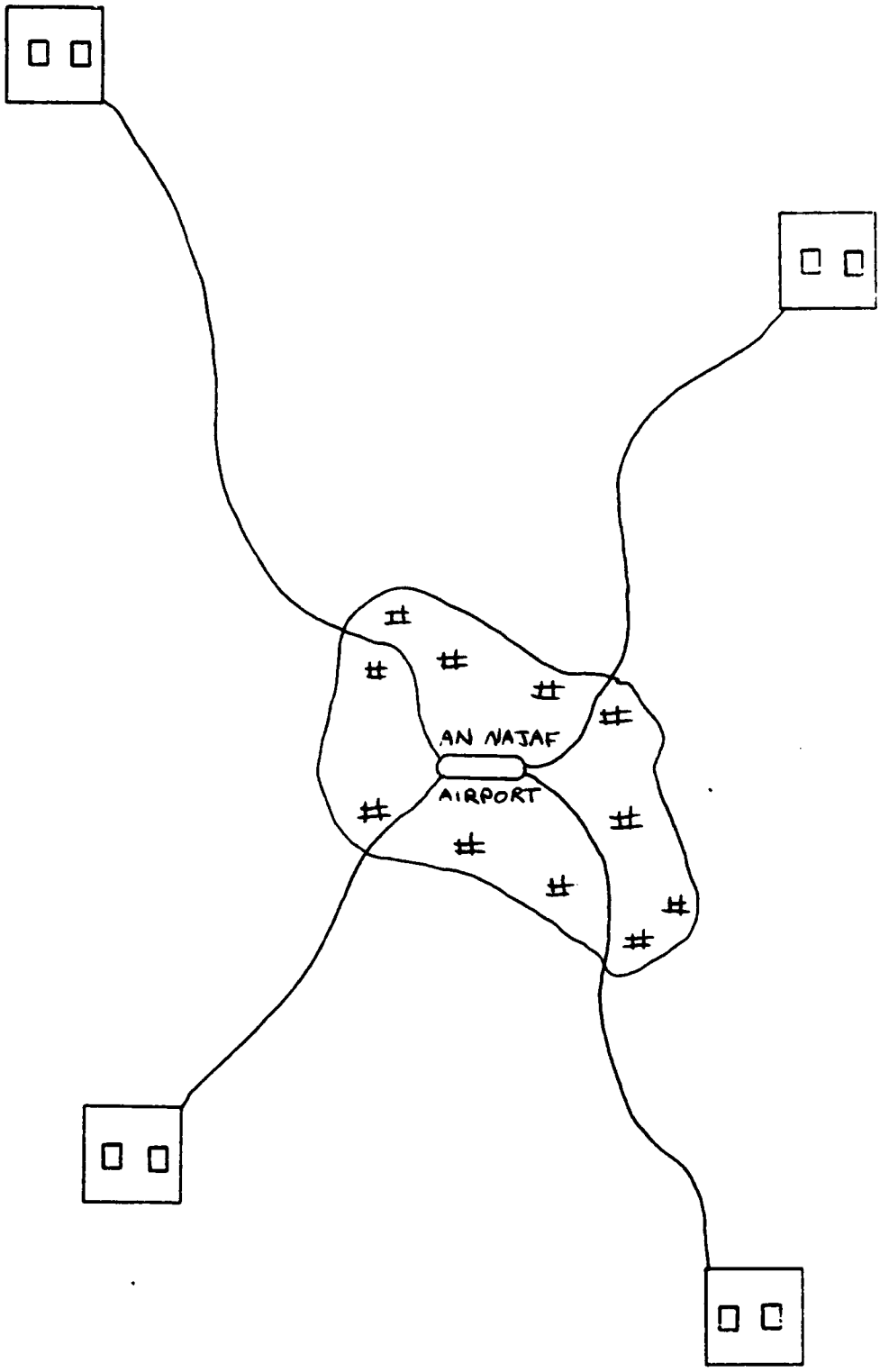

Figure 23. Search Area: Situation Template

Event Template: To confirm enemy courses of action, an event template is developed (see Figure 24). To find relocateable ballistic missiles, an event template should resolve two issues: find the launch sites and detect and monitor the movement of the relocateables to the launch sites.

For the purpose of this case study, assume satellite imagery confirms launch sites at named areas of interest 1, 2, 3, and 4. This verification of launch site locations is the first test of the event template. In fact, satellite imagery confirmed four launch sites at named area of interests (NAIs) 1, 3, and 4. NAI 2 had only three launch sites. These cluster of launch sites at NAIs 1, 2, 3, and 4 have the capacity of supporting possibly two Iraqi ballistic missiles battalions operating in and around An Najaf, Iraq.

Just as the satellite imagery found launch sites at NAIs 1, 2 3, and 4, special operating forces, and Joint Surveillance Targeting Attack Radar System (JSTARS) should be focused to detect and monitor the movement of the relocateables to confirm or deny the event template.

