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IS CURRENT FIRE SUPPORT DOCTRINE FOR THE DEEP BATTLE EFFECTIVE IN THE POST DESERT STORM ENVIRONMENT?

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 ART AND SCIENCE

by

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M.A., U.S. NAVAL POSTGRADUATE SCHOOL, Monterey, CA, 1992

Fort Leavenworth, KS
1992

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	4 June 1993	Master's Thesis, 1 Aug 92-4 June 93

4. TITLE AND SUBTITLE
Is Current Fire Support Doctrine for the Deep Battle Effective in the Post Desert Storm Environment?

5. FUNDING NUMBERS

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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ATTN: ATZL-SWD-GD
Fort Leavenworth, KS 66027-6900

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*
This study investigates the role of Fire Support Coordination Measures during Desert Storm. Desert Storm indicated the need make changes in how the fire support system interfaces with the deep battle conducted at the corps and EAC levels. This study analyzes both the framework of the deep battle at corps and echelon above corps levels as well as how the deep battle was fought in the Persian Gulf. It recommends significant change in the fire support system. Specifically, it recommends that the control of the deep battlefield be more clearly delineated between the air and the ground commander. The way to do this would be to eliminate both the Fire Support Coordination Line and the Reconnaissance Planning and Interdiction Line, and replace them with a new Fire Support Coordination Measure called the Fire Control Line (FCL).

14. SUBJECT TERMS	15. NUMBER OF PAGES
Fire support, fire support coordination, deep operations, close air support, air interdiction, artillery, ATACMS	141
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	

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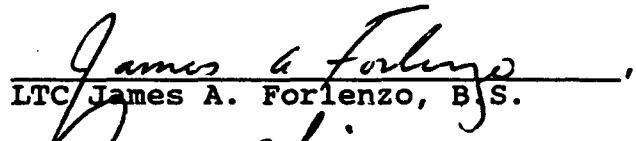
THESIS APPROVAL PAGE

Name of candidate: Major Edward J. Francis

Thesis Title: Is Current Fire Support Doctrine for the Deep Battle Effective in the Post Desert Storm Environment?

Approved by: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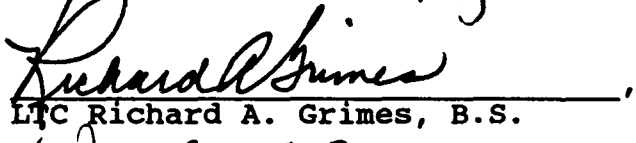
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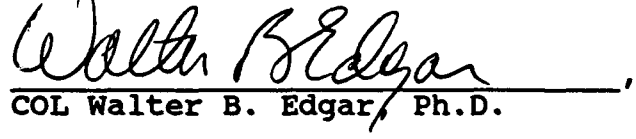
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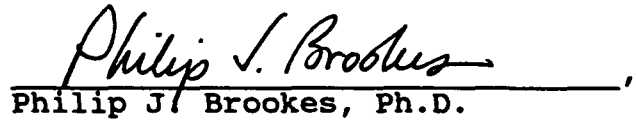
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ABSTRACT

IS CURRENT FIRE SUPPORT DOCTRINE FOR THE DEEP BATTLE EFFECTIVE IN THE POST DESERT STORM ENVIRONMENT? by MAJ Edward J. Francis, USA, 110 pages.

This study investigates the role of Fire Support Coordination Measures during Desert Storm. Desert Storm indicated the need make changes in how the fire support system interfaces with the deep battle conducted at the corps and EAC levels. This study analyzes both the framework of the deep battle at corps and echelon above corps levels as well as how the deep battle was fought in the Persian Gulf. It recommends significant change in the fire support system. Specifically, it recommends that the control of the deep battlefield be more clearly delineated between the air and the ground commander. The way to do this would be to eliminate both the Fire Support Coordination Line and the Reconnaissance Planning and Interdiction Line, and replace them with a new Fire Support Coordination Measure called the Fire Control Line (FCL).

ACKNOWLEDGEMENTS

I would like to thank the members of my thesis committee for their assistance in the preparation of this study. The committee chairman, LTC James Forlenzo, continually provided just the right amount of push to keep my thoughts on track and to ensure that I met my suspenses. His proofreading skills continually assured that my thesis met the CGSC standard.

I would also like to thank my wife, Sylvia, for allowing me to monopolize our computer for hours at a time and for ignoring the mess I continually made in our den by spreading papers and books all over the floor.

Finally, I would like to thank Major Stanley Sims and Captain John Siggelow for their assistance. Stan and John were both co-workers of mine in the ARCENT G-3 Deep Operations section during Desert Shield and Desert Storm. Stan provided invaluable assistance to me by clarifying various issues and by obtaining file copies of ARCENT briefing slides from 3rd Army Headquarters at Fort McPherson, Georgia. He also coined the term "Fire Control Line" to describe a concept that I was developing. John, a true Redleg, provided timely input on the formulation of my conclusions.

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LIST OF ABBREVIATIONS

AAR	After action review
AAFCE	Allied Air Forces Central Europe
ABCCC	Airborne command and Control center
ACA	Airspace coordination area
ADA	Air defense artillery
AFM	Air force manual
AI	Air interdiction
AOC	Air operations center
ARCENT	Army Central Command
ARFOR	Army forces
ASOC	Air support operations center
ATACMS	Army tactical missile system
ATO	Air tasking order
A^2C^2	Army airspace command and control
BAI	Battlefield air interdiction
BCE	Battlefield control element
CALL	Center for Army Lessons Learned
CAFMS	Computer assisted fight management system
CAS	Close air support
CENTAF	Central Air Forces
CENTCOM	Central Command
CINC	Commander in chief
CP	Command post
COMMZ	Communications zone
C^2	Command and control
C^3	Command, control, and communications
C^3IC	Coalition coordination communication integration center
DOD	Department of Defense
D^3	Decide, detect, deliver
EAC	Echelon above corps
FM	Field manual
FMFM	Fleet Marine field manual
FLOT	Forward line of own troops
FSCL	Fire support coordination line
FSCM	Fire support coordination measure
FSCOORD	Fire support coordinator
FSE	Fire support element
HPT	High payoff target

HVT	High value target
JEWC	Joint Electronics Warfare Center
JFACC	Joint forces air component commander
JFC	Joint forces commander
JFC-N	Joint forces command-north
KTO	Kuwait theater of operations
LNO	Liaison officer
LOC	Line of communication
MARCENT	Marine Central Command
MLRS	Multiple launch rocket system
NATO	North Atlantic Treaty Organization
NBC	Nuclear, biological, and chemical
NFA	No fire area
OPCON	Operational control
OPORD	Operations order
RFA	Restrictive fire area
RFL	Restrictive fire line
RIPL	Reconnaissance and interdiction planning line
RGFC	Republican guard forces command
SOCCE	Special operations command and control element
SOF	Special operations forces
TACP	Tactical air control party

CHAPTER 1

INTRODUCTION

The purpose of this thesis is to analyze the use and applicability of fire support coordination measures (FSCMs) in light of lessons learned during Desert Storm. Of particular interest are the FSCMs that are used in the management of the corps and echelon above corps (EAC) deep fight. As a corollary to the analysis of these measures, this thesis will also make recommendations and suggestions as to how the corps and EAC fight should be conducted in terms of using fires to shape and influence the battlefield. Those recommendations will also include the appropriate structure of the corps and EAC deep fight for contingency operations and mature theaters. The need to relook the FSCMs in question is long overdue. The publication of the 1982 version of FM 100-5 *Operations*, placed a greater emphasis on deep operations, non-linearity of future battlefields, and the importance of combined operations.

A year after its publication, Operation Urgent Fury drove these points home as U.S. forces executed a combined airborne, amphibious, air, and naval attack on numerous objectives located on the small island of Grenada. Despite the non-linearity of this operation, the well-publicized

difficulties involved in obtaining timely fire support, and the joint nature of the attack, there was little push to reform the fire support system. Six years later, U.S. forces launched Operation Just Cause where over 20,000 service personnel conducted a swift and violent assault on Panamanian forces. Again, despite the non-linearity of the attack, there seemed to be little push to reexamine the linear nature of the FSCMs that were a key part of Army doctrine. The lack of ground fire support in the operation, which was mostly characterized by simultaneous assaults of infantry and air assets on numerous objectives, was probably the reason why questions concerning FSCMs did not arise. It was not until U.S. Forces were committed in Southwest Asia that the shortcomings in the traditional measures used in fire support coordination finally were brought to the forefront.

On August 2nd, 1990, Iraqi forces invaded Kuwait. Five months later time ran out for Saddam Hussein and the U.S. led coalition forces launched a massive air attack against Iraq. After thirty eight days of bombardment, the ground phase of the campaign was initiated and one hundred hours later, with the President declaring that all military objectives had been met, the war ended. During the course of the ground and air campaigns, there were numerous issues to be resolved both among and within the services that were prosecuting the war. Among them were control, coordination,

and use of fire support assets. Indeed, in some ways the conflict concerning fire support had started prior to the first aircraft being launched on the 16th of January.

Of primary concern during the planning stages was the nature of the targeting effort: who was to determine which targets were going to be attacked during the air campaign? In terms of joint operations, the ideal solution was for the air component (Air Force Central Command--CENTAF) and the ground components (Army Central Command--ARCENT and Marine Central Command--MARCENT) to create a joint targeting cell. This cell would develop, in conjunction with the ground campaign plan, courses of action which it would then present to the joint commander (in this case, CINCCENTCOM, General Schwarzkopf). He would then chose the best solution and order the Joint Forces Air Component Commander (JFACC) to implement it. However, as will be discussed in chapter four of this thesis, this did not happen. Within the services, the same issue was not dealt with in an effective manner either. The manager of the targeting effort in both the ARCENT and Joint Forces Command North (JFC-N) areas of operation was the ARCENT G-3 Deep Operations Cell. Ideally this element was to allocate blocks of targets to its subordinate units: VII Corps, XVIII Airborne Corps, and (for targeting purposes) JFC-N; it was also to prioritized and deconflict the nominated targets vice its own targeting effort, and then submit the refined

plan to the joint targeting cell. Unfortunately, this did not occur either. The failure to adequately coordinate fire support efforts did not improve once the air campaign started.

The commencement of the air war served to only exacerbate the coordination problems within the fire support system. Of immediate concern was the continuous problem revolving around the targeting effort and who was getting the bulk of targets on the Air Tasking Order (ATO). Much of the debate was focused upon a nondoctrinal targeting C^2 measure, the Reconnaissance and Interdiction Planning Line (RIPL). This measure, established by ARCENT, served as a limiting factor on Corps' targeting efforts.

The northward expansion of the RIPL, and the corresponding increase in Corps' targeting authority, was resisted by ARCENT Headquarters. Simultaneously, a similar conflict was on-going between ARCENT and CENTAF, with the ground component vigorously lobbying for inclusion of targets on the ATO. Conflicts among services also extended to matters of airspace control where ARCENT's desire to engage deep targets beyond the Fire Support Coordination Line (FSCL) with the Army Tactical Missile System (ATACMS) were stymied by CENTAF objections to the delivery of ordnance into what it defined to be its own airspace. In many ways this dispute epitomized the conflict between the air and ground component: ARCENT saw the FSCL as a

permissive FSCM where no coordination was required for fires delivered beyond it and CENTAF viewed the FSCM as restrictive because it could not deliver ordnance short of it and ground forces could not deliver fires long of it if they would interfere with tactical air operations. The controversy surrounding the FSCL intensified during the ground war as the three subordinate elements to ARCENT (VII Corps, XVIII Airborne Corps, and JFC-N) each progressed at different rates and established different FSCLs. The impact of this was to create a disjointed battlefield where adjoining FSCLs were not close to each other, causing--due to the lack of identifiable terrain features upon which to draw the FSCLs--much confusion among air force pilots attempting to engage targets.

The net effect of these problems was to create a considerable amount of confusion for all involved and reinforce the need to reexamine the structure of the fire support coordination system in the deep battle.

Research Question

The primary research question of this thesis is: Does current fire support doctrine for the deep battle meet the needs of the military in light of the lessons learned in the Persian Gulf War?

Subordinate to this primary question are several secondary and tertiary questions which should be answered as part of this research. The geographical focal point of the

questions center on the area of the battlefield that lies between the FSCL and the RIPL. Specifically:

- Who should exercise primary control over this area? The Corps commander or the air component commander or both--but at different times--during a phased campaign?
- How should FSCMs change as a result of new technologies that allow the corps and EAC ground commander to see and attack at longer ranges than in the past?

Prior to analyzing these questions, it is necessary to define each of the terms used. However, even this process leaves room for ambiguity in the fire support arena, since the definitions come from multiple authoritative sources, that do not always agree with one another.

Definitions

The presence of specific terminology in the military has always required that those who discuss and execute doctrine be familiar with the accepted definitions that these terms carry with them. This is most certainly true in the case of analyzing FSCMs. Definitions for these measures are found in several doctrinal manuals. Chief among them is Joint Pub 1-02, *Dictionary of Military and Associated Terms*. The preface for this manual clearly states that Department of Defense activities will "use the

terms and definitions without alteration unless a distinctly different context or application is intended."[1] The caveat allows for changes in the definition by joint commanders and organizations, such as NATO. Therefore, NATO publications such as Allied Air Forces Central Europe (AAFCE) Manual 80-2 *Offensive Air Support*, are also useful in establishing definitions for the terms used in this thesis. Since many of the FSCMs are not defined in JCS publications, it is also necessary to examine service publications such as U.S. Army Field Manual 6-20 *Fire Support in the AirLand Battle*.

Fire Support Coordination Line (FSCL)

The Department of Defense definition of this FSCM (figure 1) is found in Joint Publication 1-02:

> A line established by the appropriate ground commander to insure coordination of fire not under his control but which may effect current tactical operations. The fire support coordination line is to used coordinate fires of air, ground, or sea weapons using any type of ammunition against surface targets. The fire support coordination line should follow well defined terrain features. The establishment of the fire support coordination line must be coordinated with the appropriate tactical air commander and other supporting elements. Supporting elements may attack targets forward of the fire support coordination line, without prior coordination with the ground force commander, provided the attack will not produce adverse effects on, or to the rear of, the line. Attacks against surface targets behind this line must be coordinated with the appropriate ground force commander.[2]

This definition places an emphasis on several criteria. First, it indicates that the overall purpose of the FSCL is to safeguard U.S. ground forces from the effects

of fires delivered by weapon systems not under the ground force commander's control. Second, it stresses the joint manner of the measure and specifies that it will only be established after coordination with the tactical air commander. Third, it emphasizes that the line must follow well-defined terrain features, the implicit point here being that it is extremely difficult for pilots to fly at high speeds and discern which terrain falls on either side of a grid line, as opposed to a river or a major highway system. NATO publications define the FSCL in largely the same manner, albeit with some differences. The following definition is taken from AAFCE Manual 80-2 *Offensive Air Support* and is primarily addressing air force personnel.

> The FSCL is a line established by the appropriate ground commander to ensure coordination of fire not under his control, but which may effect current tactical operations. The FSCL is used to coordinate fires of air, ground or sea weapon systems using any type of ammunition against surface targets. The FSCL should follow well- defined terrain features. The establishment of the FSCL must be coordinated with the appropriate tactical air commander and other supporting elements. Supporting elements may attack targets beyond the FSCL without prior coordination with the ground force commander provided that the attack will not produce adverse effects short of the line. Attacks against surface targets short of this line must be coordinated with the appropriate ground force commander. The FSCL should be as close to the forward elements of the land forces as possible consistent with the tactical situation. One of the factors considered by the land forces when establishing the FSCL is the area over which the ground commander has a direct influence. Normally this is limited by the range of organic army weapon systems.[3]

This definition is largely the same as that found in the joint publication cited earlier, indeed it is identical in much of its language. There are some obvious differences however. The first is that it mandates where the line should be drawn i.e, as close as possible to the forward land forces. Next it narrows this to the actual distance, which it sees as being equivalent to the reach of the army weapon systems that belong to the ground commander who is establishing the FSCL. The nature of the weapon systems themselves are not discussed, and it would be easy to assume that the definition is referring primarily to indirect fire systems, such as conventional artillery. However, the vagueness of the definition does not discount the placing of the FSCL at the operational limit of attack helicopters which would significantly lengthen the size of the area short of the FSCL. Another NATO definition of the FSCL can be found in NATO STANAG No. 2934 *Artillery Procedures*. While this definition largely mirrors that found in AAFCE 80-2, it does contain a significant addition. It specifies that "When detached forces are beyond (the) FSCL, another FSCL should be placed around the detached force."[4] This additional information acknowledges that the battlefield is not linear in nature and that forces could easily be committed deep, necessitating additional FSCMs to protect them and/or to allow them to shape their area with fires. U.S. military doctrine has traditionally had a

significant impact upon NATO doctrine so it is of little surprise that U.S. service definitions of the FSCL are closely related to their NATO counterparts, as we have already seen by comparing U.S. joint doctrine with NATO doctrine.