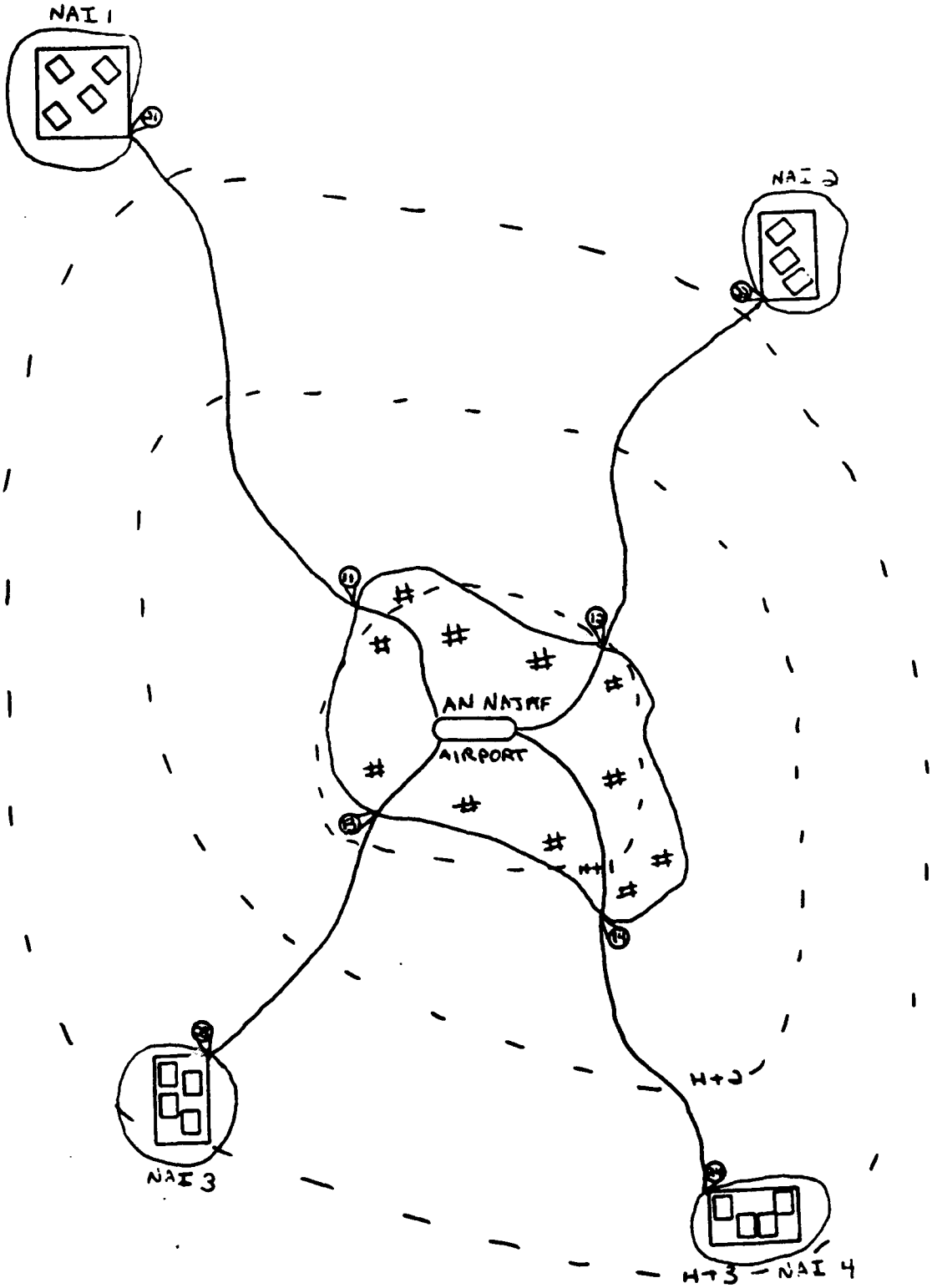

Figure 24. Search Area: Event Template

Decision Support Template: The decision support template builds upon the doctrinal, situation, and event templates. It synchronizes the employment of the commander's appropiate attack means through the use of decision points (see Figure 25). These decision points are time-sensitive and cue the commander to make timely decisions to defeat this threat. The launch sites verified by satellite become targeted areas of interest (TAIs). These TAIs are locations where the commander employs his appropiate attack means to destroy the target set.

Important, in developing the decision support template, is to determine collateral damage sensitivities of each launch site. Collateral damage, and reaction time will determine appropiate attack means. In Desert Storm fixed-wing, and special operating forces (SOF) proved invaluable in defeating this threat. Each of these attack means has varying degrees of attack precision and response time: SOF--more precise but time consuming, fixed-wing--less precise but responsive. It appears that AAHs are somewhere in between in terms of attack precision and responsiveness. Attack precision directly correlates to the ability to close with and destroy the target. Responsiveness correlates to movement speed.

Therefore, if collateral damage is not permissible, SOF would be the only viable attack means. By contrast, if

collateral damaged is not a factor, fixed-wing attack is appropiate and most efficient. However, if collateral damage is permissible but must be minimized, and SOF is not available, AAH employment is prudent.

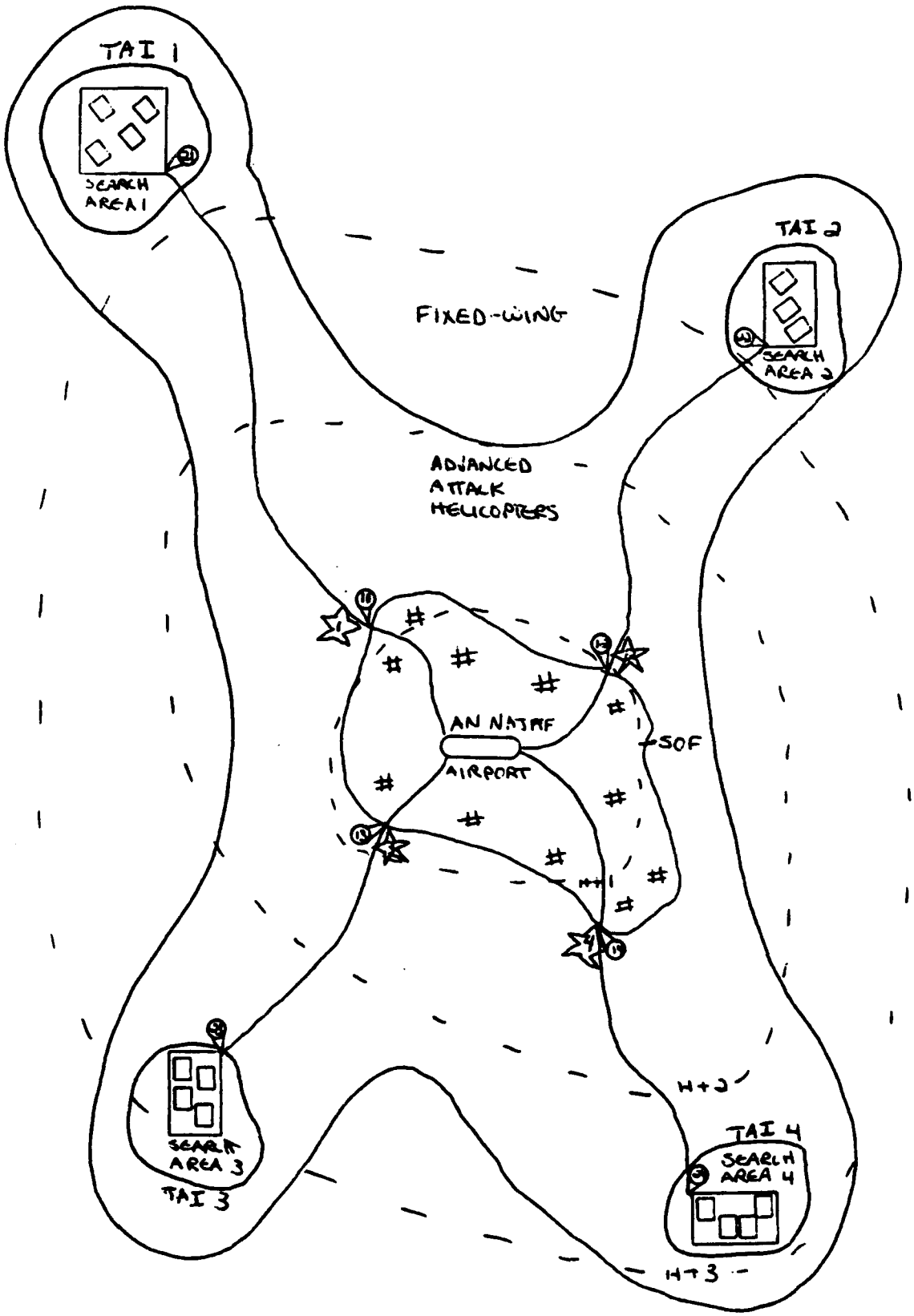

Figure 25. Search Area: Decision Support Template

Mission: 14th Aviation Brigade

At H-Hour, 10 October 1995, 14th Aviation Brigade attacks to find and destroy Al-Abbas and Al-Hussain relocateable missiles in search areas 1-4 vicinity of An Najaf.