The U.S. Army's primary source for doctrinal definitions is Field Manual 101-5-1 *Operational Terms and Symbols*. The definition found within this manual for the FSCL is an exact copy of the one in Joint Publication 1-02. It concentrates on establishing an FSCM that is designed to compartmentalize the battlefield for execution purposes. It allows unrestricted fires long of the line but prohibits fires short of the line (without coordination) that may adversely effect friendly forces. Another source for fire support definitions is Field Manual 6-20-30 *Fire Support for Corps and Division Operations*.

This fire support manual is a product of the U.S. Army's Field Artillery School and serves not only as a primary reference source for corps and division combat operations but also "as a guide for echelon above corps regarding the organization, capabilities, and employment of fire support."[5] This is a noteworthy point since the lack of EAC doctrine was a shortcoming during Desert Storm. In addition, FM 6-20-30 is often used by Army personnel as a favored source for definitions concerning fire support matters because the artillery community normally serves as

the doctrinal proponent for this area. There are numerous differences between the definitions found in this document and the definitions found in those documents previously cited, since the material is covered in greater detail.

One of the key points of the FSCM definition process in this manual is the separating of measures into two categories: permissive and restrictive. Permissive measures are designed to facilitate the attack of targets. Conversely, restrictive measures are those that place certain limiting factors upon delivery units for the area affected by the restrictive fire measure. These limiting factors may prohibit fires altogether, restrict certain types of ammunition from being expended, or require specific coordination prior to the engagements of targets. The FSCL is placed in the category of a permissive fire coordination measure because it is designed to facilitate the engagement of targets that are beyond the FSCL.

The definition of the FSCL is both lengthy and detailed in this manual and differs significantly from those definitions discussed earlier. Portions of the definition that are not critical to its understanding (e.g., means of dissemination and portrayal on maps and overlays) is omitted.

> An FSCL may be established by the corps within its area of operation to support its concept of the operation. It must be coordinated with the appropriate tactical air commander and other supporting elements. The purpose of this permissive fire control measure is to allow the corps and its

subordinate and supporting units (such as the Air Force) to expeditiously attack targets beyond the FSCL. The attack of targets beyond the FSCL with Army assets should be coordinated with supporting tactical air. This coordination is defined as informing and/or consulting with the supporting tactical air component. However, the inability to effect this coordination does not preclude the attack of targets beyond the FSCL...Three conditions should be met before an FSCL is established by a corps:

- A portion of the corps deep operation area does not require selective targeting to shape the deep operations fight.
- The expeditious attack of targets beyond the FSCL will support the operations of the corps, the attacking unit, or the higher headquarters of the attacking unit.
- The corps...(is) willing to accept the possible duplication of effort which may result from dual targeting beyond the FSCL.

The primary consideration for placement of the FSCL is that it should be located beyond the area in which the corps intends to shape its deep operations fight. The deep operations fight is shaped by restricting the movement of enemy follow-on forces to influence the time and location of their arrival into the close operations area. This usually requires selective targeting and coordinating of fires in the area where the shaping is expected to occur. Normally, the FSCL is established well beyond the range of cannon and (MLRS)...in this case only corps missile systems [e.g., ATACMS] and possibly attack helicopters have the range to attack targets beyond the FSCL. However, the corps deep operations concept may not seek to shape the fight but only focus on maximizing the destruction of enemy units...the corps (should then) establish the FSCL as close as possible to its close operations area. This maximizes the number of fire support systems capable of firing beyond the FSCL.[6]

There are several major points in this definition that should be readily clear. First is the emphasis on the FSCL as a tool for affecting the outcome of the close fight by using it to shape the deep battlefield. This differs

from the previous discussions of the FSCL which implied that the primary purpose was to protect friendly forces from indiscriminate fires which could be fired without coordination beyond the FSCL. By allowing a free engagement of targets the design of the FSCL would then result in the maximum destruction of enemy units that were beyond it. The definition from FM 6-20-30 tends to focus more on the fires that are delivered short of the FSCL and states clearly that the corps commander should place the FSCL far beyond the area which would simply create a safe area for soldiers on the battlefield. He should place it where it best serves his purpose in shaping the battlefield to the corps' advantage.

Another difference in this definition is that it specifically states that the FSCL should be placed "well beyond the range of cannon and multiple rocket FA systems."[7] This implies that the FSCL should be drawn 40km or more beyond the forward line of troops (FLOT), depending upon the interpretation of the phrase "well beyond." Yet another difference revolves around the issue of Army fires delivered beyond FSCL, a problem that is not even addressed in the other definitions of the subject. Under the concept described FM 6-20-30, the corps commander should, but does not necessarily have to, coordinate fires delivered beyond the FSCL with supporting commander(s), i.e., the Air Force. The meaning of this then is that required coordination is a

one-way street: fires delivered short of the line must be coordinated, even if they do not affect friendly forces (because they may still adversely affect the corps' commanders desired shaping of the battlefield). On the other hand, the corps commander is not required (only advised) to coordinate fires delivered beyond the FSCL, even though the lack of coordination may result in a hazardous situation for Air Force personnel in operating in that area.

Finally, this definition of the FSCL states that the duplication of targeting effort beyond the FSCL is a situation that is tolerable. Again, this matter is not discussed in previous definitions. This violates the synchronization principle of the AirLand Battle by stating that unsynchronized fires are tolerable. That this situation may not be tolerable was one of the reasons why a non doctrinal measure called the "RIPL" was established by NATO.

Reconnaissance and Interdiction Planning Line (RIPL)

This term (figure 2) refers to a planning line that is not a fire support coordination measure, but instead a delineation of the battlefield that results in assigned areas for the corps, EAC, and air component to use in their targeting efforts. The RIPL is not a doctrinal term, instead it is a measure that was adopted in Europe to give the corps commander the power to conduct deep targeting in order to support future operations. Allied Air Forces

Central Europe Manual 80-2 *Offensive Air Operations,* gives the following definition of this measure:

> The RIPL is a planning line which is determined by and coordinated between army groups. It is normally sited so as to segregate the leading armies of the Warsaw Pact from the reserve armies and follow-on elements. It will usually be located 80-100 kilometers from the FLOT, concurrent with the corps limit of intelligence and planning responsibility. Short of the RIPL the corps commander has the primary responsibility for nominating targets which have a direct bearing on the land battle. However, air interdiction sorties may also be flown in the area short of the RIPL when coordinated with the appropriate corps. Air interdiction mission (in this area) should be jointly planned.[8]

The line assists in the prevention of duplicative targeting efforts and, as such, helps synchronize fire assets on the battlefield. The fact that it does not function as either a permissive or restrictive fire control coordination measure means that its presence on the battlefield does not impede delivery of ordnance beyond the FSCL. Air assets can still engage targets, particularly targets of opportunity at will so long as the effects of the fires do not adversely affect operations on the other side of the FSCL. The corps commander then, does not hold ownership of this area, he only controls the targeting process: i.e., he has the primary responsibility for the acquisition, attack, and nomination of targets for air attack. Air interdiction can be planned by the air forces in this area, but only after coordination with the corps commander. Failure to effect coordination withthe corps

commander does not preclude target engagement by the air forces.

Other Fire Support Coordination Measures.[9]

There are numerous other FSCMs than the FSCL and a basic understanding of them is necessary for the adequate analysis of the research question.

The basic fire support coordination measure is the boundary (figure 3.) It is both permissive and restrictive in nature. They are restrictive in that fires cannot be delivered across them unless those fires have been coordinated with the force operating within the limits of that boundary, unless a permissive FSCM such as an FSCL is in effect that would allow the firing without coordination. Boundaries are permissive in nature because the maneuver commander has freedom of fire within his own boundaries.

The coordinated fire line (CFL) is a permissive fire coordination measure (figure 4.) The CFL is a line beyond which fires may be delivered without the coordination of the CFL establishing authority. The applicable fires are surface to surface only and include mortars, field artillery, and naval gunfire. It does not include air to ground fires from Army attack aviation or Air Force assets. The purpose of the CFL, much like the FSCL is to expedite the delivery of fires beyond the measure while requiring coordination for fires delivered short of it. This coordination limitation protects soldiers operating short of

the CFL from fires and allows for the maximum destruction of enemy forces long of the measure. It is normally located as close as possible to the as possible to the establishing unit. The CFL is designated by brigade level units and then consolidated at division level into a consolidated division CFL.

Another permissive fire coordination measure is the Free Fire Area (FFA). The FFA (figure 5) is an area in which fires may be delivered without coordination. The applicable fires include all fires: surface-to-surface naval gunfire, and tactical air. It is usually established at division level or above and is often located on identifiable terrain so that aircraft can readily identify it and use it as an undeliverable ordnance "dump site" when necessary. Unlike other FSCMs which tend to be linear, the FFA is a continuous line: a circle, or an oval shaped area. The remaining permissive fire measure is the FSCL which has already been discussed in detail.

A restrictive fire support coordination measure places limitations on delivery units in terms of the time, place, and/or types of ordnance that can be delivered. A Restrictive Fire Line (RFL) is an example of a restrictive fire measure (figure 6.) The purpose of the RFL is to protect converging friendly forces by prohibiting the delivery of fires across it. It is established by the next higher commander common to the converging forces and is

usually located on readily identifiable terrain. Fires across the line can only be delivered after the delivery unit has coordinated with the affected unit on the other side of the line.

A second type of restrictive fire measure is the No Fire Area (NFA). An NFA (figure 7) is an area where no fires can be delivered with two exceptions: 1) On a case-by-case basis of approval by the establishing authority, 2) If friendly forces operating within the NFA are engaged by enemy forces. In this case the friendly forces can fire to defend themselves. It is usually established by a division or a corps on identifiable terrain. Like the FFA, the shape of the NFA is continuous in nature.

A similar measure is the Restrictive Fire Area (RFA) which is an area that limits the delivery of ordnance into a certain area. As an example, an RFA may restrict the delivery of ordnance which is composed of submunitions if the terrain is to be occupied by friendly forces before the area can be cleared by ordnance disposal teams. The RFA can be established by a battalion or higher level command and like the NFA and FFA, it is continuous in nature.

The final restrictive fire support coordination measure is the Airspace Coordination Measure (ACA). The ACA (figure 8) is a three dimensional block of airspace that protects friendly aircraft from indirect fires on a target while allowing both the aircraft as well as the indirect

fire assets to simultaneously engage the target. To accomplish this, restrictions are usually placed upon the mortars, artillery, or naval gunfire assets that are engaging the target, normally in the form of a maximum ordinate for the delivery of munitions. Aircraft may also have restrictions placed upon them in the form of minimum and maximum altitudes within which aircraft can operate in. Implementation of this restrictive fire measure usually takes a significant amount of time and requires considerable coordination. Because of this, the formal ACA is often supplanted by an informal ACA which uses time, lateral separation, or altitude to segregate indirect fires from aircraft operating in proximity to each other. In addition to these FSCMs, other measures have been used to control the application of surface-to-surface and air-to-surface fires.

Non-Doctrinal Measures

During Desert Storm, one of these non-doctrinal measures used was the RIPL, which has already been defined and will be discussed in greater detail in Chapter 3. Another method utilized was the "kill box" technique of employing tactical air assets. Kill Boxes were established on maps as two-dimensional boxes that measured approximately 15x15 miles, and were identified alphanumerically, e.g., Kill Box AB32, BD14, etc. All of the boxes were drawn beyond the corps FSCLs. They were mostly used in the latter portion of the air campaign to assign aircraft to

geographical areas to engage targets of opportunity or planned targets that had not been sufficiently attritted. They were also used by the Airborne Command and Control Center (ABCCC) to assist aircraft unable to find their previously assigned targets because of bad weather, or target displacement.[10]

Air Support

The use of air assets played a major role in deep operations during Desert Storm. Close Air Support (CAS) and Battlefield Air Interdiction (BAI) (figure 9) were both terms used extensively during the conduct of operations, despite that the latter of these terms is not part of U.S. doctrine (the Air Force, for example, use "air interdiction" to describe interdiction operations; the Army differentiates between "air interdiction" and "battlefield air interdiction."

Close air support is defined in Air Force Manual 1-1 as "Air action against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces."[11] This definition is the same that is found in Joint Publication 1-02 as well as FM 101-5-1.

Defining BAI is not as easy. First, neither the Department of Defense, or the U.S. Air Force recognize the term. The Army, however, does recognize the validity of the BAI concept, primarily because of its use in NATO.

Like the RIPL, BAI is a term that is doctrinally accepted in Europe, but not in the U.S. AAFCE Manual 80-2 gives the following definition of BAI:

> Battlefield Air Interdiction is air action against hostile surface targets which are in a position to directly affect friendly forces but which does not require the detailed integration of each air mission with the fire and movement of those forces. These air missions can have a direct effect on the enemy's ability to continue operations and may be conducted on either side of the FSCL. While BAI missions require coordination and joint planning they may not require continuous coordination during the execution stage. Execution of BAI short of the FSCL must be coordinated with the appropriate corps.[12]

The Army definition (FM 101-5-1) of BAI is similar and notes that the term is "NATO usage." The definition found in FM 6-20-30 is similar to the NATO definition:

> BAI is an Air Force task within the framework of an of the AI mission. The AI attacks conducted against hostile land forces that are not in close proximity to friendly forces are referred to as battlefield air interdiction if the hostile forces could have a near term effect on the operation or scheme of maneuver of friendly forces. Prior coordination id required between the Army and the Air Force for attack of BAI targets. BAI has a direct or near-term effect on surface operations.[13]

All three sources of information used in describing air interdiction (AI) use the same definition:

> Air operations conducted to destroy, neutralize, or delay the enemy's potential before it can be brought to bear effectively against friendly forces at such distance from friendly forces that detailed integration of each mission with the fire and movement of friendly forces is not required.[14]

This final part of the definition section deals with the method of targeting employed by the U.S. Army. The

"Decide-Detect-Deliver" (D^3) targeting process determines the following information:

- What targets are to be acquired and attacked.
- When they are to be acquired and attacked.
- What is required to defeat the target.[15]

The first step, *decide*, develops target priorities to support the commander's intent. The end product of this phase is the commander issuing targeting guidance, PIRs, and high-payoff target list. These products drive the focus of the collection assets during the detect phase.

The second step is the *detect* phase, where the target acquisition assets available to the commander search for those targets whose acquisition and subsequent destruction support the execution of the mission.

The final step is the *deliver* phase where those targets that had been detected in step 2 are attacked. This attack may come from artillery, mortars, attack aviation, tactical air, or naval gunfire. If subsequent battle damage assessment shows that the commander's guidance has not been met, then the D^3 process continues focusing upon those targets deemed vital to mission accomplishment.

Summary

As a result of our recent experiences in combat, most notably in Desert Storm, there has developed a need to reexamine fire support doctrine. Of particular concern is

the area where the corps and EAC units conduct their deep battle and use the D^3 method of targeting.

Because of the heavy focus on doctrinal terms, it is necessary to adequately define those terms in the introduction of this thesis so as to avoid confusion during the analysis and recommendations chapters of this thesis. Of particular concern is the definition of the Fire Support Coordination Line and the Reconnaissance and Interdiction Planning Line since these terms are at the very heart of the problems encountered by units during the war.

Endnotes

1. Joint Chiefs of Staff, Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington D.C.: Joint Chiefs of Staff, 1989), iii.

2. Joint Publication 1-02, 144.

3. Allied Air Forces Central Europe, AAFCE Manual 80-2 *Offensive Air Support* (Ramstein, Germany: AAFCE Headquarters, 1986), 18.

4. North Atlantic Treaty Organization, NATO STANAG No. 2934 *Artillery Procedures* (n.p, n.d.), 1.

5. U.S. Army, FM 6-20-30 *Fire Support for Corps and Division Operations*, (Washington D.C.: Department of the Army, 1989) xi.

6. FM 6-20-30, F-4 to F-5.

7. FM 6-20-30, F-4.

8. AAFCE Manual 80-2, 18.

9. FM 6-20-30, F-2 to F-7.

10. VII Corps Fires After Action Review (Letter distributed to subordinate VII Corps units, March 1991.)

11. U.S. Air Force, AFM 1-1 *Basic Aerospace Doctrine of the United States Air Force"* (Washington D.C.: Department of the Air Force, 1992) 276.

12. AAFCE Manual 80-2, 31.

13. FM 6-20-30, 3-2.

14. AFM 1-1, 271.

15. U.S. Army, FM 6-20-10 *Tactics, Techniques, and Procedures for the Targeting Process* (Washington D.C.: U.S. Department of the Army, 1989) 1-3.

CHAPTER 2

LITERATURE REVIEW AND RESEARCH METHODOLOGY

Literature Review

A great many of books have been published about the Persian Gulf War since 1991. Among these, there are several that stand out as factually accurate, non-polemic works that describe in detail the nature of the military effort. Two of these books, *Desert Victory: The War For Kuwait* and *Triumph Without Victory* are perhaps the best of the genre. While they do not address fire support issues in particular, they do provide an accurate accounting of the major operations conducted as well as a historical background on that area of the Middle East. Nonetheless, dissecting the war in military (as opposed to political) terms, is not the strong point of either one of these otherwise excellent works.

Government documents provide a more descriptive account of the war in general and shed more light on the various contentious issues that arose during the course of the war. They are also a reliable primary reference source. An excellent unclassified overview of the war can be found in *Conduct of the Persian Gulf War: An Interim Report to Congress*. This document, submitted to Congress by the

Department of Defense, addresses twenty-six questions submitted to the Secretary of Defense by the members of the House and Senate Armed Services Committees. Again, while fire support is not among the issues discussed in the document, it provides much information about the air and ground campaign, and the disposition of forces. A final report, submitted to Congress in May of 1992 is classified and is therefore not referenced in this thesis.

Along the same line is *Defense For a New Era: Lessons of the Persian Gulf War* written by the House Armed Services Committee. It also provides an analysis of the many issues that arose during the course of the war: the effectiveness of the air campaign and the ground campaign, the role and use of the reserve components, problems encountered in coalition warfare, and maintenance and training issues. Like the DOD document, this study is more of a general overview and does not address in detail the issues analyzed in this thesis.

The concerns raised in this thesis addressed in many of the unit after action reviews (AARs) conducted in the war's aftermath. Also, much information is found in the analyses prepared by the Center for Army Lessons Learned (CALL). Prior to reviewing these, the doctrinal foundation of fire support must be laid and this can be accomplished by analyzing numerous manual and publications printed by the DOD and the individual services.

A logical place to begin a literature review on this subject is at the joint level. The Joint Chiefs of Staff have published several manuals that address the fire support and deep battle issues that are analyzed in this thesis. Certainly, one of the most useful of the joint publications is Publication 1-02 *The Department of Defense Dictionary of Military and Associated Terms*. This manual, as its name implies, places subordinate services--theoretically at least--in a common frame of reference. However, as has already been shown in Chapter One, this is not exactly the case, even though that was DOD's intent. The different definitions of the FSCL are prime examples of this. The definition found in Pub. 1-02 should be applicable to all services without modification. This has not stopped the Army from greatly expanding upon the DOD definition. However, why this is so is not clear and it would obviously be unwise to assume that there is any malicious intent on the part of any service to ignore DOD policy. A more plausible explanation may be that the services, and branches within the services, are the actual generators of the definitions and may have simply pushed out in front of higher headquarters in developing and revising the meanings of the terms involved.

Joint Publication 3-03, *Doctrine for Joint Interdiction Operations* and Joint Publication 3-52, *Doctrine for Joint Airspace Control,* are also very useful

publications in that they provide an excellent framework from which to start the thesis. Another source of joint publications is NATO.

Of particular importance among NATO documents is AAFCE Manual 80-2 *Offensive Air Operations* which provides the NATO definition for the RIPL which was used during the Persian Gulf War, but is otherwise a nondoctrinal measure for U.S. forces. NATO STANAG 2934 *Artillery Procedures* is also cited in Chapter One as it provides its own definition of the FSCL and other FSCMs.

The individual U.S. services publish doctrinal manuals which address numerous warfighting issues, among them fire support matters and issues related to the fire support arena. The service that deals with this issue in the greatest detail is the Army. This is not surprising since the majority of fire support assets (artillery, mortars, missiles, attack helicopters) are found in the Army.

The Army manual that provides definitions for the force is FM 101-5-1 *Operational Terms and Symbols*. This field manual mainly uses the same definitions as those found in Joint Publication 1-02, but also provides definitions for terms that are relevant, but not joint per se, and therefore not found in the joint publications. The primary source of information concerning U.S. Army fire support doctrine is found in the FM 6-20 series of manuals. FM 6-20 provides a general overview of the fire support system and how it

operates in the AirLand Battle. Both FMs 6-30 and 6-40 address fire support issues pertaining to corps, division, and brigade operations. These manuals, in particular, FM 6-20-30 *Tactics, Techniques, and Procedures for Fire Support for Corps and Division Operations*, are among the most useful sources of doctrinal information found for this thesis. The remaining manual in this series, 6-20-10 discusses targeting methodology and provides a useful and concise definition for the *decide-detect-deliver* targeting process.

There are numerous other Army field manuals that are relevant to the analysis. Among them are FM 100-7 *The Army in Theater Operations (Coordinating Draft)*, and FM 100-15 *Corps Operations*. Both of these manuals discuss the deep battle at corps and EAC levels. A more useful manual in this area is the *Corps Deep Operations Handbook--1990* published by the Combined Arms Center at Fort Leavenworth, Kansas. This manual, being updated in late 1992, is not a stand alone document, but instead one meant to be used in conjunction with FM 100-15. It focuses upon intelligence and weapon systems that are available to the corps in its D^3 targeting process. Other relevant manuals include FM 90-28 *Tactical Air Planning of Ground Operations*, FM 71-100 *Division Operations*, and FM 100-103 *Army Airspace Command and Control in a Combat Zone*.

While the Army has produced most of the relevant manuals, it does not have a doctrinal monopoly on the fire

support issue. Basic Air Force doctrine is found in Air Force manual 1-1 *Basic Aerospace Doctrine of the United States Air Force*. This manual does not specifically address the fire support system, but does give doctrinal guidance on the meaning and use of air interdiction and close air support. That there is not more specific information in the Air Force system on the interrelation of fire support and tactical air is somewhat surprising and might be considered to be somewhat of a doctrinal gap in the Air Force.

Marine Corps doctrine concerning fire support coordination is found in Fleet Marine Force Manual (FMFM) 7-1 *Fire Support Coordination* and FMFM 7-2 *Naval Gunfire Support*.

Since the experience of the Persian Gulf War uncovered many of the doctrinal problems involved in the fire support arena, it is useful to review the government literature available in this category. Chief among these resources are the various After Action Reviews (AARs) conducted by the units involved in the war. The VII Corps AAR located in the Combined Arms Research Library (CARL) at Ft. Leavenworth, is probably the most useful of all sources used in the formulation of this thesis. It provides a detailed overview, including pertinent staff duty officer logs, of the Desert Storm ground campaign. The AARs conducted by the major U.S. Army service schools (infantry, artillery, aviation, etc.) are also of high value.

Shortly after the conclusion of the war, all U.S. Army units were directed to prepare a set of lessons learned concerning the combat operations conducted. The individual lessons were then combined into the Joint Uniform Lessons Learned (JULLS) master data base. Unfortunately, many of these JULLS are of poor quality and never spend more than a paragraph stating a problem and recommending a solution. They have the distinct appearance of something that was put together to satisfy an administrative requirement and meet a corresponding suspense date.

Finally, an important source of information for this thesis is the body of articles, including previous theses, that have been produced in the past two years. Many of these articles are found in popular military journals such as the *Military Review*, *Field Artillery Journal*, *Airpower Journal*, and the *AirLand Battle Bulletin*. In addition, there are a number of unpublished articles produced by Command and General Staff College students that are referenced. Captain John Bonsell's article "The Sky is the Limit," is particularly useful in that it offers original recommendations in improving the various problems in the fire support system and how it relates to the deep battle.

This thesis is not the first thesis that has tackled the fire support issue in light of lessons learned during Desert Storm. Major David H. Zook III's thesis "The

Fire Support Coordination Line: Is It Time to Reconsider Our Doctrine?" is particularly useful because of its historical thoroughness in describing the FSCL and how it has been used by the military over the years. Major Frederick Gisler's thesis "Joint Fire Support: Who is the Coordinator?" is also of great use in providing a concise source of information concerning the joint targeting arena. Both theses have a common weakness: however, in that while they excel in stating the problem, neither goes very far in developing recommendations. That is where this thesis hopes to pick up the challenge.

Methodology

The methodology used in this thesis is primarily that of a review of existing literature in order to define the problem and then developing recommendations to correct the shortcomings in the fire support system. Given the nature of the problem, it is not practical to test the solutions in any scientific sense, and thus, the only option is to offer them up in the hope of moving the decision making process along. As discussed in the previous section the existing literature falls into three basic categories: (1) Current doctrine at the joint level and the individual service level, (2) Persian Gulf War documents that are relevant to the problem being analyzed, and (3) The thought and opinions of others who have dealt with this issue.

To lay the groundwork for the thesis, Chapter three will focus upon deep operations conducted at corps and EAC level using the literature discussed in the previous section of this chapter. Chapter four will review the actions of units during Desert Storm. Included in chapter four will be a review of major combat operations, primarily of VII Corps, and the actions that were taking place at the EAC level while VII Corps was conducting the fight. The focus will be on the targeting methodology, and the placement of the RIPL and FSCL during the air and ground war. Included in this chapter will be the opinions of several people who took part in the operation. Some of these opinions will be culled from JULLS and VII Corps documents, and others will be from interviews conducted with Desert Storm participants who are stationed at Ft. Leavenworth. Chapter five will focus on recommendations for the future and summarize the major points of the thesis.

Summary

There exists a significant body of relevant literature on the topic of fire support and the problems that the fire support system(s) encountered in the Persian Gulf War.

The literature reviewed in the preparation of this thesis fall into three major categories: doctrinal literature, Desert Storm primary source materials, and

various articles and theses that have been published by others who have dealt with this issue in the past two years.

The methodology employed in the formulation of the thesis will be to review the literature available and then attack the problem in three steps: (1) Describing the deep fight, in particular how the fire support system operates in the deep battle, (2) Reviewing the major relevant actions that occurred in Desert Storm, and (3) Developing recommendations and conclusions.

CHAPTER 3

DEEP OPERATIONS

Close, Rear, and Deep Operations--An Overview

The purpose of this chapter is to lay a doctrinal foundation for the analysis of the deep fight during Desert Storm and to assist in the derivation of doctrinally sound recommendations in the final chapter of this thesis. To do this, a brief overview of close, rear, and deep operations will be provided, followed by a more in-depth look at the deep fight conducted by echelon above corps and corps level units. As an integral part of the deep operation overview, the chapter will briefly describe the joint interdiction fight--that is, how the air component conducts the deep fight and how the ground component interfaces with that aspect of the battle.

Air Land Battle doctrine states that U.S. Army units fight close, deep, and rear operations.[1] While these types of operations are conducted at different levels, they appear to be truly distinct only at division level and higher. Conversely, at brigade level and lower, close deep and rear operations begin to blur and become indistinguishable with one another. These nature of these operations should be viewed in both terms of space and time.

Close operations are where the battle is either won or lost. These operations are normally characterized by maneuver, close combat (including close air support), and indirect fire support. The close operations of a unit at any echelon includes the close, deep, and rear operations of the next subordinate echelon, e.g., the close operations of a division inherently include the close, deep, and rear operations of each committed brigade.[2] The majority of FSCMs are applicable to close operations. Included are: boundaries, brigade and division level coordinated fire lines, airspace coordination areas, no-fire and restrictive fire areas, and where friendly forces are converging, restrictive fire lines. The fire support coordination line also applies to the close battle since it requires that fires delivered short of it be coordinated with the establishing headquarters prior to the engagement of targets.

Rear operations are those activities conducted to the rear of units in contact that assure freedom of maneuver and continuity of support and command and control. Rear operations are normally characterized by the following activities: assembly and movement of reserves, redeployment of fire support assets, the maintenance and protection of sustainment efforts and command and control, establishment and maintenance of lines of communication (LOCs), medical and field services, traffic and refugee control and the

maintenance of civil order. The measure of success of rear operations is determined by whether the close fight is successful.[3] The fire support coordination measures that are associated with close operations, for the most part, do not apply to rear operations which are usually short of the boundaries surrounding the delivery units. Those FSCMs that do apply to rear operations are normally restrictive, (to prevent fratricide and damage to friendly material) such as the restrictive fire line and the no-fire area.

Deep operations are those activities that focus upon enemy units that are not in contact with friendly forces. The objective of deep operations is to favorably influence the future close battle. Deep operations are characterized by deception, deep surveillance and target acquisition, electronic warfare, command and control countermeasures, and interdiction by a variety of assets including: surface to surface fires, air to ground fires, ground or aerial maneuver, and the use of special operations forces. At the operational level these activities are designed to isolate current battles from enemy follow-on forces and supplies and influence the nature and shape of future battles. At the tactical level, deep operations shape the battlefield so that subsequent engagements can be fought on advantageous terms. The key concept involved in understanding deep operations, whether they are conducted at the operational or the tactical level, is the concept of

"time." In each case the deep fight is being waged with the thought that if it is successfully prosecuted then the future close fight can be more easily won. There are several FSCMs that are applicable to deep operations. Of primary concern is the FSCL. The placement of this FSCM is driven by numerous factors, as stated in the definition located in first chapter. Primarily, the FSCL is placed beyond the range of the conventional cannon and rocket fire that is available to the corps commander. It is also placed beyond the area that the corps commander wants to shape his deep fight, i.e., targets engaged beyond the FSCL will not adversely affect the maneuver scheme. Finally, the FSCL's requirement that coordination be made for fires delivered short of it gives the corps commander an important tool for avoiding casualties and damage caused by friendly fire.

There are several other FSCMs that apply to deep operations. Boundaries, by their very nature, affect the way in which deep operations are conducted. No fire and restrictive fire areas also affect deep operations since they limit the engagement of targets on the deep battlefield. Normally this is done to prevent injury to non-combatants, and to prevent damage to churches, hospitals, and other protected structures. Since friendly forces may be operating deep, these restrictive fire measures also protect them from fratricide.

As a result of the military's experience in Desert Storm, the conduct of deep operations indicate that there are problems that need to be addressed. These problems apply to U.S. Army units at the corps and EAC levels since these are the echelons where the FSCL is (or should be) established.

Summary

This portion of chapter three has provided a brief overview of close, rear, and deep operations. Of concern in this thesis is the manner in which both close and deep operations are conducted in terms of integrating fire support assets. Of particular concern is the conduct of deep operations, i.e., those operations conducted against enemy forces not in direct contact but having an influence on how close operations are, or will be, conducted.

Deep Operations at Echelon Above Corps Level

> The senior Army commander in a joint organization supports the Joint Forces Commander (JFC) by conducting Army operations to support or obtain the objectives of the JFC. The Army contributes armored, light, and special operations forces to perform combat, combat support, and combat service support activities in theater. The Army organizes, trains, and equips these land forces to accomplish all assigned missions.[4]

The U.S. Army component commander in a theater (COMARFOR) has three roles in his mission as a subordinate service commander operating in a joint theater. First, he must establish a relationship with the joint headquarters.