14th Aviation Brigade: Commander's Guidance: To determine how many advanced attack helicopters (AAHs) are necessary to clear a search area, search area dimensions are defined as a function of time. Time has two constraints: anticipated response time of the threat and the station time for the AHHs--whichever is less. Furthermore, time to clear a search area must be sensitive to the type of terrain and the number of possible targets within the search area. Search areas must be cleared simultaneously to minimize AAH exposure time. Also, intelligence must confirm target location before the AAHs cross the forward line of own troops. Finally, this mission requires success of three critical tasks: intelligence, planning, command control and communications.

Intelligence

Thorough intelligence preparation of the battlefield is critical to mission success. With the development of the doctrinal, situation, event, and decision support templates, 14th Brigade can begin route planning and search area

planning. From the methodology and the commander's guidance, 14th Aviation Brigade planning focuses on the following: air defense threat, chemically contaminated areas, obstacles, weather, cover and concealment, and location of target.

Planning

Route Development: Flight routes Silver and Gold satisfy both the commander's guidance and the litmus tests from the methodology. Iraq and Iran have not used chemicals, and the probability is low that they will use chemicals. Therefore, there are no contaminated areas to avoid.

Also, these flight routes minimize exposure to threat air defense systems. The air defense threat along the route and in the search area consist of SA-2, SA-3, SA-7, SA-8, SA-14, SA-16 and ZSU-23-4. The SA-2 and SA-3 have a minimum altitude of 100 meters.[37] Since advanced attack helicopters (AAHs) fly at 100 feet above ground level, the SA-2 and SA-3 are ineffective. The SA-7, SA-14, and SA-16 have no night time or adverse weather capability.[38] Therefore, if the mission is flown at night survivability and surprise are enhanced. Only, the SA-8, and ZSU-23-4 are a full-time threats.[39] Therefore, suppression of enemy air defense (SEAD) should focus on SA-8s and ZSU-23-4s. However, it is prudent to attack known air defense systems at the forward

line of own troops (FLOT) to ensure success in crossing the FLOT.

Another consideration to ensure security and surprise for AAH operations is to jam enemy communications. Enemy communications should be jammed as the helicopters cross the FLOT. This confuses the enemy and prevents them from reporting the presence of advanced attack helicopters (AAHs) which enhances surprise. The Air Force has an effective communications jammer: Compass Call.[40]

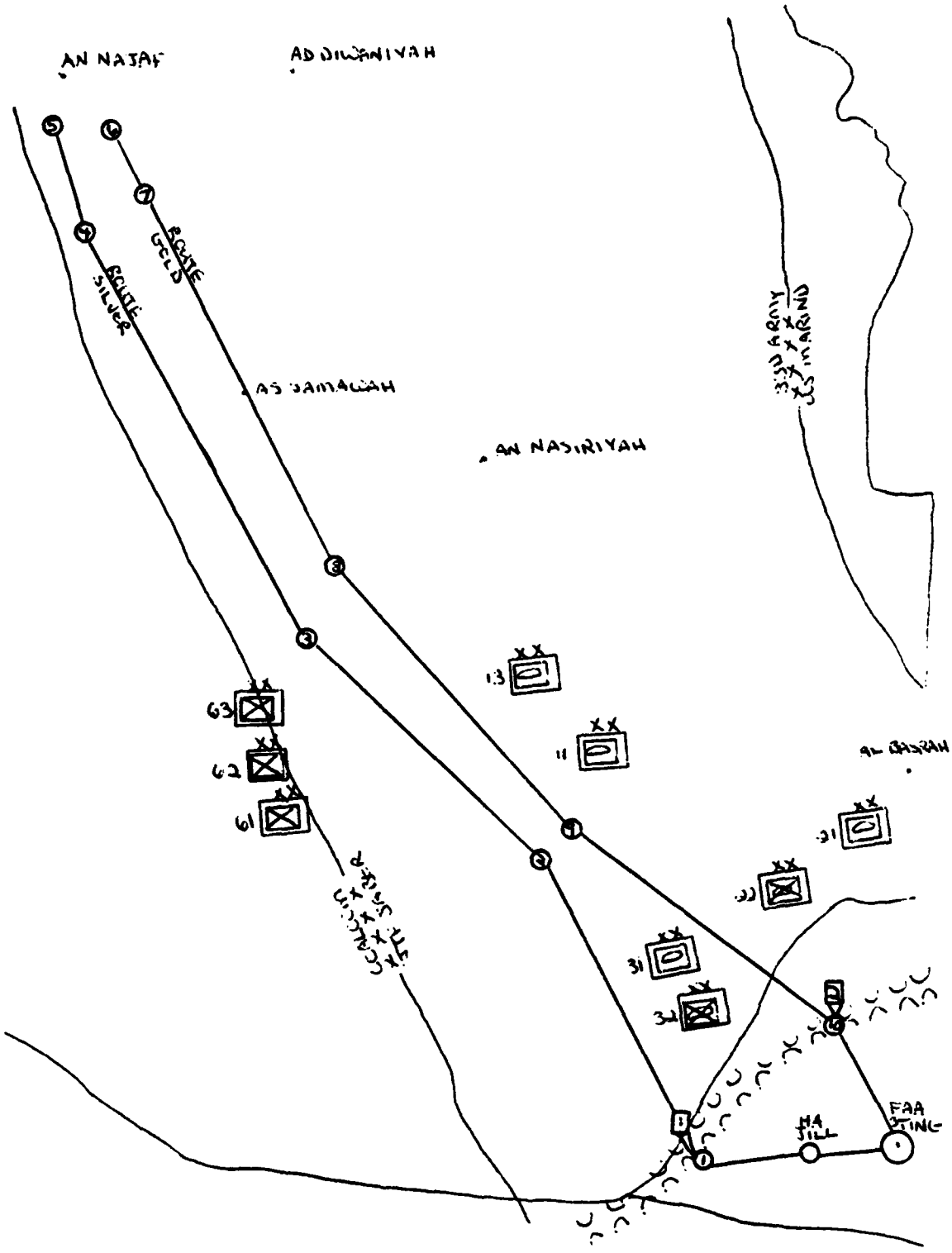

Figure 26. Route Planning
*Source: Bahrain, Iran, Iraq, Kuwait, Qatar, Saudia Arabia, United Arab Emirates, Series ONC, Sheet H-6, Edition 6-GSGS, Scale 1:1,000,000, 1985.