Second, he must conduct combat operations as directed. Third, he conducts support operations for his subordinate units.[5]

The first of these roles, establishing the linkage with the joint headquarters entails numerous activities. Initially the Army component receives direction and guidance from the joint headquarters. This step involves receiving specific missions and tasks which are an integral part of the JFC's plan for the joint command. Once the guidance is received the Army commander advises the joint headquarters on the employment of Army forces in accordance with the directed plan and designates specific forces to joint operations as required. To ensure proper coordination, the Army commander establishes liaison links with the joint headquarters and the sister services as applicable.

The second role of the Army in the joint theater is to conduct combat operations. In this role the Army plans and conducts operations that are part of a campaign or major operation. This aspect of the Army component's involvement in the joint arena usually revolves around the use of a corps or more than one corps that is subordinate to the Army headquarters, and focuses on the operational level of war.

The third role for the Army is to support its own forces through the Army's own chain of command regardless of whether those units fall under the Army service component headquarters or directly under a joint headquarters. The

support functions that are included in this role include logistics: personnel, health, and legal services.

Of particular concern in this thesis is the second role of the Army component headquarters functioning in the joint arena, that is, the role that it plays in conducting combat operations. Historically, the operations that have been conducted subordinate to the joint headquarters were either joint operations or single service operations.[6] However, more recent experiences in Panama and in Southwest Asia indicate that future operations will most certainly be less single service and more joint service.

The integration of operational fires by the Army component commander is one of the primary examples of how the future battlefield is becoming more joint and less single service oriented. As part of his operational fire plan, the Army component commander has a variety of lethal and non-lethal fire at his disposal. Those lethal fires include conventional, nuclear, and chemical fires. The means of delivery for those fires include field artillery, naval gunfire, tactical air support, and Army aviation. These means are not necessarily exclusive of one another and may be used simultaneously as in the case of a Joint Air Attack (JAAT) where artillery, Army aviation, and tactical air assets may simultaneously engage a target or target group. The objective of lethal fires is to delay, disrupt, destroy, or degrade enemy forces and facilities. The non-lethal

fires at the Army commander's disposal include electronic warfare, psychological operations, and non-lethal chemical warfare. The means of delivery may be either surface-to-surface or air-to-surface.[7] The objective of these non-lethal fires is somewhat similar to the objective of lethal fires: to delay, impair, and disrupt the enemy's capabilities. In either case these objectives do not usually serve as an endstate in themselves, but rather fulfill one or more of three primary tasks on the battlefield for operational fires: facilitate maneuver, isolate the battlefield, and to destroy enemy units and facilities.[8]

Operational fires can facilitate the maneuver of friendly units to operational depths by creating gaps in the enemy's tactical defenses. The massing of artillery and tactical air on a linear obstacle and the enemy weapon systems covering that obstacle would be an example of using operational fires to create an exploitable gap so tactical forces could conduct deep operations. Operational fires also serve to isolate the battlefield by interdicting enemy follow-on forces, curtailing their freedom of maneuver, and thereby preventing their entry into the close battle. These fires can also be used to destroy specific facilities such as, bridges, airfields, and logistics sites.[9]

Although operational fires may come from a variety of sources, many of which are organic to the Army, the

primary tool that the Army component has to deliver these fires comes from the tactical air support provided to him by the air component. This results from the relatively short range of conventional artillery, usually no more than 30km. (ATACMS has altered this arrangement somewhat, giving the Army component commander the ability to use organic deep operational fires for the first time).

Much of the same can also be said about the Marines, that is, they use much of the same equipment that the Army uses (except the Multiple Launch Rocket System (MLRS)and ATACMS) and are also dependent upon tactical air for delivery of most of their deep operational fires (much of their tactical air support is comprised of fixed-wing aircraft that are organic to their service or to the Navy, but may fall under a joint air component in a major campaign). Since both the Marines and the Army may be assigned to the same theater, they may both come under the same land component commander should the joint force commander decide to designate one.

Alternatively, he may retain the title of land component commander and establish a joint commander for the air component only. This is what occurred in Desert Shield/Storm where the joint force commander (JFC), CINCCENTCOM, established service component commands; CENTAF, ARCENT, MARCENT, and Navy Central Command (NAVCENT) and one joint subordinate command, the Joint Forces Air Component

Command, whose commander was dual-hatted as both Commander CENTAF and the Commander Joint Forces Air Component Command (JFACC).[10] For the remainder of this chapter, it will be assumed for simplicity purposes that an air component commander (the JFACC) controls the theater's air assets and that the senior Army commander, as in Southwest Asia, functions as COMARFOR.

The first step in determining how air power is going to shape COMARFOR's deep battle is to determine how much tactical air will be available for his use. This is done by consulting with the JFACC and recommending an apportionment plan based upon the guidance that COMARFOR received from the JFC. The JFACC after having received input from COMARFOR and the remaining service component commanders, will make his apportionment recommendation to the JFC.[11] The JFC will then apportion air assets based upon his mission from the Secretary of Defense and his assessment of the situation. His apportionment decision will assign a percentage of the air assets to the various tactical air operations; air interdiction, counter-air, airlift, reconnaissance, and close air support.[12] His decision may not be static: it may change over time, particularly if the joint command is conducting a phased operation.

Once the JFC has made his apportionment decision, the JFACC will allocate air assets by translating the

apportionment into numbers of sorties available for each task. The actual number of sorties will be based upon the mission, availability of aircraft, aircrews and munitions, and the rate of sortie generation. The Air Tasking Order (ATO) will provide information on the specifics of the sorties to be flown in any given 24 hour period.[13]

After receiving his allocation of tactical air assets from the JFACC, COMARFOR will distribute the sorties to his subordinate units. COMARFOR and his subordinate commanders will then use their tactical air assets as part of their operational fires plan to facilitate maneuver of friendly units, interdict follow-on enemy units, and destroy enemy units and facilities.[14]

COMARFOR also has the option of nominating targets to the JFACC for engagement by tactical air assets. COMARFOR may elect to do this when he has no sorties available, a situation that can arise if there is a distinct "air campaign" where all air assets are under the control of the JFACC. Or he may decide to nominate targets if he feels that he has insufficient sorties available to execute his operational fires plan.

The JFACC, as part of the joint interdiction campaign team will integrate nominated targets into the air tasking order in accordance with the JFC's guidance. To assist him in this task he may rely his own staff to prioritize and deconflict targets. Alternatively, the JFC

may establish a joint targeting coordination board (JTCB) that will deconflict and prioritize targeting from both COMARFOR and the JFACC's own targeting personnel. The JTCB would meet daily to provide timely input to the ATO planning cycle by means of a joint target list. The target list would then be used to construct the ATO. [15]

Internally, COMARFOR will have established procedures and common reports to facilitate the nomination of targets and the eventual delivery of operational fires. The ARFOR G-3 will normally be responsible for the Army component target development plan. As such, the ARFOR G-3 serves as the army component level Fire Support Coordinator (FSCOORD). This is a task normally filled by the senior artillery commander at corps level and below. However, since there is no organic fire support at the ARFOR level, it is up to the ARFOR G-3 to fill this role.[16]

As the ARFOR FSCOORD, the G-3 is responsible for integrating Army and other services' fires into COMARFOR's Operations Order (OPORD). He does this by developing Army fire support requirements, coordinating requirements with subordinate units, higher headquarters, and sister services; prioritizing targets and air support assets, and nuclear and chemical fire planning. To assist him in this task, a deep operations cell is established within the ARFOR G-3 section and is staffed by representatives from G-3 plans, G-2, Air Defense Artillery (ADA) element, G-5, and Liaison Officers

(LNOs) from Special Operations Forces (SOF) and the subordinate corps. Within that cell, a fire support section may also be established.[17]

The deep operations cell (and fire support section, if established) develops the targeting plan for the G-3. The targeting plan is based upon the ARFOR ground scheme of maneuver and utilizes the decide-detect-deliver methodology. The process is continual and dynamic. It is also performed in coordination with the subordinate corps requirements and their own target development plan.[18]

The deep operations cell will develop an ARFOR fire support plan for the G-3 based upon the process described above. Within the plan ARFOR may direct subordinate corps to provide deep fires on targets which ARFOR has deemed critical to the success of the deep battle. Subordinate corps may also be directed to provide fires to an adjacent corps for a specified purpose such as the adjacent corps being designated as the main effort. The fire plan will also provide details on the allocation of tactical air assets and guidance on the nomination of targets from subordinate corps to ARFOR. Target nominations from corps to EAC may be necessary if the corps does not have sufficient assets to engage necessary targets. These nominated targets will be submitted to ARFOR for approval and then passed to the Battlefield Control Element (BCE), the Army interface at the Air Operations Center (AOC).[19]

The BCE serves as COMARFOR's coordination element with the JFACC and is collocated with the AOC. The BCE synchronizes the ARFOR Operations Order (OPORD) with the AOC by coordinating targeting and intelligence data. Specifically the BCE coordinates the deep battle with the AOC, provides the AOC with information concerning ARFOR planning directives, current operations, targeting objectives and priorities. As part of the targeting process, the BCE provides target nominations to the AOC at least seventy-two hours prior to the implementation of the ATO, deconflicts nominated targets with the AOC's own targeting section when possible, and requests other air support (reconnaissance and airlift) as necessary. The BCE also coordinates and deconflicts airspace requirements and integrates ARFOR's air defense activities into JFACC's plan for area counter-air operations. To facilitate Command and Control (C^2) efforts, the BCE also coordinates battlefield geometry with the AOC. This includes passing information concerning boundaries, forward line of troops, forward edge of the battle area, and fire support coordination measures such as NFAs, RFAs, and the FSCL.[20]

Summary

This section of Chapter Three has discussed EAC deep operations. A major facet of EAC (ARFOR) deep operations is the manner in which it integrates operational fires into COMARFOR's scheme of maneuver. Since EAC does

not have organic fire assets, it directs corps fire assets to conduct specified missions and requests air support from the air component to engage targets critical to the success of COMARFOR's plan. Targets are nominated from ARFOR to the AOC when ARFOR has no air assets or insufficient air assets to engage the applicable targets. The nomination process uses the D^3 targeting methodology and is carried out by the deep operations cell that is subordinate to the ARFOR G-3. The targeting requirements are passed from ARFOR to the AOC by means of the BCE which is COMARFOR's method of interfacing with the air component.

Corps Deep Operations

> Corps deep operations are those activities which are directed against enemy forces not currently engaged in close operations, but capable of engaging or influencing future close operations.[21]

The objectives of corps deep operations are determined by the corps commander with input from his staff. Generally, the objective of attacking the enemy deep is to disrupt the tempo of their operations and set the conditions for success in future close operations. This is accomplished by isolating the follow-on forces from the close operation by attacking them in depth and thereby creating favorable conditions for the close fight. It is not necessary to completely destroy enemy forces in depth to accomplish this objective. A synchronized plan of delaying and disrupting enemy forces can yield the desired effects.[22]

The primary method of conducting deep operations is through the use of deep fires. Another method is through the use of deep maneuver of forces, which may include the deep maneuver of army aviation assets.

The corps FSCOORD, normally the corps artillery commander, is given the responsibility to control deep fires. This includes artillery fires, tactical air support, naval gunfire, and electronic jamming operations. The FSCOORD and his staff use the decide-detect-deliver methodology in selecting high-payoff targets as part of the deep operations plan. Typical targets that arise from the use of the D^3 methodology are: enemy forces (such as independent tank regiments and/or battalions, attack helicopter units, and air defense systems) not in contact with friendly forces; enemy command, control and communications (C^3) centers, fire support and fire support intelligence collection centers, and logistics facilities.[23] Other targets such as bridges, railyards, chokepoints, and airfields may also be targeted even if enemy troops are not present, if they are vital for successful enemy operations.[24]

The corps fire support cell assists the corps commander in planning and integrating fires delivered by corps fire assets, subordinate fire assets, and those assets belonging to the sister services. The fire support cell includes representatives of the following agencies: G-2, G-

3, engineer, army aviation, air defense, field artillery fire support element (FSE), tactical air control party (TACP), air support operations center (ASOC), naval gunfire, and army airspace command and control (A^2C^2). The representatives are not always co-located and their input is often provided on a request or as needed basis.[25]

The corps commander has a variety of fire support assets available to assist in the prosecution of the deep battle. Within his corps artillery, his two primary methods of engaging deep targets are with the MLRS, and ATACMS. These two systems allow the corps commander to engage targets at ranges of 30km and 100+km respectively. Also available to the commander are corps and division aviation assets which include (depending upon the particular make-up of the corps and its subordinate divisions) the AH-64 Apache and the AH-1 Cobra attack helicopters. Both of these aircraft are capable of delivering a variety of munitions out to ranges of 230km and beyond (depending upon the munition/fuel configuration chosen for the particular aircraft).[26]

The corps commander may have tactical air assets at his disposal as well, unless the CINC reserves all assets for the JFACC's use which may occur in a phased campaign. If air assets are apportioned to the ground commander a number of platforms may be available to him for the delivery of lethal fires. Chief among these is the A-10 Thunderbolt,

an aircraft specifically designed to be employed in the support of ground troops. Fighter-bombers and multi-role aircraft such as the F-15E and F-16D may also be used against enemy forces within the corps zone of maneuver. Although not normally thought of as a ground support aircraft, the F-111 bomber was used successfully during Desert Storm against enemy tank formations in the ARCENT zone. (Their mission of dropping laser-guided munitions on tanks was referred to as "tank plinking".)[27]

The fire support cell serves as the focal point for corps' coordination for and use of tactical air assets. Corps requests for air support fall into one of three categories: air interdiction, battlefield air interdiction, and close air support. (It should be noted that the Air Force does not recognize the concept of battlefield air interdiction.)[28]

Corps requests for tactical air support are either planned or immediate. Planning for air support flows from the decide and detect functions of the D^3 targeting methodology. First, the corps commander must conduct target value analysis and decide which enemy targets are high-value targets (HVTs), i.e., which targets are essential to the enemy's successful accomplishment of their mission. From this target set the commander determines which HVTs must be successfully engaged to ensure success of the friendly scheme of maneuver. These targets are referred to as high-

payoff targets (HPTs.)[29] Once the HPTs have been determined, they must be accurately located--the detect function of the D^3 process. Underlying this process is the assumption that the corps commander has been given a specific area in which to focus his targeting effort.

This area will normally be defined as that area falling within his corps boundaries. However, because his corps boundary may extend beyond the range in which his sensors can detect enemy units, his targeting authority may be restricted by ARFOR. The delineation of that restriction is portrayed as the RIPL. While this C^2 measure is not part of U.S. doctrine it is part of NATO doctrine. The JFC determines whether or not it will be used in theater. The establishment of the RIPL or the use of some other guidance will allow the corps commander to execute the decide and detect function of the D^3 process.

The final step in the D^3 process is the delivery of ordnance on target. For the delivery of planned fires to take place, the targeting information must be passed to the AOC which will ultimately pass the information to the platforms that will engage the targets. Target nominations for planned air strikes are forwarded to the AOC in one of several ways. If the JFC is conducting a phased campaign and air assets have not been allocated to the land component, then target nominations are passed from the corps FSE to the ARFOR deep operations cell. After prioritizing

the nominated targets vice other corps nominations and its own nominations, ARFOR will transmit a revised target list to the BCE which, in turn, will coordinate the information with the AOC. The BCE must be in receipt of these targets at least seventy-two hours in advance for their inclusion into the ATO. If there is no EAC in the theater, then the ASOC, located at the corps command post (CP), will transmit the corps nominations directly to the AOC and the FSE will pass the same targeting information to the BCE. In effect, the targets will be simultaneously worked through parallel channels.[30]

If the theater campaign is not phased, or if it is in the ground phase, the corps will have air assets allocated for its use. Coordination for target engagement is performed directly with the ASOC which, along with the TACP, controls the use of air in the corps zone. The ASOC and the corps FSE communicate directly with the AOC and the BCE. There is no established doctrine as to how requests for attacks on targets beyond the resource capability of the corps are passed to the AOC. An assumption would be that the corps FSE would coordinate directly with the BCE, however, COMARFOR could direct that these requests be routed through the deep operations cell at ARFOR. Regardless of the coordination, delivery of any strikes must be executed in conjunction with limitations imposed by FSCMs.

The proper positioning and use of FSCMs attempts to balance the dual needs of controlling the battlefield and facilitating the attack of enemy targets. The proper location and use of the FSCL highlights this dilemma. The FSCL is primarily used by the corps commander to compartmentalize the battlefield: to give him exclusive control of the area short of the FSCL so that he can appropriately shape the area, and to relinquish control of the area beyond the FSCL so that ground and air based weapons delivery systems can inflict maximum destruction upon enemy units and facilities. The "shaping" of the battlefield may take a variety of forms. It may seek to block, divert, or delay enemy movements or canalize enemy forces into restricted terrain or chokepoints. Shaping may also deny the enemy use of terrain by the use of mines or by the destruction of road networks and bridges. Regardless of the objective of the shaping, the process will normally require selective targeting to ensure that the effort is successful.[31] Although the placement of the FSCL implies that the corps commander does not wish, or does not have the capability to shape the area of the battlefield beyond the FSCL, he still maintains some control over the area through the use of other FSCMs. Both RFAs and NFAs can be used beyond the FSCL to protect areas that the corps commander does not want engaged. Short of the FSCL he may establish FFAs to facilitate the attack of time sensitive targets.

While the engagement of targets beyond the FSCL does not require coordination with the JFACC, it is recommended that it be done. For the corps commander, the co-location of Army and Air Force personnel within his fire support cell expedite this process. Not only should the attack of targets beyond the FSCL be coordinated within the fire support cell, but the very placement of the FSCL and other FSCMs should be accomplished with the consultation of the air component.[32]

Summary

Corps deep operations are designed to delay, destroy, and disrupt enemy activities and thereby set favorable conditions for the future close battle. The corps commander has a number of assets at his disposal in which to wage the deep battle. The control and coordination of these assets is primarily the responsibility of the corps fire support cell which include the corps fire support element, and representatives from the ASOC, the TACP, the G-3, and other staff officers.

Requests for tactical air assets to be used in deep operations are normally planned well in advance using the D^3 targeting methodology. The coordination for the final step in the D^3 process--delivery--may be direct from the corps to the AOC, or may pass through EAC channels. Each possible contingency does not have a doctrinal solution and may be dependent upon the senior commander's judgment.

The corps FSCOORD recommends to the corps commander the proper establishment and placement of FSCMs in the corps area. Key to the nature of the deep battle is the establishment of the FSCL which is designed to simultaneously allow the corps commander to shape the battlefield in accordance with the scheme of ground maneuver and allow for the rapid delivery of munitions on time sensitive targets of opportunity.

Endnotes

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19. Ibid., 2-12 to 2-14.

20. Ibid., 2-14 to 2-16.

21. FM 100-15, 3-0.

22. Ibid., 3-1.

23. FM 6-20-30, 4-16.

24. FM 100-15, 3-2.

25. FM 6-20-30, 1-2 to 1-3.

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27. Office of the Secretary of Defense, *Conduct of the Persian Gulf Conflict: An Interim Report to Congress* (Washington D.C.: Department of Defense, 1991), 4-3.

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CHAPTER 4

DESERT STORM

A Brief Overview

Less than seventy-two hours after the Iraqi invasion of Kuwait on the 2nd of August 1990, President Bush stated that "this shall not stand." He then outlined U.S. policy objectives in regard to Iraqi aggression:

- Immediate, complete, and unconditional withdrawal of all Iraqi forces from Kuwait.
- Restoration of Kuwait's legitimate government.
- Security of Kuwait's legitimate government.
- Safety and protection of the lives of Americans abroad.[1]

On the 7th of August, the U.S. began deploying troops to accomplish the objectives listed above, and continued the deployments for over six months. The troops deployed under the command of CINCCENTCOM (General Norman Schwarzkopf). During that time, the United Nations passed eleven resolutions designed to convince the Iraqis to withdraw. Since they had no effect, the use of force was authorized after the 15th of January, 1991. The following day, at 2AM local time, the war began, under the command of

CINCCENTCOM. It was "The first truly unified military operation under the firm control of the theater Commander in Chief as required by the Goldwater-Nichols (Defense Reorganization Act of 1986)."[2]

CINCCENTCOM's military objectives were spelled out in OPORD 91-001 "Desert Storm":

- Attack Iraqi political-military C^3 facilities.
- Gain and maintain air superiority.
- Sever Iraqi lines of communications.
- Destroy nuclear, chemical, and biological (NBC) manufacturing, storage, and delivery means.
- Destroy Republican Guard units within the Kuwait Theater of Operation (KTO), and
- Liberate Kuwait.[3]

To accomplish these objectives, Desert Storm was conducted in four phases: strategic air operations, air superiority operations, battlefield preparation, and the ground campaign. The first three of these phases are referred to as the "air campaign."

The first of these phases, the strategic air operations, was designed to inflict damage to enemy centers of gravity located deep inside of Iraq, i.e., mostly out of the KTO. The initiation of this campaign was on the morning of 17 January and continued for the duration of Desert Storm (43 days). Among the key facilities targeted were numerous

C^3 centers, petroleum refining and distribution plants, power generation and electrical distribution facilities, and telecommunication and broadcasting facilities.[4]

Air superiority operations were the second phase of Desert Storm. They were conducted in conjunction with the strategic air campaign and focused upon the destruction of surface to air missile and gun sites (along with their corresponding C^3 facilities), airfields, and enemy aircraft. On the tenth day of the air campaign this mission was essentially complete and air superiority had been achieved.[5]

The third phase of Desert Storm was battlefield preparation. During this phase 35,000 sorties were flown against enemy targets in the KTO. Targets attacked included tactical and operational C^3 facilities, artillery, armor, and logistics units.[6] After the 20th of January (following Scud attacks on Israel) a significant portion of aircraft designated for air to ground operations were diverted into southern Iraq for the purpose of "Scud-hunting." It was estimated that this additional mission used between 600-700 aircraft each day or about 25-30% of all of the coalition's sorties.[7] The overall objective of the air campaign was to reduce the strength of enemy units in the KTO to 50% or less. Certain units (armored, mechanized and selected Republican Guard) were to be reduced by more than 50% as were certain weapons systems.[8]

The fourth phase of Desert Storm was the ground campaign. The planned endstate of this final phase envisioned the liberation of Kuwait, the destruction of Republican Guard Forces Command (RGFC) in the KTO and the surrender or destruction of other Iraqi units in the theater. The actual endstate closely resembled the plan and was attributable to a number of factors including the combined forces/arms approach to conducting the ground phase.

While the description of Desert Storm as a four phased campaign seems to imply that these operations were conducted sequentially (with planned beginnings and ends for each phase) that was not necessarily the case. Strategic air operations were conducted throughout Desert Storm, and air superiority operations were conducted mostly for the first ten days. Battlefield preparation began with selected strikes following the achievement of air supremacy and then gradually gained momentum as the air campaign progressed. Correspondingly, the strategic focus gradually diminished and shifted towards the engagement of operational and tactical targets following the destruction of most strategic targets during the first several weeks of the air campaign. The air campaign continued at the strategic, operational, and tactical levels during the ground phase.[9]

The high levels of success resulting from Desert Storm was largely a result of the organizational structure

at CENTCOM which placed all U.S. and many allied units under the centralized command and control of CINCCENTCOM.

CENTCOM and ARCENT Organization

Subordinate to CENTCOM were the component services: ARCENT, MARCENT, NAVCENT, and CENTAF. ARCENT was the designation of the Third Army, a numbered Army, garrisoned at Fort McPherson, Georgia. When the Third Army deployed as part of Desert Shied, it was placed in the position of having to act as three entities. The first was as a numbered field Army as it had been under General Patton in World War II. The second role of the Third Army was to be a theater army, similar to the Seventh Army in Europe and the Eighth Army in Korea. The third role was to serve as component army, i.e., the Army component service headquarters subordinate to CENTCOM.[10]

As a theater Army, ARCENT's mission was to generate force capability for the theater commander (CINCCENTCOM) by drawing upon the resources of the Department of the Army and other specified and unified commands, such as: Forces Command, U.S. Army Europe, Training and Doctrine Command, and U.S. Army Pacific. The second major function was to provide resources to the subordinate units: two corps, multiple EAC units, several attached coalition units, and a headquarters.

The Third Army also served as a component head-quarters subordinate to CENTCOM. Its primary respon-

sibilities in this role included planning for the ground campaign, operation of the communications zone (COMMZ), and coordinating with other services (joint operations), and allies (combined operations.) Coordination with allied forces was primarily accomplished by the Coalition Coordination Communication Integration Center (C^3IC) located at CENTCOM headquarters. Coordination was effected at lower levels as well.

One of the most important combined operational tasks was assisting the Joint Forces Command North (JFC-N) (Saudi Arabia, Kuwait, Egypt, and Syria) with planning their deep operations. This was done primarily by planning and coordinating their air-targeting effort.[11] To effect this coordination, ARCENT provided a liaison team to JFC-N. The team was tasked with transferring real-time intelligence information to the JFC-N, providing other support as necessary[12] and planning and coordinating air support (the actual control of the aircraft was made by special operations forces units that were also provided to JFC-N).[13]

The Third Army also functioned as a numbered field army. In this role, the Third Army had two major responsibilities. The first was to maintain operational control of VII and XVIII Corps. The second responsibility was to allocate scarce resources such as transportation and engineer assets, intelligence collection, air defense coverage, and air support.[14]

ARCENT'S air support was coordinated by the BCE. The wartime tasks of the BCE closely resembled the doctrinal functions joint agreement in 1984. BCE interrelationships are at figure 10. The duties of the BCE were:

- Furnish input on ground operations to the JFACC and the AOC. This was done formally during daily briefings as well as informally and upon request.
- Coordinate ARCENT requests for air support. This included requests for BAI, preplanned CAS, tactical air reconnaissance, electronic warfare, psychological operations (PSYOPS) missions, and airlift support.
- Exchange intelligence information between ARCENT and the AOC, particularly intelligence and operational data concerning target nominations.
- Coordinate the deconfliction of airspace requirements and coordinate Army air defense operations with the AOC's counter-air plans.[15]

Subordinate to ARCENT were numerous EAC units, VII Corps and XVII Airborne Corps. (ARCENT command and control is depicted at figure 11.) Major EAC units included the 416th Engineer Command, 800th Military Police Brigade, 7th Transportation Brigade, 11th Air Defense Artillery Brigade, 11th Signal Brigade, and the 513th Military Intelligence Brigade.

VII Corps was ARCENT's main effort and was responsible for the destruction of the RGFC. Major units

subordinate to VII Corps included the 1st Infantry Division (Mechanized), 1st Armor Division, 3rd Armor Division, 1st Armored Division (UK), the 2nd Armored Cavalry Regiment, 11th Aviation Brigade, and VII Corps Artillery. Under the tactical control (TACON) of the VII Corps commander was the 1st Cavalry Division (configured as a 2-brigade armored division) which was CINCCENTCOM's theater reserve. (VII Corps command and control is depicted at figure 12.)

XVIII Airborne Corps conducted ARCENT's supporting attacks by cutting Iraqi lines of communication (LOCs) along the Euphrates River and blocking the escape of RGFC units from the KTO. Major units subordinate to XVIII Corps were the 82nd Airborne Division, 101st Airborne Division (Air Assault), 24th Infantry Division (Mechanized), 3rd Armored Cavalry Regiment, 12th Aviation Brigade, and XVIII Corps Artillery. (XVIII Airborne Corps command and control is depicted at figure 13.)

Each corps was given an assigned zone in which to conduct its attack. Furthest west was XVIII Airborne Corps. On the left flank of XVIII Airborne Corps was the 6th Light Armor Division (FR) which was placed under the operational control (OPCON) of XVIII Corps.[16] To the right was VII Corps, whose zone ran east to the right edge of the Wadi al-Batin, a valley lying to the west of the desert town Hafar al-Batin. The wadi was a major terrain feature in the region. East of VII Corps was, in succession from west to

east: JFC-N, MARCENT, and JFC-E. The geographical laydown of these units is enclosed as figure 14.

Deep Operations During Desert Storm--ARCENT

Within the ARCENT G-3 section was a deep operations cell (see figure 15) that was responsible for the planning and execution of deep operations. During peacetime the cell was manned by approximately six active duty personnel and augmented by several reservists during extended exercises, deployments, and annual periods of active training. During Desert Shield the deep operations cell, including LNOs from VII and XVIII Corps, grew to 37 soldiers. None of the additional soldiers had specific previous deep operations experience, although several had attended the Army-Air Force air ground operations school. The definition and framework of deep operations closely mirrored the doctrinal concept of deep operations discussed in Chapter 3:

- Deep operations comprise activities directed against enemy forces not in combat (and are) designed to influence the conditions in which future close operations will be conducted.
- Includes efforts to isolate current battles and influence where, when and against whom future battles will be fought.
- Shapes battlefield to assure advantage in future operations.

- Successful deep operations create the conditions for future victory.[17]

There were numerous tasks to execute in order to successfully carry out the deep operations plan. The first was to develop a deep operations strategy that was a product of COMUSARCENT's concept of operations. This was accomplished by integrating fires with the scheme of maneuver in the KTO. Secondly, the deep operations cell had to synchronize corps and EAC planning.[18] This was accomplished prior to the war by holding two fire support conferences at the ARCENT Main CP located near Riyadh in Saudi Arabia.[19]

Once ARCENT and the corps had finalized the concept of their respective operations, targeting objectives and priorities were established to support the plans. The establishing of objectives and priorities enabled ARCENT planners to generate targets for nomination to the AOC. To do this, the deep operations cell drew upon the intelligence production of the 513th MI Brigade, an EAC unit located at the Main CP site.[20]

As individual targets were identified, they were placed on a priority list that was transmitted via secure modem to the BCE. Target nominations were transmitted to the AOC 72 hours prior to ATO execution. This enabled BCE and AOC planners to integrate and deconflict the ARCENT nomination list with the JFACC target list. It also allowed

for platforms to be configured with proper ordnance, for pilots to be briefed, and for the ATO itself to be compiled, coordinated, and published.

Once the ATO had been published, the next challenge was to track its execution. To do this a Computer Assisted Flight Management Systems (CAFMS) terminal was set up in the BCE operations section. This enabled the BCE staff to download the ATO and transmit it to the deep operations section, normally within an hour of its release. (It was normally released five hours prior to its activation.) Within the deep operations section a customized program had been installed on its computers that enabled them to receive the ATO (which was often 500 or more pages long) via secure modem and to selectively generate from it specific ARCENT targeting information.[21]

This data link between the deep operations section and the BCE also provided information on whether the sortie was launched successfully. It did not, however, provide information on whether the targets were successfully engaged. This information had to initially be drawn from pilot reports provided to Army Ground Liaison Officers (GLOs) stationed at the air bases from which the aircraft departed. The information was then passed to the BCE which manually kept track of it and reported the results to ARCENT by secure voice, when time permitted.[22] The importance of this process was heightened by the unusually poor weather

during the first ten days of the air campaign which caused approximately 40% of the scheduled sorties to be cancelled.[23]

The final step in tracking the execution of the ATO was analyzing BDA once it was available. The poor weather made this a dual-edged problem: it kept sorties from the engaging their targets because of poor visibility and it kept reconnaissance flights from photographing targets that had been engaged for the same reason. Despite these problems every effort had to be continually made to garner information so that deep operations personnel could decide whether or not the target should be renominated for a strike.[24]

There were two other key functions that the deep operations cell conducted. First was to plan and coordinate special missions. Some of these missions included the use of BLU-82s (15,000 pound demolition bombs), PSYOP leaflet drops, managing target diverts through AM communications with the Airborne Battlefield Command and Control Center (ABCCC), and targeting Iraqi fire trenches.[25] The latter of these missions was more difficult than it may seem.