Route Silver	Distance	Time
FAA--HA Jill	45 KM	12:00 Minutes
HA Jill--ACP 1	21 KM	5:36 Minutes
ACP 1--ACP 2	107 KM	28:32 Minutes
ACP 2--ACP 3	100 KM	26:40 Minutes
ACP 3--ACP 4	123 KM	32:48 Minutes
ACP 4--ACP 5	55 KM	14:36 Minutes
Subtotal	451 KM	129:38 Minutes

Route Gold	Distance	Time
ACP 6--ACP 7	45 KM	12:00 Minutes
ACP 7--ACP 8	106 KM	28:12 Minutes
ACP 8--ACP 9	82 KM	21:50 Minites
ACP 9--ACP 10	130 KM	34:40 Minutes
ACP 10--FAA 1	36 KM	9:36 Minutes
Subtotal	399 KM	106:18 Minutes

Total Route Distance: 451KM + 399KM= 850KM

Total Route Time: 129:38 + 106:18= 235:56 Minutes

Total Flight Time with Two External Fuel Tanks: 304:00 minutes. (see Figure 9, Chapter Two)

Time on Station:
304:00 Minutes - 235:56 Minutes = 68:04 Minutes

* Estimated Enemy Response Time: = 20:00 Minutes

Note: This time reflects how long it is expected for the enemy to detect and engage the AH-64s in the search areas. As stated earlier, air defense will not be a threat in the search area, but a security force accompanying the relocateables might be able to counter the AAHs. 20 minutes is an arbitrary figure, but it is plausible given the success that AAHs had in Desert Storm during daylight hours in avoiding detection (see Chapter Two: Battle of the Causeway).

Search Area Development: Comparing 68 minutes station time to 20 minutes enemy response time, 20 minutes satisfies the commander's guidance. Therefore, the launch sites must be cleared in 20 minutes. These launch sites, identified by satellite imagery, become the search areas.

Satellite imagery and map reconnaissance reveal that the terrain of the search areas is flat and void of man-made or natural features. However, these search areas could develop target clutter: possibly support vehicles, and other ancillary targets. Therefore, all targets in the search area must be verified before engagement. Also these search areas are located inside a religious sanctuary, and minimizing collateral damage requires target verification before engagement. Therefore, fixed-wing attack is not appropiate, but AAH is appropiate.

Because these relocateables move-shoot-move, they should be hot and easily detected, with the AH-64's forward looking infrared (FLIR). Also, their big size and unique shape ease identification. These facts coupled with the real-time intelligence from Joint Surveillance Targeting Attack Radar System (JSTARS), should enable each AH-64 crew to clear two-square kilometers in four minutes.[41] To Clear an area, the AH-64 crew must detect, acquire, identify, and engage the target if necessary. These tasks are best performed with five kilometers standoff.[42] This distance is close enough to perform target identification, but distance enough to enhance AH-64 survivability. In 20 minutes, each crew can clear a 10 by 10 kilometer area. Therefore, to clear a (12 by 12 kilometer) search area in 20 minutes, it requires two AH-64s. Since there are four search areas, there must be a minimum of eight AH-64 available to do this

mission. To enhance team survivability and protection, each team should be augmented with one AH-64. Therefore, a requirement of 12 AH-64s would require one attack helicopter battalion.

Command Control, and Communications

The command, control, and communications for this mission involves: chain of command, mission control, abort criteria, radio nets.

Chain of Command: The chain of command flows from the Commander-in-Chief India Command, to the 33d Army Commander, to the 14th Aviation Brigade commander. The chain of command within the aviation brigade becomes a standard operating procedure which needs no discussion.

Mission Control: Since this mission is assigned to 14th Aviation Brigade, the brigade commander will control the mission. India Command and 33d Army will monitor mission progress and relay combat information. The brigade commander will be positioned aboard a Guardrail to coordinate information between Joint Surveillance Attack Radar System (JSTARS) and 1-14th Attack Battalion: the unit conducting the attack. The 1-14th Commander will be aboard a UH-60, equipped with a command and control console; he accompanies the AH-64s on the mission to facilitate command and control and downed pilot pickup.

Abort Criteria: There are four events that justify aborting the mission.

* Twelve AH-64s and crews must be mission ready by H-4.

* Two Guardrail aircraft and crews must be mission ready by H-4.

* Relaocateables must be detected before AH-64s cross the forward line of own troops (FLOT).

* If lost communications occurs before arriving at the search area.

Radio Nets, Lost Communications, Information Friend or Foe: The radio nets adhere to the structure depicted in Figure 27. The communications network is similar to the existing doctrinal network in Figure 14 in Chapter Two. The noteable exception is that the Guardrail aircraft will communicate with JSTARS, 33d Army, 21st Corps Artillery, Compass Call, and 1-14th Attack Helicopter Battalion. Also, there is not a corps command post or attack group. Lost communications upon arrival in the search area or afterwards: aircraft will proceed according to the time line. Information Friend or Foe (IFF): aircraft will use mode 4 on Route Gold within five miles of the front line of own troops.

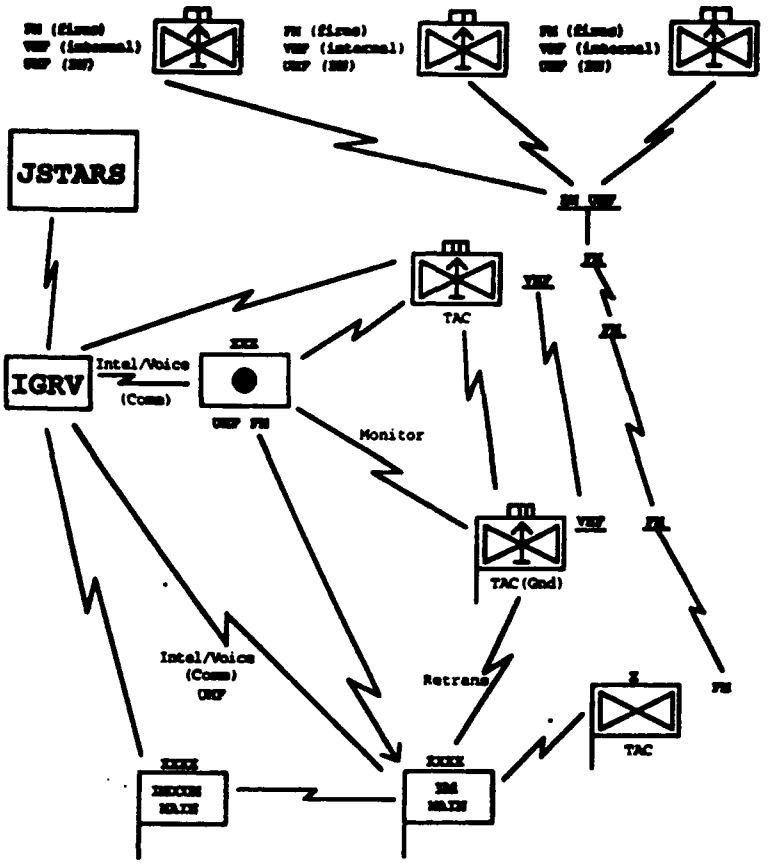

Figure 27. Proposed Aviation Communications

Mission Execution

By 1000 Hours 9 October 1995, 1-14th Attack Helicopter Battalion (ATKHB) and 14th Aviation Brigade's tactical command post (TAC) are set at Forward Assembly Area Sting. 14th Brigade is ready to attack to find and destroy the relocateable missiles in search areas 1, 2, 3, and 4 near An Najaf. 1-14th ATKHB has 14 AH-64s, and 14th Brigade has 3 Guardrail aircraft that are fully mission capable. 1-14th ATKHB Commander organizes 12 AH-64 into four teams of 3

AH-64s. He designates them Teams 1, 2, 3, 4 to correspond to their assigned search areas.

Each team has a total of 20 Hellfire missiles, 19 Hydra-70 rockets, 3600 rounds of 30 millimeter ammunition. One AH-64 is equipped with two external fuel tanks, 4 Hellfire missiles, one 19 shot pod of Hydra-70 rockets, and 1200 rounds of 30mm. The two other AH-64s are equipped with two external fuel tanks, 8 Hellfire missiles, and 1200 rounds of 30mm.

At 1800 Hours 9 October, 33d Army orders 14th Brigade to be at readiness condition 2 (ready for takeoff in 15 minutes) no later than 2400 Hours 9 October. The weather for that evening is clear, with no winds. The electro-optical forecast supports AH-64 operations.

At 2200 Hours, the 14th Commander, in his airborne TAC, launches out to establish communications with 33d Army and Joint Surveillance Targeting Attack Radar System (JSTARS), Compass Call, and the 21st Corps Artillery, and 14th Brigade ground TAC. In an orbit inside his assigned restricted operations zone (ROZ), the 14th Commander contacts all parties.

At 0030 Hours 10 October 1995, JSTARS detected two relocatables moving from a hangar at the An Najaf airport towards Search Area 1. JSTARS designated this Target Set 1 as these relocateables cross named area of interest (NAI) 11 (see Figure 25). This information was transmitted to 33d

Army, 14th ground and airborne TACs simultaneously. The 14th Brigade Commander ordered 1-14th Attack Helicopter Battation to readiness condition 1 (ready for immediate takeoff).

At 0035, JSTARS detected 4 more relocateables moving from other airport hangars. Two cross NAI 12 moving towards Search Area 2, and JSTARS designated this Target Set 2. The other two crossed NAI 13 headed to Search Area 3, and JSTARS designated them Target Set 3.

From the decision support template, Intelligence estimated total exposure time of these relocateables to be 3 hours. The 14th Brigade Commander informed 33d Army that he is prepared to launch at 0045 hours. 33d Army Commander consented. The 14th Brigade Commander contacted 1-14th Commander who is in his UH-60, airborne tactical command post (TAC). Also, the 14th Brigade Commander contacted 21st Corps Artillery and Compass Call to execute suppression of enemy air defense (SEAD) and communications jamming beginning at 0100: approximately 2 minutes before the helicopters cross the front line of own troops (FLOT).

At 0045 Hours, 12 AH-64s and the UH-60, airborne TAC, departed Forward Assembly Area (FAA) Sting along route Silver. At 0100, SEAD and jamming commenced; two minutes later 1-14th crossed the FLOT. While crossing the FLOT, the flight was engaged and 3 AH-64s were casualties.[43] One

AH-64 from teams 1, 2, and 3 were victims.[44] The flight continued as planned.

At 0130 Hours, Joint Surveillance Targeting Attack Radar System (JSTARS) detected two more relocateable from the same area crossing NAI 14 moving to Search Area 4. JSTARS designated this Target Set 4. Also, JSTARS reported that Target Sets 1, 2, and 3 continued to move towards templated search areas 1, 2, and 3.

At 0235 Hours, 1-14th arrived at the release point on Route Silver. JSTARS reported that Target Set 1 was set in Search Area 1 and launched one missile. Fortunately, a Patriot missile intercepted and destroyed the ballistic missile. Target Sets 2 and 3 had arrived in their respective Search Areas, but they had not set up to fire. Target Set 4 continued to move and was crossing NAI 24.

At 0250 Hours, 1-14th arrived at Search Areas 1, 2, 3, and 4. By 0315 Hours, 1-14th acquired, identified and destroyed all 8 relocateables and 8 support vehicles in Search Areas 1, 2, 3, and 4.[44] It took 21 Hellfire missiles to kill 16 vehicles. This equated to a .76 single shot kill probability.[45]

While in their search areas, the teams were engaged. The two remaining AH-64s in Team 2 were casualties upon departure from Search Area 2.[46] All other helicopters were unaffected.

At 0330 Hours, 1-14th rallied at the start point for Route Gold for the trip home. At 0525, five miles from crossing the front line of own troops (FLOT), 1-14th Attack Battalion turned on mode 4. This identified the flight as friendly to air defense, and triggered 21st Corps Artillery to fire suppression of enemy air defense. Upon crossing the FLOT, 5 AH-64s and the UH-60 were successfully engaged by the threat.[47] At 0555, of the 13 helicopters that departed on the mission, only 2 AH-64s survived to close on Forward Assembly Area Sting and be debriefed. The other helicopters sustained varying degrees of damage that rendered them combat ineffective.

Conclusion

By satisfying the intelligence, planning, and command, control,and communications requirements of the methodology, this hypothetical case study demonstrates that an echelon-above-corps (EAC) aviation brigade, equipped with advanced attack helicopters (AAHs), is capable of finding and destroying relocateable ballistic missiles. This gross analysis lacks the detail associated with actual cost and operational effectiveness analyses performed by U.S. Army agencies. Therefore, losses seem alarmingly high. Also, this analysis can not determine whether the threat response was catastrophic or superficial. This is particularly

frustrating, in light of the AH-64's successes in cross FLOT operations during Desert Storm.

Fortunately, 1-14th succeeded in finding and destroying all the relocateables. The question for the operational commander is: Is the risk of employing advanced attack helicopters deep commensurate with the payoff?

Clearly, the coordinated employment of special operating forces (SOF), fixed-wing aircraft, and advanced attack helicopters (AAHs) will undoubtedly enhance the operational capability of all warfighting commander-in-chiefs (CINCs). Saddam Hussein's success in disrupting the campaign tempo of Desert Storm with relocateable ballistic missiles did not go unnoticed. Therefore, this elusive threat will certainly proliferate.

Chapter Four draws conclusions from the research. These conclusions are categorized into doctrine, organization, and materiel.

Chapter Three Endnotes

(1) U.S. Army, Advanced Tactics Staff Planning Book, A 301, (Fort Leavenworth, KS: U.S. Army Command and General Staff College Print Office, October 1991), 1-4 (hereafter cited as A 301).

(2) Ibid.

(3) Ibid.

(4) Ibid.

(5) Ibid, 1-6.

(6) Ibid.

(7) Ibid.

(8) Ibid, 1-5.

(9) Ibid, 2-1.

(10) U.S. Army Aviation [After Action Report], "Aviation in Desert Shield/Storm," (Fort Rucker, AL: U.S. Army Aviation Center Print Plant, 30 June 1991), 4.1 (hereafter cited as "Aviation in Desert Shield/Storm").

(11) John F. Stewart Jr, "Operation Desert Storm the Military Intelligence Story: A View from the G-2, Third U.S. Army," A U.S. Army Desert Storm After Action Review (April 1991): 18.