As part of the Iraqi defensive belt, fire trenches were dug along the north side of the berm that formed the border between Saudi Arabia and Iraq. Leading to the trenches was a system of pipes that came together at several oil pumping stations. The Iraqi concept was to fill the

trenches with fresh oil just before the ground offensive (to do it earlier than necessary might cause the weather to turn the oil too viscous to ignite) and then light them. This had been done by the Iraqis during their war against Iran and had proven to be an effective obstacle and canalizing device. ARCENT's response to this problem was to target each pumping station and "T-joint" that connected two or more pipes. The targets were then engaged several days prior to the beginning of the ground phase so that the Iraqis did not have time to effect repairs. The majority of fire trenches were not set on fire during the breaching operation.[26]

The final function of the deep operations cell was to plan the employment and synchronize the use of a variety of electronic warfare platforms. This involved the use of non-lethal fires to disrupt Iraqi C^3 and the use of jamming platforms such as the C-130 Compass Call to protect deep helicopter raids. The deep operations cell was assisted in this task by a section attached to it from the Joint Electronics Warfare Center (JEWC).[27]

There was no provision within ARCENT to establish fire support coordination measures as part of deep operations. The issue of FSCLs was left to the subordinate corps. Restricted and No-Fire Areas to protect special forces units working north of the berm during the air campaign were established by Special Operations Command.

They were relayed to ARCENT through the Special Operations Command Coordinating Element (SOCCE). ARCENT relayed them lower to the subordinate corps (who normally were in receipt of the information through the work of their own SOCCEs) and to the BCE so that the AOC was aware of them.[28]

After the initiation of the ground phase, ARCENT continued to leave FSCM matters to the respective corps. This led to confusion at the AOC as subordinate corps established separate FSCLs that did not link up with one another and did not match any discernible terrain features in the bleak desert environment. As a result, on the third day of the ground phase (February 26) the BCE reported that the AOC wanted ARCENT to establish a consolidated FSCL. This request was analyzed within G-3 Deep Operations and was considered be a non-doctrinal solution to the problem. Notwithstanding, it was considered to be feasible. The senior G-3 shift leader, however, made the decision that since it was considered non-doctrinal for ARCENT to establish an army-level FSCL then the matter should be left to the subordinate corps.[29]

The following day, as confusion at the AOC rose over rapidly changing FSCLs being used by VII and XVIII Corps, the issue was raised once again. ARCENT balked at the idea. Finally, the AOC (acting upon approval of CINCCENTCOM) directed the use of a theater wide FSCL, designated FSCL HORNER. ARCENT responded with FRAGO 066

issued at 271900Z February establishing an ARCENT FSCL that followed the AOC trace. It eliminated the subordinate corps' FSCLs and provided for a new FSCL along the Euphrates River east to the Shatt al-Arab and south along the Kuwaiti coast.[30]

Deep Operations During Desert Storm--VII AND XVIII Corps

One of ARCENT's key functions was to integrate and synchronize both the ARCENT and the two subordinate corps' targeting efforts. The first step in this process was to allocate targeting authority to the subordinate corps by using the RIPL. This was placed at the limit of the corps' ability to see the battlefield with its organic intelligence assets: about 80-100km beyond the FLOT (figure 2). Initially this was along Phase Line (PL) SMASH for both VII and XVIII Corps.[31] Within this area the two corps had primary targeting authority. Beyond the RIPL, ARCENT had primary, but not exclusive, targeting responsibility north to the Euphrates River. The initial placement of the RIPL along PL SMASH preceded the movement of the corps from their staging areas in eastern Saudi Arabia. This was done even though neither corps had intelligence assets positioned to see the battlefield. Instead they used intelligence provided to them by EAC sources so that they could begin their targeting process.[32]

For the JFC-N, the RIPL was the berm. Since they did not have the intelligence assets to see much beyond

visual range they effectively had no intelligence information with which to work. (The liaison team was not equipped with military intelligence targeting analysts either, so it would not have been particularly useful to pass raw intelligence data to them.) Instead, ARCENT assumed responsibility for JFC-N targeting.[33]

As the two corps shifted westward in preparation for the ground phase, ARCENT moved the RIPL north to PL RIPPER (the Euphrates River) in the XVIII Airborne Corps sector. This was done at the request of the XVIII Corps commander who was concerned about the planned deep penetration of his corps to the Euphrates and his desire to shape the battlefield to facilitate this movement. Once the ground phase began the RIPL for VII Corps and XVIII Airborne Corps shifted out to an area north of the Euphrates River, not designated by a phase line and referred to as RIPL 3.

For both VII and XVIII Corps the initial FSCL was the berm.[34] For the corps commanders this meant that they could nominate targets lying between the berm and PL SMASH to ARCENT for inclusion into the ATO. They could not plan their own BAI for this area as the AOC did not allocate BAI.

The two corps were not successful in getting many nominated targets included in the ATO. XVIII Corps claimed that less than 15% of their nominated targets were ever included on the ATO. (Similarly, ARCENT itself did not initially get many of its own targets on the ATO.)[35]

The establishment of the FSCL along the berm implied that either corps could engage targets at will, since the FSCL was a permissive fire measure. The AOC did not view the FSCL as being permissive and instead viewed it as a restrictive fire measure: it restricted air operations short of the FSCL by the requirement to coordinate with the ground commander and it likewise restricted the fires of the ground commander beyond the FSCL by requiring him to coordinate from his fire support cell (ASOC and FSE) to the AOC. This caused some confusion among the two corps.

Added to this restriction was CINCCENTCOM's deception plan that largely (but not completely) ruled out fires west of the Wadi al-Batin in an attempt to convince the enemy that Coalition Forces were not moving westward in that direction.[36] The cumulative effect of these restrictions were not initially detrimental to the effort of the two corps, which were still more concerned with positioning forces into the area. (VII Corps was still unloading equipment at Jubayl and Dhaharan when the air campaign began.) Still, it was a cause for concern:

> Because [the Air Force] absolutely would not fly short of the FSCL before G-Day, we kept the FSCL in close to facilitate the air attack of division and corps high priority targets. This caused two problems. Every fire mission or AH-64 attack beyond the FSCL had to be carefully and painstakingly cleared through Air Force. Even counterfire required this lengthy process. Equally bad, air sorties beyond the FSCL were completely the domain of the Air Force. VII Corps could nominate targets beyond the FSCL, but could never be sure they would be attacked.[37]

Of particular concern to the Air Force was the use of the ATACMS missile which had a maximum ordinate of 100,000 meters. Coordination for the use of this missile frequently took two hours and longer. (Oddly enough, it was first used on the 17th of January in the opening stage of the air campaign when the AOC requested that it be used to destroy a AAA site. Coordination time was about 30 minutes.)[38]

As VII Corps and XVIII Airborne Corps units closed in attack positions their ability to detect targets improved. The FSCL began a gradual shift northwards during the air campaign for XVIII Airborne Corps: on 140800Z Feb the FSCL was MSR OHIO, on 220400Z Feb it shifted to PL CHARGER.[39] This movement northward of the FSCL allowed XVIII Airborne Corps to begin engaging targets with organic assets without having to coordinate fires.

VII Corps took a different approach. The FSCL was shifted out from the berm for designated and coordinated artillery and attack aviation raids. After the completion of the raid, the FSCL would shift back to the berm to facilitate air attacks.[40]

Once the ground phase began the FSCLs shifted rapidly. On the 24th of February (G-Day) XVIII Airborne Corps shifted the FSCL to PL RAM, fifteen hours later it was changed to PL JET. At 242300Z Feb it changed for the third time in twenty four hours, this time to PL VIKING. On the

25th of February the FSCL changed to PL RIPPER. It remained there as XVIII Airborne Corps units established blocking positions south of the Euphrates River. PL RIPPER eventually became FSCL HORNER on the 27th of February (figure 16.)[41]

VII Corps FSCLs changed even more rapidly. Unlike XVIII Airborne Corps which used known phase lines to disseminate FSCLs, VII Corps used grid coordinates to identify their FSCLs. During the 100 hour ground war, the VII Corps FSCL changed seven times. Because of the battlefield geometry, the majority of the FSCLs ran north to south and could not possibly connect with the XVIII Airborne Corps FSCLs which ran mostly from east to west. Indeed, once VII Corps oriented itself *on* the RGFCs' flanks, its FSCLs were perpendicular to the XVIII Airborne Corps' boundary.

Close air support was readily available throughout the operation. While there were numerous pre-planned CAS sorties, the majority of close air was delivered as "push-CAS", i.e., CAS sorties handed off to the ABCCC who coordinated their mission with the corps' ASOCs. Aircraft that could not be effectively utilized were sent north of the FSCL to specified kill boxes where they attacked known targets.

Analysis--Deep Operations

An analysis of the fire support coordination problems that occurred during deep operations must first begin by examining the how deep operations were conducted. The focus here leads to ARCENT as opposed to VII Corps and XVIII Airborne Corps. Both of the corps were trained in the conduct of close, deep, and rear operations and had regularly deployed on tactical field exercises over the years to rehearse these procedures. ARCENT, on the other hand was a reflection of its higher headquarters: CENTCOM. Both organizations were paper commands that did not have the operational control of forces in peacetime and rehearsed operations in a limited manner (command post exercises and other staff exercises that did not involve the use of troops, only staff personnel, and ultimately may not have been conducted in a realistic manner).

In peacetime, the ARCENT deep operations cell was an austere organization, staffed by a small crew of active duty and reserve component personnel. During Desert Shield its size increased over 500%, few of the personnel that augmented the cell had any previous deep operations or fire support experience. Worse, many were assigned just days prior to the commencement of Desert Storm and were not familiar with the commander's intent for the operation.[43]

The focus of the cell was not as wide as one would expect. The deep operations personnel at ARCENT level did

not engage in the planning and execution of deep operations involving the use of U.S. Army forces. For example, the cell did not attempt to plan deep attacks by Army aviation assets, and with a couple of exceptions, did not actively plan deep missile strikes with ATACMs missiles. In both cases, this planning was left to the subordinate corps.

There are several reasons why this occurred. First, COMUSARCENT had left the impression upon his staff that ARCENT's primary purpose was to synchronize logistic support, allocate scarce resources, and deconflict points of contention between the subordinate corps. In this role, ARCENT frequently operated as a clearinghouse for information where messages, orders, and directives from CENTCOM were analyzed and passed along, and information from subordinates was gathered, analyzed, repackaged, and submitted to CENTCOM staff.

A second reason no doubt resulted from the inexperience of the ARCENT staff in its duties. This applied not only to the deep operations cell, but to the remainder of the staff as well which grew in size from approximately two hundred in peacetime to just under a thousand during Desert Storm. A major challenge throughout the operation was to integrate and train newly assigned personnel, a significant distractor for ARCENT leadership.

A third reason for the deep operations cell to maintain a hands-off approach to the nature of its business-

-conducting deep operations--could be explained by the lack of delivery systems organic to the EAC level. COMUSARCENT's EAC units were primarily logistics providers and those (such as MPs) who were responsible for guarding prisoners of war and maintaining rear security.

Unwilling or unable to direct the application of combat power, the deep operations cell focused upon coordinating COMUSARCENT's targeting efforts with the JFACC. Ideally, this should not have been very difficult. ARCENT was to compartmentalize the targeting effort, receive nominations from the corps, roll them into a priority list containing their own nominations, and then pass them to the BCE. The BCE, in turn, would give the targets to the Joint Target Coordinating Board which would compare them to the JFACC's targeting plan, and then integrate them into a consolidated targeting list, reflecting CINCCENTCOMs' guidance.

It was not so easy. First, it was not immediately clear who controlled the BCE. Since its inception in 1985, the BCE had been stationed at Fort Bragg, North Carolina and had frequently deployed with XVIII Airborne Corps on joint exercises. It had also deployed a section with XVIII Airborne Corps during Just Cause. This seemingly habitual relationship between XVIII Airborne Corps and the BCE continued during Desert Shield, despite the fact that the BCE had participated with Third Army on a number of

exercises, including Central Command's Internal Look 1990, conducted just weeks prior to Iraq's invasion of Kuwait.

This close relationship with XVIII Airborne Crops caused some confusion (initially) as to who was providing guidance to the BCE: COMUSARCENT or the XVIII Corps Commander. The matter was resolved in November 1990 when the ARCENT G-3 issued guidance clarifying the BCE's chain of command and instructing BCE personnel to remove the XVIII Airborne Corps shoulder patch from their sleeves and replace it with the ARCENT shoulder patch.[44]

Once the proper role of the BCE was established--COMUSARCENT's liaison with the AOC--the organization could fully focus its energies upon establishing a targeting plan reflecting COMUSARCENT's guidance. This occurred, but was seemingly fruitless, because the JTCB was never established. Instead, CENTAF had already devised their own targeting plan, without regard COMUSARCENT's scheme of maneuver, and had briefed it to CINCCENTCOM, who approved it. COMUSARCENT's subsequent brief to CINCCENTCOM resolved some, but not the majority of differences in the two plans. The result was that for the duration of the 43 day war, ARCENT (through the BCE), could never count on any planned number of sorties from the AOC. Instead it had to attend the daily ATO meeting and sell as many targets as possible to the JFACC's representatives who were free to include on to the ATO, as many, or as few as they wanted.[45]

The ARCENT-BCE relationship was plagued by poor feedback concerning target strikes, cancelled missions, and target diverts. There were several reasons for this, and certainly the lack of proper hardware (such as a CAFMS terminal at ARCENT headquarters) was one of them. Another was simply the inability to determine beforehand what type of information would be needed to make decisions, and how that information was to be transmitted and in what format it would be transmitted in. Another cause for the poor flow of information resulted from the lack of information at ARCENT level concerning the JFACC's intent.

Indeed, the responsibility of passing information seemed to rest upon ARCENT alone: there was no BCE equivalent provided to ARCENT from the AOC. This was an unsatisfactory arrangement that led to feelings of cynicism and mistrust (misguided as they were) among several ARCENT personnel who did not believe that the AOC was particularly concerned about joint deep operations.[46]

Analysis--Fire Support Coordination

Pre-Ground Offensive

The primary doctrinal disconnect revolved around the use of the FSCL. Despite the fact that Joint Publication 1-02 states that fires beyond the FSCL do not require coordination with the air component, the rules seemed to suddenly change in the desert. The AOC effectively took control of the land lying beyond the FSCL

by requiring the prior coordination of fires into that area. This was a change from accepted joint doctrine.

The original FSCL along the berm facilitated the air attack of those targets lying beyond it. Given the initial defensive posture of ARCENT's forces, establishing the FSCL in close seemed to be the doctrinally correct solution. In practice this procedure had the desired effect: most of the targets that COMUSARCENT and the subordinate corps commanders wanted attacked, were in fact, attacked. This occurred even though the targeting information did not appear on the ATO with ARCENT targeting numbers (they appeared with AOC targeting numbers instead), giving the appearance that neither ARCENT's nor the corps' targeting objectives were being carried out. In fact, many of them were, albeit in a way that was difficult to track, unless each AOC target on the ATO was manually plotted by latitude and longitude and compared to ARCENT (and corps) nominated targets.

Once the corps had generated combat power in the area of the berm, they wanted to engage targets with organic artillery. However, this proved to be almost impossible since the AOC would not clear any fires beyond the FSCL. This led to VII Corps' non-doctrinal approach of shifting the FSCL out several kilometers (and effectively closing down the airspace short of the FSCL), firing at the intended targets, and then bringing the FSCL back to its original

position along the berm. In effect, the berm delineated the close battle from the deep battle.

Despite these unique efforts used in engaging enemy targets with organic artillery, it was still assumed by the corps commanders that in Phase IIIB of the air campaign, they expected a more doctrinal approach would be used. Specifically, they expected that AI packages would be allocated to the corps commanders for their use in shaping the corps deep battle, i.e., the area between the FSCL and the RIPL (essentially, BAI). This date was referred to as "cross-over day" and its activation was supposed to be driven by the adjudged attrition level of Iraqi forces in the theater, but was assumed to be on or about G-8 (eight days prior to the ground war).[47]

As both G-8 and the adjudged attrition level (50%) came and went, the failure of the AOC to allocate AI packages became a major source of frustration at corps level. As a result, several VII Corps representatives visited CENTCOM and argued their case for allowing the corps commander to shape the deep battle with allocated air assets, as opposed to relying on the cumbersome target nomination process that had been on-going for over a month. Their point of view was noted by AOC personnel and given to the JFACC, but "cross-over day" never materialized.[48]

Air operations prior to the ground offensive show the disconnects between the corps and the AOC. Neither

could agree on a common definition of the FSCL; the AOC effectively ignored what had previously been accepted as joint doctrine. Similarly, neither the corps nor the AOC found any common ground concerning the use of BAI. For the corps commanders, BAI was to be used to conduct the deep fight between the FSCL and the RIPL and would be allocated to them, like CAS, expressed in a number of sorties per day. Unfortunately BAI did not, and does not, exist--not for the AOC, not for the Department of Defense, and ultimately, not for the corps commanders during Desert Storm.