(12) A 301, 7-1. The troop list for this Southwest Asia scenario does not include an echelon-above-corps (EAC) aviation brigade. Therefore, the 14th EAC Aviation Brigade is developed from the basic structure depicted in U.S. Army, FM 1-111, Aviation Brigades, (Washington D.C.: U.S. Government Printing Office, August 1990), 1-4 (hereafter cited as FM 1-111).

(13) FM 1-111, 1-3.

(14) Ibid.

(15) Ibid.

(16) Ibid, 1-4.

(17) A 301, 5-12.

(18) Ibid, 4-8.

(19) Ibid.

(20) Ibid.

(21) Ibid.

(22) Ibid, 4-9.

(23) U.S. Army, Student Text 100-9, Techniques and Procedures for Tactical Decisionmaking, (Fort Leavenworth, KS: U.S. Army Command and General Staff College Print Office, July 1991), 2-1.

(24) Barbara Starr, "Ballistic Missile Proliferation: A Basis of Control," International Defense Review (April 1990): 265.

(25) Jeffery M. Lenorovitz, "USAF F-15Es Lead Night Attack Effort Against SCUD Launchers," Aviation Week & Space Technology (February 18, 1991): 60.

(26) Captain Calvin Lovering, interviewed by author, Fort Leavenworth, KS, 10 March 1992. Assigned to Combined Arms Command, Threat Directorate, Captain Lovering is an expert on threat ballistic missiles around the world. He states that Iraq's Al-Hussain and Al-Abbas missiles must be launched from specific sites to hit desired targets.

(27) Lenorovitz, 60.

(28) FM 1-111, J-2.

(29) Joseph S. Bermudez, "Ballistic Missiles in the Third World--Afghanistan 1979-1992," Jane's Intelligence Review (February 1992): 57.

(30) Bermudez, 57.

(31) U.S. Army, FM 1-112, Attack Helicopter Battalion, (Washington D.C.: U.S. Government Printing Office, 21 February 1991), 2-16.

(32) FM 1-111, 1-4. FM 6-20-10,The Targeting Process, (Washington D.C.: U.S. Government Printing Office, 29 March 1990), B-2, B-4.

(33) Major Leonard Samborowski, interviewed by author, Fort Leavenworth, KS, 6 February 1992. Major Samborowski is an Army aviator who served as a crew member aboard a Joint Surveillance Attack Radar System (JSTARS) aircraft during Desert Storm. A resident expert, he witnessed the employment of JSTARS in detecting Iraq's Al-Hussain and Al-Abbas missiles.

(34) Ibid.

(35) FM 6-20-10,The Targeting Process, (Washington D.C.: U.S. Government Printing Office, 29 March 1990), B-2.

(36) Ibid, B-4.

(37) U.S. Army, FM 100-2-3, The Soviet Army: Troops, Organization, and Equipment, (Washington D.C.: U.S. Government Printing Office, June 1991), 5-121.

(38) Ibid.

(39) Ibid.

(40) U.S. Army, Student Text 100-2, U.S. Air Force Basic Data, (Fort Leavenworth, KS: U.S. Army Command and General Staff College Print Office, May 1991), E-6,E-7.

(41) Major Larry Maynard, interviewed by author, Fort Leavenworth, KS, 9 March 1992. Major Maynard is an Army aviator and AH-64 instructor pilot who served as a battalion executive officer for an AH-64 battalion in Desert Storm.

(42) Ibid, Major Maynard flew reconnaissance missions in the AH-64. His first-hand experience reflects the same techniques that are appropiate for AH-64s in this scenario.

(43) See Appendix. It provides the empirical analysis for the hypothetical case study results.

(44) Ibid.

(45) Ibid.

(46) Ibid.

(47) Ibid.

CHAPTER FOUR

CONCLUSIONS AND RECOMMENDATIONS

Review of the Study

At the behest of General Frederick Franks, (Commander of Training and Doctrine Command), and Major General David Robinson (Commander of the United States Army Aviation Center), this study examined the feasibility of advanced attack helicopters (AAHs) to find and destroy relocateable ballistic missiles. It began with a brief historical trace of warfighting contributions of armed helicopters. This historical glimpse illustrated the vital tactical contributions of gunships in Vietnam to the operational significance of AAHs in Desert Storm.

Strategically important, the proliferation of relocateable ballistic missiles threatens vital interests of the United States around the world. Furthermore, increased precision and lethality of these weapons threaten operational and tactical centers of gravity as well. Indeed, the unexpected importance of these missiles became the primary focus of the coalition forces throughout Desert Storm.

By performing operational fires in concert with other capable joint systems, advanced attack helicopters (AAHs) offer a possible solution in defeating relocateable ballistic missiles. By definition, this operational function is above the scope of corps-level units and below. Therefore, it is reasonable that advanced attack helicopters (AAHs) of the echelon-above-corps (EAC) aviation brigade perform this mission. This deductive reasoning developed into a hypothesis: an EAC aviation brigade, equipped with AAHs, can find and destroy relocateable ballistic missles. Since there exists no operational doctrine, the criteria for the methodology was derived from the closest existing material: tactical doctrine and experience from a corps perspective.

This methodology was applied to a hypothetical case study based upon the Training and Doctrine Command (TRADOC), Southwest Asia, common teaching scenario. Modified to include a relocateable missile threat, the study demonstrated that an EAC aviation brigade, AAH equipped, can find and destroy relocateable ballistic missiles.

Conclusions and Recommendations

Relocateable ballistic missiles represent a clear threat that will become more important with time. Developing new ways to counter this threat is a necessity.

Doctrine: The campaign significance of relocateable ballistic missiles makes this an issue of joint and allied service concern. Doctrine writers and operational planners should identify and catalog capable joint systems to counter this threat such as: special operating forces, advanced attack helicopters, fixed-wing aircraft, Patriot missiles, and intelligence systems. By definition this will involve both lethal and nonlethal attack means. Nonlethal means may well include psychological, and jamming operations.

Focusing on advanced attack helicopters (AAHs), Chapter Three, the hypothetical case study considered three lethal attack means to defeat relocateable ballistic missiles: special operating forces (SOF), advanced attack helicopters (AAHs), and fixed-wing aircraft. Each of these attack means has an expected degree of precision: SOF--most precise, fixed-wing--least precise, AAHs--somewhere in between. The degree of precision correlates to the ability of each of these assets to close with and destroy the target. With the increased emphasis on collateral damage, this is important. Doctrine writers should develop an umbrella concept that maximizes the collective capabilities of these systems. The intelligence community is crucial to this entire effort.

Intelligence efforts should be channeled to detection and monitoring. Intelligence products must be timely and accurate to serve the needs of each asset employed to attack this threat. Operationally important and highly elusive,

relocateables necessitate the fusion of national, theater, and tactical intelligence assets to paint a clear picture. Also important to this effort is a refinement of the doctrinal, situation, event, and decision support templates presented in Chapter Three.

As stated in the hypothetical case study (Chapter Three), relocatable missiles are a threat that must be attacked early in a campaign. Therefore, the assets earmarked to counter this threat must deploy to theater early in the strategic flow, and, depending on the pervasive nature of this threat, perhaps a full-time joint task force should be formed?