Ground Offensive

Problems concerning the FSCL during the ground offensive were similar to those encountered during pre-ground offensive air operations. Not all artillery fires across the FSCL needed to be coordinated during the ground phase. Some after action reports indicated that firing across the FSCL was not difficult provided the ASOC could establish that there were no aircraft in the area. However, all fires above 32,000 feet needed to be coordinated by order of the AOC and this caused lengthy delays in firing many ATACMS and some MLRS missions.[49]

> On several occasions, firing elements were laid and ready to fire on Iraqi targets, only to have the mission ended because of problems coordinating airspace with the Air Force. Unique to this operation was the use of the fire support coordination line as a restrictive fire measure, which was particularly vexing. Placing the FSCL close to the forward line of own troops necessitated clearing all fires with the Air Force.

> The time consumed in this process severely impeded the battalion's ability to respond. In one instance the battalion was passed ten targets...after waiting for more than an hour clearance was granted to fire on only two of the targets.[50]

ATACMS missions caused even longer delays. To coordinate an ATACMS mission ARCENT and/or the corps which was firing the mission had to forward to the AOC the target location, launch unit's location, maximum ordinate, time of flight, direction, and the desired thirty minute launch window. Approval often took up to two hours, effectively eliminating the use of any ATACMS missile on a time sensitive target.[51]

The other major problem concerning the FSCL was the speed in which it moved, and the irregular shape that the two corps FSCLs assumed once VII Corps wheeled right and attacked the RGFC. The answer to this would have been for ARCENT to establish an FSCL for its subordinates. However, because FM 6-20-30 implies that this is a corps commander's function (even though FM 101-5-1 states that it is the duty of the "appropriate commander"), ARCENT was unwilling to establish the measure. Instead, the AOC established the FSCL.

Operationally, this probably turned out to be a wise move for the VII Corps Commander (XVIII Airborne Corps had already established its FSCL along the Euphrates River which turned out to be where the AOC finally established the FSCL for the theater). Once the FSCL had shifted north and

east to the Euphrates and the Shatt al-Arab, all artillery fires in the VII Corps zone could be fired without coordination with the AOC since they were short of the FSCL. Likewise, all air in the VII Corps zone would now have to be coordinated with the VII Corps fire support cell. While this no doubt inhibited some air deliveries because of coordination difficulties it probably saved the lives of soldiers who were rapidly advancing through (and detonating) air-delivered sub-munitions in their zone of maneuver. Among these sub-munitions were GATOR mines that had been dispersed by various Air Force and Navy air platforms to prevent the escape of RGFC forces. The maneuver forces encountering these mines were unaware of their existence since they (only hours prior) had been delivered beyond the FSCL and therefore did not require coordination with ground elements.[52]

Summary

Desert Storm was conducted in four phases. The first three phases were all part of an overall air campaign that lasted throughout the entire war. The last phase was the ground campaign that lasted 100 hours and was fought in conjunction with an air campaign that continued to hammer away at Iraqi strategic, operational, and tactical targets.

The forces that deployed on Desert Shield did so under a unified commander--CINCCENTCOM. Subordinate to him were the component services, including U.S. Army Central

Command (USARCENT) which functioned as a theater army, a numbered field army, and as a component service command. Among the many responsibilities that ARCENT had was to plan and coordinate the operational activities of the two subordinate corps: VII Corps and XVIII Airborne Corps. Part of this planning extended to the planning of deep operations.

The ARCENT deep operations plan was developed by the ARCENT deep operations cell that was a part of the ARCENT G-3 section. The deep operations cell developed a plan that integrated COMUSARCENT's concept of operations with the higher headquarters guidance and the subordinate corps' own deep operational plans.

The ARCENT deep operations section did not establish FSCMs; it left this matter up to the corps commanders. This became a significant problem as each corps commander developed an FSCL that was not synchronized with the adjoining FSCL. This caused the JFACC to establish an FSCL for the theater. The FSCL problem was further intensified by the air component's view of it as a restrictive measure, requiring Army coordination for the delivery of ground fires beyond the measure. This view caused numerous problems for each corps in their attempt to engage targets in their zone of maneuver.

The use of other FSCMs did not seem to play a major role during the war. CENTAF's restriction of fires did seem

to eliminate the need for ACAs to be established. Whether this was truly a surprise for many--given the difficulty in establishing ACAs during peacetime training--was never fully established.

The use of the RIPL did not appear to have much of an influence upon operations. Theoretically, the RIPL serves to compartmentalize the targeting effort on the battlefield, an important step in allowing the corps commander to shape the deep fight between the FSCL and the RIPL with air to ground fires. The key assumption however, is that the corps commander will receive AI packages that will allow him to engage the targets in this area. Should this not be forthcoming (and it was not forthcoming in Desert Storm) a next best solution allows the corps commander to nominate targets between the FSCL and the RIPL and then wait for the air component to strike them when time permits. The extent to which this occurred in Desert Storm is debatable and an analysis of the problem is beyond the scope of this thesis. The opinion of corps and many ARCENT personnel was that corps and ARCENT targeting efforts were wasted since very few of the targets ended up on the ATO. This was true, but perhaps besides the point. What was important was that the targets on the ground were successfully attacked. What was not important was which target number was attacked. Any serious analysis would indicate that, based upon the speed of the operation and the

relatively low number of friendly casualties, the Air Force did a fairly competent job in attritting enemy forces prior to the ground offensive--even if they did end up using their target numbers instead of ARCENT's.

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CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The purpose of this thesis was to analyze the use of FSCMs in the deep battle and to determine if they were still effective in the post-Desert Storm environment. Not all of the FSCMs defined in Chapter One were used during the Desert Storm, such as the RFL. Others, (NFAs) were used effectively and did not seem to result in problems. And yet others--the FSCL and the RIPL--did cause a number of problems. Their use needs to be modified and clarified for effective use in future joint operations.

Fire Support Coordination Line

The FSCL should be eliminated. A long held maxim in the Army is that we should "train as we will fight." Correspondingly, our doctrine should also reflect how we fight in reality, not how we fight in CPXs or in the academic environment.

There were several problems with the use of the FSCL. First, the use of the FSCL did not follow accepted joint doctrine. Second, the ranges at which it was established beyond the FLOT often proved to be inadequate in

such a fast-paced maneuver environment: by the time some units were in receipt of the measure, it was in the process of being changed again. Third, there was confusion over who should establish the FSCL at ARFOR level. As a result two Army corps established FSCLs that met at a right angle, did not follow recognizable terrain features, and finally, led to the JFACC stepping in and establishing a theater wide FSCL.

Joint Publication 1-02 does not state that the ground commander must coordinate fires beyond the FSCL with the air component commander. Neither does AAFCE Manual 80-2. During Desert Storm, however, this was changed. The ground commander was told to coordinate fires beyond the FSCL with the air component commander. Many times this coordination was to difficult to carry out and as a result the fires were never executed. The purpose of this change was to protect pilots from the effects of ground delivered munitions delivered beyond the FSCL. This use of the FSCL essentially changed its meaning to that of a boundary much like the boundary between maneuver units. This is not wrong: it is a smart and proper measure to take. However, it should have been agreed upon long ago as a result of peacetime training exercises or it should have been directed prior to the commencement of the war. Changing rules in midstream only generated confusion and cynicism.

The current doctrinal guidance on where to place the FSCL is inadequate because it does not adequately address the pace of high-speed maneuver warfare. Under current doctrine, the FSCL is placed at the limit of the establishing commander's (usually the corps commander's) organic fire systems. This means that the FSCL is placed at a range of 30-40 kilometers beyond the FLOT. During Desert Storm, this was only a few hours away, and had to be continually moved to correspond to the fast pace of the battle.

U.S. Army Field Manual 6-20-30 alludes to the corps commander establishing the FSCL. This largely reflects the opinion of the U.S. Army Field Artillery School and--at least in this case--does not reflect Army doctrine as a whole. Army doctrine, as outlined in FM 100-5-1 states that the FSCL should be established by the appropriate commander. Adherence to the former guidance instead of the latter caused ARCENT headquarters to take a hands-off approach to the FSCL. As a result, the VII Corps and XVIII Airborne Corps' FSCLs changed at different rates, were not contiguous and caused considerable confusion among members of the air component. The JFACC solved this problem by establishing an FSCL for the ground forces. In the future ARFOR should follow the guidance of FM 101-5-1 and take a stronger role in establishing the FSCL for the subordinate corps.

Reconnaissance and Interdiction Planning Line

The use of this measure reflected the impact of NATO doctrine on joint operations. Much effort was put into the establishment of this measure and it was the subject of considerable conversation within the ARCENT Deep Operations Cell. All of this was probably unnecessary. The establishment, use, and impact of the RIPL was largely irrelevant. As such, the measure itself is superfluous and unneeded.

The intent of the RIPL was to grant the corps commander input into the targeting effort. Mechanically, the RIPL functioned as it was intended. The line was drawn at the extent of the corps commanders' ability to detect targets. The corps commanders then nominated targets short of that line to ARCENT which prioritized the targets and forwarded them to the AOC. And then very little happened.

Few of the targets nominated by the corps commanders were engaged. Many other targets that were not nominated were engaged instead. There were two reasons why this happened. First, the theater was a target rich environment. The corps commanders had many valid and important targets that needed to be engaged. There were, however, many other important targets to be engaged. There was a fixed number of air assets to attack these targets and many of these assets were diverted to Scud-hunting missions. The result was that neither the corps commanders nor the

ARCENT commander felt that enough air power was devoted to attacking Army nominated targets.

Second, the D^3 targeting process was not responsive enough to changing intelligence and unusually poor weather. As a result when pilots attempted to attack targets they often were no longer at the specified location. When they were there, they frequently could not be seen, causing the pilots to divert to other targets. In both cases the corps commanders felt they were getting insufficient support.

Notwithstanding, enemy units were attritted in accordance with the CINC's guidance prior to the beginning of the ground phase and the results of the war indicate that the corps commander's concerns were unnecessary.

Other Fire Support Coordination Measures

The basic fire support coordination measure is the boundary. The use of boundaries among maneuver units worked well; there is no indication that problems arose at any level. In fact, boundaries worked so well the FSCL was used as a boundary between the corps commanders and the JFACC.

The Coordinated Fire Line, a permissive FSCM, was not used at corps level, as it is most often used at division and brigade level. The focus of this thesis, the deep battle, has not lent itself to an analysis of division and subordinate operations. Therefore, the adequacy of the CFL cannot be appropriately determined.

The Free Fire Area did not play a role in deep operations during Desert Storm. There is insufficient evidence to draw any conclusions as to its adequacy.

The Restrictive Fire Line did no play a role in deep operations either, although it did become a relevant issue during the ground phase when the JFC-N maneuvered into the southern flank of VII Corps' boundary. Desert Storm did not unfold in such a way as to direct ground units to converge upon one another.

No Fire Areas were used liberally during the war to protect special forces units operating forward of the FLOT. They were established at CENTCOM level and were effective in preventing fratricide.

It would be easy to conclude that airspace coordination was a major problem during Desert Storm, and in a conceptual sense it was a major problem as both the land and air forces competed for use of airspace in which to fly and deliver munitions.

Operationally, airspace coordination was a minor problem because of the non-doctrinal use of the FSCL. This virtually eliminated the need to establish formal Airspace Coordination Areas. Instead, aircraft were either cleared out of an area so that artillery could engage targets or the guns (or the ATACMS launchers) remained silent. In this regard, the formal ACA became meaningless. This is not surprising since peacetime training scenarios that replicate

high speed joint operations have often yielded the same result. The lessons learned during Desert Storm indicate the need to dispense with formal measures that require extensive coordination and the need to adopt flexible, easy to understand measures.

Non-Doctrinal Measures

Other than the RIPL, the primary non-doctrinal measure used to control fires was the kill box. These rectangular geographic areas were designated by the AOC and were a simple and effective way of compartmentalizing the battlefield.

Recommendations

Following Desert Storm, there was a considerable amount of misgivings mixed in with the congratulations. Many of those misgivings revolved around the issues analyzed in this thesis, and many articles detailing these feelings are found in the bibliography. One of those articles, "Notes From the BCE" offers a number of recommendations that are designed to fix, or at least ameliorate some of the doctrinal and operational glitches and disconnects experienced during the war.

In addition to those documents already cited in this work, two others stand out: "Fight as a Team" by Lieutenant General John H. Cushman, U.S. Army (Retired) and "A Doctrinal Statement of Selected Joint Operational

Concepts" by the Chairman of the Joint Chiefs of Staff, General Colin L. Powell. (This was a memorandum released to the field by General Powell.)

The Systems Approach

General Cushman's concept of fighting the battle, the deep battle in particular, takes the "systems approach."[1] Under the precepts of this method, the CINC becomes responsible for executing the deep battle using the "systems", i.e., the "maneuver system" and the "air system" to defeat the enemy. In the battlefield that Cushman describes, the major maneuver commanders' targeting efforts are not handcuffed to the RIPL or some other form of measure. Instead, the CINC defines the commander's area of operations as a "zone of maneuver" that extends beyond the FSCL to a line set by the CINC himself. The JFACC is directed to cooperate with the maneuver commander in establishing air attacks (Cushman intentionally avoids using the word "interdiction" and its numerous variants) that support the scheme of maneuver.

"Using the air allocated to them," Cushman writes, "maneuver formation commanders will designate air attack targets in their zone of maneuver." Implicit here is the idea that the person who has the final say on targeting efforts should be the ground commander who will ultimately move across the territory with soldiers. That territory will be defined by the CINC as part of the joint fight.

> Coordinating with the JFACC [the maneuver commanders] will establish the FSCL...the formation commander should tell the airman the specific effect to be achieved and let the airman, working with the artilleryman and the using shared intelligence, find and hit the targets to achieve that effect.

Clearly, Cushman sees the territory beyond the FSCL and short of the CINC's forward maneuver boundary as the maneuver commander's targeting area. What he does not say is how he specifically wants the FSCL to be used and who is responsible for coordinating what; the assumption here is that it is meant to be used as described in Chapter One, and not as a command and control demarcation line as it appeared to have been used for much of Desert Storm.

"Complying with my guidance," Cushman writes, "the JFACC will do targeting beyond the zone of maneuver and will determine the timing of target attack." It should not be assumed then, that the maneuver zone would encompass all of the CINC's area of operation. Certainly there would be a large and no doubt, extremely important area of the battlefield for the JFACC to conduct his own targeting activities.

Cushman continues in his article by describing a somewhat abbreviated ATO cycle, and one personally managed by the CINC, that has major maneuver commanders submitting air attack requirements (with justification) to him every 24 hours. The CINC would then turn to his JFACC, request his input, and then issue orders.

The advantage of this approach, Cushman contends, is that it will enable us to get on with the business of planning and fighting wars, and will dispense with the need to rewrite missions and roles, a popular notion. It is better, he contends, "To live with the systems that we have, (and) to work out procedures and operational doctrine for their integrated use in battle."

Cushman's article has some flaws, to be certain. For one, he ignores current doctrine of creating a joint targeting board and places quite a bit of latitude in the hands of a major maneuver commander.

No doubt a point of contention in such a scheme would be the maneuver commander's desire to target enemy formations like artillery batteries that could pose a threat to ground forces versus the JFACC's desire to target AAA sites and other enemy units that pose a threat to air forces. The assumption that Cushman makes is that the maneuver commander would operate in the best interests of the air commander, but certainly since the opposite proposition is not always true, how could anyone expect this to be true?

It would be a mistake, however, to designate this as a fatal flaw in his concept, after all the CINC could (and hopefully, would) issue his own guidance on targeting. No doubt this would place enemy AAA systems right where they belong...at the top of the priority list. Indeed, in

Cushman's world, this is a safe assumption since his ideal CINC tells his subordinates that the first step in any war is to attain air superiority.