In terms of time and space relationships, the response time of the AAHs can be reduced if the helicopters can stage from remote areas inside enemy territory. This practice must be carefully evaluated to ensure that the associated risk is commensurate with the payoff. The success of this doctrine is not quantified by how many relocateables are destroyed, but by the ability to prevent the employment of these weapons. Therefore, massing our attack means at the decisive ponit and time while sustaining a tempo commensurate with relocateable employment will define success.

Organization: Just as 3d Army was the army force (ARFOR) in Desert Storm, 33d Army was the ARFOR in the

hypothetical case study. In Desert Storm, 3d Army focused on three actions:

* The initial focus was on its Army component command role to coordinate the joint and combined functions necessary to secure facilities to sustain and receive arriving forces.

* Later, the focus was on a theater army to determine the forces needed and the order in which they were to deploy to the Arabian Peninsula.

* Finally, the focus was as a numbered field army to control combat forces during operations.[1]

It is apparent that an Army Force (ARFOR) is too busy to dedicate itself to a brigade-size operation. In truth, the ARFOR exists to resource its subordinate corps units. Also, the echelon-above-corps (EAC) aviation brigade is a support organization for the ARFOR.

Army Aviation experts may contend that a corps aviation brigade is better suited for this mission. Indeed, they are robust, routinely fight deep, and have a habitual working relationship with their higher headquarters. However, consider Desert Storm: could the VIIth Corps Commander (then Lieutenant General Franks) have employed his corps aviation brigade during the air campaign to find and destroy relocateable ballistic missiles without risking the loss of precious combat power before the ground offensive?

Therefore, it is time to decide the fate of the EAC aviation brigade. Should the EAC brigade continue to solely

exist to perform perfunctory tasks, or should it break new ground as an operational asset? If so, FM 1-111, Aviation Brigades, must be expanded from the one-page coverage of the EAC brigade and discuss operational employment of this brigade. The EAC brigade staff should be resourced to the same robust structure of the corps brigade. This enables the EAC brigade to perform the necessary staffing functions already perfected by a corps brigade. The type and mix of subordinate units will be dependent upon the theater and wartime missions.

Materiel: Already issues of major concern, the AH-64 is deficient in three areas: navigation, target acquisition, and aircraft survivability equipment. As Task Force Normandy reinforced, the AH-64 does not posses a long-range, low-level, precise navigation capability. That is why the MH-53, Pave Low III, Helicopters led the AH-64s to their battle positions to destroy the Iraq's early warning radar. To be an operational asset, the AH-64 must have a long-range, low-level, precise navigation and the long-range, secure communications capabilities that are equivalent to the Pave Low III. AH-64s would greatly profit from a global positioning system (GPS). Fortunately, the Longbow system incorporates both GPS and a ground mapping mode which aids the pilot in terrain avoidance and obstacle detection in poor weather.[2]

Also, to speed the detection, acquisition, identification and engagement sequence of processing relocateable targets, advanced attack helicopters (AAHs) would be more efficient to find relocateable missiles if AAHs were equipped with the Longbow system. The Longbow system rapidly detects, acquires, and classifies vehicles.

Also, critical to this effort is a means to communicate directly with command and control agencies as well as necessary intelligence systems. This would streamline command and control and enable AAHs to be more responsive to the threat.

Employed as an operational asset, AAHs survivability would be greatly enhanced if these strike packages could jam air defense radars and enemy communications. This would reduce the burden on other services to provide these essential services.

Controversy continues over the role of the UH-60 in deep operations. A highly versatile aircraft, the UH-60 is the best command and control platform in the attack helicopter battalion. To enhance its capability it must be equipped with nose-mounted forward looking infrared system with a record/playback capability is a must. Providing multimode long-range secure communications, the AN/ASC-15B commmand and control console is sufficient. The airborne target handover system would also enhance command and control.

In conclusion, relocateable ballistic missiles are a proliferating menance that could easily complicate future military operations. Fuzed, with other joint capable systems, the Army's advanced attack helicopter is a versatile system to counter this threat.

Chapter Four Endnotes

(1) John J. Yeosock, "Army Operations in the Gulf Theater," Military Review Volume LXXI (No. 9), (Fort Leavenworth, KS: U.S. Army Command and General Staff College, September 1991), 4.

(2) Major Donald Mark Ferrell, interviewed by author, Fort Leavenworth, KS, 25 February 1992. An expert on the LONGBOW System, Major Ferrell is an Army aviator who served as an Army LONGBOW project officer from June 1989 to June 1991.

APPENDIX

QUANTITATIVE ANALYSIS

This appendix contains the empirical data which supports the results of the hypothetical case study of Chapter Three. Captain Robert Jacobs provided the unclassified data for both Hellfire missile performance and threat response. Captain Jacobs is assigned to Training and Doctrine Analysis Command, Combined Arms Command, System Analysis Center located at Fort Leavenworth, Kansas.

The unclassified single shot kill probability (SSKP) for the Hellfire missile is .7 at 5 kilometers. Five kilometers corresponds to the maximum distance desired for AH-64s to detect, acquire, identify, and engage targets. Therefore all engagements occurred at this range.

The unclassified aggregate threat response to AH-64 is .33. Flown at night, the AH-64s are at greatest risk crossing the forward line of own troops (FLOT), and while clearing the search areas. Therefore, threat response is determined at these critical points. Because this is an aggregate probability, it is impossible to assess the degree of damage. For the sake of gross analysis, all affected helicopters are considered mission failure at that point.

Engagement Resolution: Using a random number table from page 499, CRC Standard Mathematical Tables (see Figure 28),[1] Hellfire performance is determined by selecting the numbers in column 1 sequentially from the top of the column. The threat response is determined in the same fashion using column 2.

Threat Response

Location	Aircraft	*Value	Results
Crossing FLOT (ingress)	Team 1		
	AH-64	.150	Msn Abort
	AH-64	.465	No Effect
	AH-64	.483	No Effect
	Team 2		
	AH-64	.930	No Effect
	AH-64	.399	No Effect
	AH-64	.069	Msn Abort
	Team 3		
	AH-64	.729	No Effect
	AH-64	.919	No Effect
	AH-64	.143	Msn Abort
	UH-60	.368	No Effect
	Team 4		
	AH-64	.695	No Effect
	AH-64	.409	No Effect
	AH-64	.939	No Effect
Search Area 1	Team 1		
	AH-64	.611	No Effect
	AH-64	.973	No Effect
Search Area 2	Team 2 **		
	AH-64	.127	Msn Abort
	AH-64	.213	Msn Abort
Search Area 3	Team 3		
	AH-64	.540	No Effect
	AH-64	.539	No Effect

Search Area 4	Team 4		
	AH-64	.976	No Effect
	AH-64	.912	No Effect
	AH-64	.584	No Effect
Crossing FLOT (egress)	Team 1		
	AH-64	.323	Msn Abort
	AH-64	.270	Msn Abort
	Team 3		
	AH-64	.330	Msn Abort
	AH-64	.722	No Effect
	UH-60	.205	Msn Abort
	Team 4		
	AH-64	.573	No Effect
	AH-64	.042	Msn Abort
	AH-64	.264	Msn Abort

* Value must be less than .333 for the threat be effective.

** Assume Team 2 enagaged its targets before a threat response transpired.

Hellfire Performance

Location	Target	***Value	Results
Search Area 1	Relocateable	.104	Kill
	Relocateable	.223	Kill
	Wheeled vehicle	.241	Kill
	Wheeled vehicle	.421	Kill
Search Area 2	Relocateable	.375	Kill
	Relocateable	.779	Miss
	Second shot	.995	Miss
	Third shot	.963	Miss
	Fourth shot	.895	Miss
	Fifth shot	.854	Miss
	Sixth shot	.289	Kill
	Wheeled vehicle	.635	Kill
	Wheeled vehicle	.094	Kill
Search Area 3	Relocateable	.103	Kill
	Relocateable	.071	Kill
	Wheeled vehicle	.510	Kill
	Wheeled vehicle	.023	Kill
Search Area 4	Relocateable	.010	Kill
	Relocateable	.521	Kill

Wheeled vehicle	.070	Kill
Wheeled vehicle	.486	Kill

*** Value must be less than .7 for the Hellfire to be effective

A TABLE OF 14,000 RANDOM UNITS

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	10480	15011	01536	02011	81647	91646	69179	14194	62590	36207	20969	99570	91291	90700
2	22368	46573	25595	85393	30995	89198	27982	53402	93965	34095	52666	19174	39615	99505
3	24130	48360	22527	97265	76393	64809	15179	24830	49340	32081	30680	19655	63348	58629
4	42167	93093	06243	61680	07856	16376	39440	53537	71341	57004	00849	74917	97758	16379
5	37570	39975	81837	16656	06121	91782	60468	81305	49684	60672	14110	06927	01263	54613
6	77921	06907	11008	42751	27756	53498	18602	70659	90655	15053	21916	81825	44394	42880
7	99562	72905	56420	69994	98872	31016	71194	18738	44013	48840	63213	21069	10634	12952
8	96301	91977	05463	07972	18876	20922	94595	56869	69014	60045	18425	84903	42508	32307
9	89579	14342	63661	10281	17453	18103	57740	84378	25331	12566	58678	44947	05585	56941
10	85475	36857	43342	53988	53060	59533	38867	62300	08158	17983	16439	11458	18593	64952
11	28918	69578	88231	33276	70997	79936	56865	05859	90106	31595	01547	85590	91610	78188
12	63553	40961	48235	03427	49626	69445	18663	72695	52180	20847	12234	90511	33703	90322
13	09429	93969	52636	92737	88974	33488	36320	17617	30015	08272	84115	27156	30613	74952
14	10365	61129	87529	85689	48237	52267	67689	93394	01511	26358	85104	20285	29975	89868
15	07119	97336	71048	08178	77233	13916	47564	81056	97735	85977	29372	74461	28551	90707
16	51085	12765	51821	51259	77452	16308	60756	92144	49442	53900	70960	63990	75601	40719
17	02368	21382	52404	60268	89368	19885	55322	44819	01188	65255	64835	44919	05944	55157
18	01011	54092	33362	94904	31273	04146	18594	29852	71585	85030	51132	01915	92747	64951
19	52162	53916	46369	58586	23216	14513	83149	98736	23495	64350	94738	17752	35156	35749
20	07056	97628	33787	09998	42698	06691	76988	13602	51851	46104	88916	19509	25625	58104
21	48663	91245	85828	14346	09172	30168	90229	04734	59193	22178	30421	61666	99904	32812
22	54164	58492	22421	74103	47070	25306	76468	26384	58151	06646	21524	15227	96909	44592
23	32639	32363	05597	24200	13363	38005	94342	28728	35806	06912	17012	64161	18296	22851
24	29334	27001	87637	87308	58731	00256	45834	15398	46557	41135	10367	07684	36188	18510
25	02488	33062	28834	07351	19731	92420	60952	61280	50001	67658	32586	86679	50720	94953
26	81525	72295	04839	96423	24878	82651	66566	14778	76797	14780	13300	87074	79666	96725
27	29676	20591	68086	26432	46901	20849	89768	81536	86645	12659	92259	57102	80428	25280
28	00742	57392	39064	66432	84673	40027	32832	61362	98947	96067	64760	64584	96096	98253
29	05366	04213	25669	26422	44407	44048	37937	63904	45766	66134	75470	66520	34693	90449
30	91921	26418	64117	94305	26766	25940	39972	22209	71500	64568	91402	42416	07844	69618
31	00582	04711	87917	77341	42206	35126	74087	99547	81817	42607	43808	76655	62028	76630
32	00725	69884	62797	56170	86324	88072	76222	36086	84637	93161	76038	65855	77919	88006
33	69011	65797	95876	55293	18988	27354	26575	08625	40801	59920	29841	80130	12777	48501
34	25976	57948	29888	88604	67917	48708	18912	82271	65424	69774	33611	54262	85963	03547
35	09763	83473	73577	12908	30883	18317	28290	35797	05998	41688	34952	37888	38917	88050
36	91567	42595	27958	30134	04024	86385	29880	99730	55536	84855	29080	09250	79656	73211
37	17955	56349	90999	49127	20044	59931	06115	20542	18059	02008	73708	83517	36103	42791
38	46503	18584	18845	49618	02304	51038	20655	58727	28168	15475	56942	53389	20562	87338
39	92157	89634	94824	78171	84610	82834	09922	25417	44137	48413	25555	21246	35509	20468
40	14577	62765	35605	81263	39667	47358	56873	56307	61607	49518	89656	20103	77490	18062
41	98427	07523	33362	64270	01638	92477	66969	98420	04880	45585	46565	04102	46880	45709
42	34914	63976	88720	82765	34476	17032	87589	40836	32427	70002	70663	88863	77775	69348
43	70060	28277	39475	46473	23219	53416	94970	25832	69975	94884	19661	72828	00102	66794
44	53976	54914	06990	67245	68350	82948	11398	42878	80287	88267	47363	46634	06541	97809
45	76072	29515	40980	07391	58745	25774	22987	80059	39911	96189	41151	14222	60697	59583
46	90725	52210	83974	29992	65831	38857	50490	83765	55657	14361	31720	57375	56228	41546
47	64364	67412	33339	31926	14883	24413	59744	92351	97473	89286	35931	04110	23726	51900
48	08962	00358	31662	25388	61642	34072	81249	35648	56891	69352	48373	45578	78547	81788
49	95012	68379	93526	70765	10593	04542	76463	54328	02349	17247	28865	14777	62730	92277
50	15664	10493	20492	38391	91132	21999	59516	81652	27195	48223	46751	22923	32261	85653

Figure 28. Table of Random Units

Appendix One Endnotes

(1) William H. Beyer, Ph.D, Standard Mathematical Tables, (Cleveland, OH: CRC Press, 1976) 499.

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