Cushman's concept obviously has quite a bit of appeal for those who empathize with the maneuver commander. He eliminates the RIPL and along with it, the harnessing in of the corps commander's targeting authority. While some see this as inherently faulty--after all, any commander should be able to target only what he can detect--it does square with the new reality of detection. The new reality being that the corps commander (or some other maneuver commander) equipped with JSTARS downlinks, tactical faxes that transmit real time aerial photography from strategic and national assets, and other assorted technological marvels, can now "see" much of the same battlefield as ARFOR, the JFACC, or the CINC. In fact, a plausible argument would be that if the major maneuver commander (in these days of instantaneous data communications) could not see what the JFACC and COMARFOR could see, then something would be very seriously wrong with the intelligence flow and that we would all be better off fixing that problem instead of placing handcuffs on the maneuver commander.

The Chairman's View

In November 1992, the Chairman of the Joint Chiefs of Staff issued a memorandum to the service chiefs and unified and specified commanders. In this document he

clarified his position on a number of issues and offered them to the addressees as "additional guidance."[2]

Within this document, General Powell attempts to right some wrongs. He reiterates, in a clear manner, that the FSCL is designed to be used as a permissive FSCM. And while he encourages ground commanders to coordinate the delivery of ordnance beyond the FSCL, he does not deem it mandatory. Instead, he allows that in exceptional circumstances fires could be delivered across it without coordination.

In terms of interdiction, he restates current joint doctrine and does not discuss battlefield air interdiction, either as a separate entity or as a subset of air interdiction.

If the corps commander, or some other major maneuver commander can not count on BAI to shape his deep fight then how could that be accomplished? Current joint doctrine suggests (but does not mandate) that the CINC establish the JTCB. This point is repeated by General Powell. He suggests that "typically" the CINC would form a JTCB that would include representatives from each component and would synchronize the targeting effort.

General Powell's memorandum did not direct any significant changes. It reiterated policy. Specifically, it pushed harder on the pedal for joint operations, certainly a welcome move. His comments concerning the

establishment of the JTCB as the norm, was certainly welcome for those who believe that the battle should become more joint. Unfortunately, his position towards the FSCL did not address the air component's concerns over pilot safety. One wonders who would be the approval authority for the "exceptional circumstances" clause: the maneuver commander? The CINC? This static position on the future of the FSCL suggests that there is still some work to do in this area or else the next war may be a replay of the previous war where the FSCL served as a boundary, not as a coordination line.

How then should the deep battlefield be structured? Cushman's model seems to be a move in the right direction. However, instead of coming up with a "systems approach" perhaps the best answer is to establish a "control approach."

The Fire Control Approach

The "fire control" approach emphasizes the control of fires rather than the coordination of fires. This reflects the reality of Desert Storm: the primary conflict centered on who was *controlling* the delivery of fires. Coordinating fires, that is, requesting that the *controlling* authority approve a fire mission, was a problem logically subordinated to the question of who was controlling the fires to begin with. Therefore, it is the control issue that should be the focal point of FSCM reform.

The adoption of this method rests upon several assumptions. The first assumption is that both the CINC and the maneuver commander should have some geographical sense of where the operations desired endstate should be. This desired endstate should be portrayed on a map. It could be for example, that the desired endstate for VII Corps during Desert Storm was (after the destruction of the RGFC) to form a ring encircling Basra. This position becomes the geographical endstate. What the Corps (or the ground) commander has then, is a maneuver zone, much like the one that Cushman describes.

For the ground commander, this maneuver zone eliminates the need to establish a measure like the RIPL, which is based on the faulty assumption that the corps commander can only detect targets so far out on the battlefield. As part of the fire control approach a second assumption is that the intelligence flow to the ground commander would be the same as it is for the for the CINC and the JFACC. Certainly this is technologically feasible. Armed with adequate intelligence, the ground commander would have targeting authority from his line of departure to his geographical endstate. He would control the targeting of enemy units within this maneuver zone in accordance with his own scheme of maneuver and the CINC's guidance.

The air component would not be frozen out of this process. Target nominations from the JFACC would be

accepted by the corps and prioritized by a multi-service JTCB. The final approval of the target, however, would be made by the ground commander or his designated representative. Similarly, should the corps commander desire to target outside of his maneuver zone, then his nomination would have to be forwarded to the same multi-service JTCB, and the final approval would be made by the JFACC or his designated representative. In each case the board would receive guidance and priorities from the CINC. This guidance would not necessarily be static, in fact it is assumed that it would be dynamic. The CINC would issue targeting guidance for air superiority operations and then different guidance for battlefield preparation, and then again different guidance for the maneuver campaign. Within each of these major categories, the CINC would review the progress of the targeting board and inject additional guidance when necessary.

The primary advantage to this method is that it emphasizes control of the battlefield and eliminates confusion over who has responsibility for targeting different portions of the theater of war. The ground commander retains authority for the area that forces must maneuver on. The air commander retains authority for the remainder of the theater. During Desert Storm that was virtually all of Iraq north of the Euphrates River: a fairly large portion of territory.

As a part of this system, the execution of all targets within the maneuver zone would, if the corps commander desired, require coordination with the corps. There would no longer be an FSCL established. Why?

Current doctrine directing the establishment of an FSCL implies several things. First, the maneuver commander who establishes the FSCL is not interested in shaping the portion of the battlefield beyond the FSCL. This is nonsense. It is inconceivable that a corps or an EAC commander does not want to shape, or in a larger meaning, influence the battlefield that his troops are going to traverse in the very near future. During Desert Storm, this "future" was often just a few hours away. Did neither the VII Corps commander nor the XVIII Airborne Commander want to influence what was happening on the battlefield an hour and a half away? Certainly they did. Unfortunately the current system of targeting and execution denied them that opportunity. In the future, it is unrealistic to think that a maneuver commander would not want to control the land that his forces are going to roll over. At the very least, the commander will want to shape the area by restricting the delivery of certain types of munitions, such as GATOR minefields, that could impede maneuver lanes that he needs to keep open.

Second, establishing the FSCL implies that the joint commander is willing to duplicate targeting efforts on

the battlefield. This is because of the nature of the FSCL (anyone can fire beyond it without coordination). Thus, it is entirely possible that an air strike using scarce, high cost precision guided munitions could be followed by an ATACMS strike on the same target minutes later. This results in an unsynchronized battlefield, a violation of one of the AirLand Battle's imperatives. It also represents a waste of precious resource that the CINC could ill afford.

It is obvious that one of the primary drawbacks of this system would be to discourage the attack of targets by the air component since every attack would require coordination with the ground commander. Because the ground commander himself may want to avoid this situation, a measure would be implemented that would facilitate the delivery of fires by eliminating the need for coordination, much like the current FSCL. This measure would be called the Fire Control Line (FCL). The FCL would be depicted in a manner similar to the FSCL (figure 17).[3]

The FCL would be a line established by the appropriate ground commander that would allow the air component commander to control the delivery of restricted fires beyond the line. The fires would be restricted in two ways. First, at the ground commander's option, they would be restricted to targets pre-approved by the establishing commander. Second, they could be restricted in terms of ammunition delivered, such as mines or bombs containing sub-

munitions. Other than these two caveats, the FCL would effectively grant control of the area beyond the line to the air component commander. The ground component commander would not be able to engage targets beyond the line without coordinating with the air component commander, as he was not able to do during Desert Storm.

The placement of the FCL would be determined by the appropriate ground commander based upon METT-T. It could conceivably be drawn in as close as 5-10 kilometers or as far away as 300 kilometers, depending upon the ground commander's assessment of METT-T and guidance received from the CINC. It would not normally be placed at the range of the ground commander's conventional artillery systems, as is currently encouraged under the present system. This method, which virtually assumes a static battlefield, proved to be inadequate during Desert Storm.

This measure would replace the current FSCL and would effectively create a boundary between the maneuver commander and the air commander.

The FCL would be an improvement over the FSCL for several following reasons. First, unlike the FSCL, the placement of the FCL would not be largely driven by the range of a howitzer or rocket launcher as is the FSCL. Instead it would be established based upon an analysis of METT-T. If the result of this analysis would indicate that ground troops would move 30-40 kilometers in twelve hours

then the ground commander would have the option of placing the FCL out at a range of 80-100 kilometers (or whatever distance he felt would facilitate success of the battle).

Second, under this concept the ground commander could easily establish an FCL that would take advantage of both his ATACMS and his combat aviation assets. The FCL could be placed far enough in front of the FLOT so that these weapon systems could engage targets without endangering air assets engaging targets without coordination. Further, by placing the FCL at a sufficient distance from the FLOT, the ground commander would no longer be saddled with the problem of moving an FSCL several times daily. Nor would the air component commander have to worry about this measure changing faster than the information could be disseminated to pilots.

Third, and perhaps most important, the adoption of this measure would eliminate the confusion over who controls the different areas of the battlefield. This was precisely the point of contention during Desert Storm.

There will be several arguments made against this concept: (1) There is nothing wrong with the current system, it serves us well, (2) If there are problems with FSCMs in the deep battle they could best be addressed by adding different FSCMs to solve the problems, (3) If there are problems with the FSCL it should be modified, perhaps with the ideas presented, but the term FSCL should remain, and

(4) There is no point in trying to radically restructure the system because the Air Force would never agree to it.

The first argument, that there is nothing wrong with the system, ignores the problems that were encountered during the war. There is definitely something wrong when one of the most important FSCMs--the FSCL--is radically transfigured in war in order to facilitate operations. Yet there will still be those who adopt this argument. Why?

Much of this revolves around the bureaucratic nature of the military. This is not meant to be a disparaging comment, simply a reflection of reality. The senior personnel in the fire support system have invested a good portion of their careers studying, teaching, training, and operating with the current doctrine. As such, many may be reluctant to discard a significant part of it.

The second argument works to a point--at least it recognizes that there are problems to contend with. Unfortunately, much of the argument in this category results in ideas that add in the complexity of the fire support structure by adding missile transit routes, or by expanding upon the use of the RIPL.[4] The problem here is that adding to the complexity of the system is exactly what is not needed. The lessons learned from the Persian Gulf demand simpler systems, easier to understand, and faster to coordinate and disseminate.

The third argument also acknowledges faults in the system and agrees with changes offered but still wants to cling to what is familiar: the labels used to describe the measures employed. While this is understandable, it ignores the human cognitive dimension. Changing names, from the Fire Support Coordination Line to the Fire Control Line, sends up a flag to the fire support student. It says that there is a new way of doing business and that the old way must be discarded. New names are used because they get attention and help drive home the point that things have changed.

The last argument is specious. The thought of a ground commander assuming targeting control over vast amounts of territory would certainly be opposed by the air component commander who would unfailingly perceive this as a grab for power. Or would it?

A more plausible argument would be that the air commander is as frustrated as the ground commander at the inability to agree on joint doctrine, and as a result, would readily agree to a solution that allows for both of them to assume a definitive amount of control over the battlefield. Further, the establishment of the FCL gives the air component what they want, namely the ability to control the application of artillery fires into the airspace that air assets are operating in.

Other FSCMs and Remaining Issues

The conclusions portion of this chapter addressed the various FSCMs originally discussed in chapter one. Of these, the RIPL, like the FSCL, should be discarded. The effect of its use during Desert Storm was essentially irrelevant. There is no indication for change in the use of NFAs and RFAs as a result of the war. Under the "fire control system" discussed in the preceding pages, these measures, along with RFLs, would continue to be used.

The need for formal ACAs would no longer exist. The FCL would grant the air commander control of airspace beyond the FCL, and he would probably either move aircraft out of the way completely or establish an informal, hasty measure to segregate air and ground fires as he deemed necessary.

CAS would continue to be defined as it is currently defined, as would AI. On the other hand, BAI would disappear from the U.S. lexicon. Since the ground commander would enjoy complete targeting authority in his maneuver zone, he would not need dedicated BAI packages to shape his deep fight anyway. His approval authority for targeting engagement would ensure that the battlefield was shaped in accordance with his concept of maneuver and the CINC's guidance.

The apportionment and allocation system would also remain largely unchanged. The CINC would continue to

apportion his air assets as he deemed necessary and would probably change the apportionment ratio during different phases of the campaign. As a corollary, the CINC would also consider apportioning certain Army assets during an air campaign. In this scenario, he could apportion a certain percentage of ATACMS missiles and Army aviation assets to the air component to assist in achieving and maintaining air superiority. This would be a rather significant change over current doctrine, but any serious analysis of Desert Storm would lead one to question: Why assets belonging to the ground commander should not be made available to the air commander during the crucial quest for air superiority?

The BCE-ARFOR-AOC relationship would be modified to include a BCE equivalent being provided to the ARFOR headquarters by the AOC. The relationship would otherwise remain unchanged, except for needed improvements in internal SOPs and improvements in the use of data systems to transfer information.

The ARFOR Deep Operations Cell would be strengthened by adding more active duty soldiers and by establishing an FSE sub-element to the structure. This would give the Deep Operations Chief needed experience in fire planning and in task organizing field artillery assets.

Summary

Desert Storm indicated the need make changes in how the fire support system interfaces with the deep battle

conducted at the corps and EAC levels. Much of the reform focuses upon which commander, the air or ground, should control the area beyond the close battle. Numerous thoughts on this have been made by influential observers. Some, such as General Cushman, have advocated a new paradigm. General Powell has called for adherence to current joint doctrine.

This thesis recommends significant change in the fire support system. It recommends that the control of the deep battlefield be more clearly delineated between the air and the ground commander. The way to do this would be to eliminate both the FSCL and the RIPL and replace them with a more specified area of operations for the ground commander. This would be supplanted by a new FSCM called the Fire Control Line (FCL) which would require the coordination of air delivered munitions short of the FCL with the ground commander, and would correspondingly require coordination of surface delivered munitions beyond FCL with the air commander.

There would be numerous arguments against such an approach. Some of the arguments would contain valid points, other portions of the arguments would no doubt reflect the fear of change, even when it is clearly called for.

What is important is that the fire support community finally begins to move on the subject. Since the end of the war, now over two years ago, little has been done to correct the numerous problems that arose, leaving the

issue of fire support in the same category as the weather: everybody is talking about it, but nobody seems to be doing anything about it.

Endnotes

1. John H. Cushman, "Fight as a Team," *Proceedings* (January 1993): 58-62.

2. Colin L. Powell, "A Doctrinal Statement of Selected Joint Operational Concepts" (unpublished memorandum to selected commanders, 1992.)

3. Credit for the term "FCL" goes to Major Stanley Sims, U.S.A., who was an intelligence officer assigned to the ARCENT Deep Operations Cell during Desert Shield and Desert Storm.

4. John Bonsell, *The Sky is the Limit* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, unpublished paper, 1992) and William Carlton, *Fire Support Coordination Measures for Airland Operations* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, unpublished paper, 1991.)

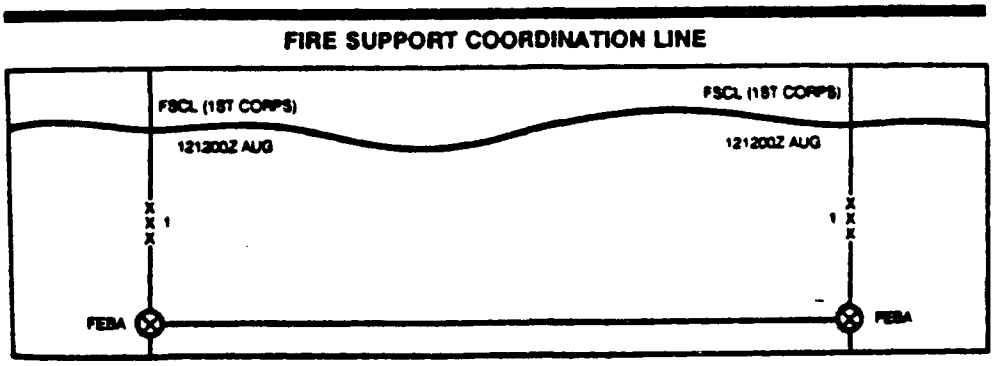


Figure 1. Fire Support Coordination Line (FSCL). Source: U.S. Army, FM 6-20-30 *Fire Support Coordination for Corps and Division Operations*, (Washington D.C.: Headquarters, Department of the Army, 1989) F-3.

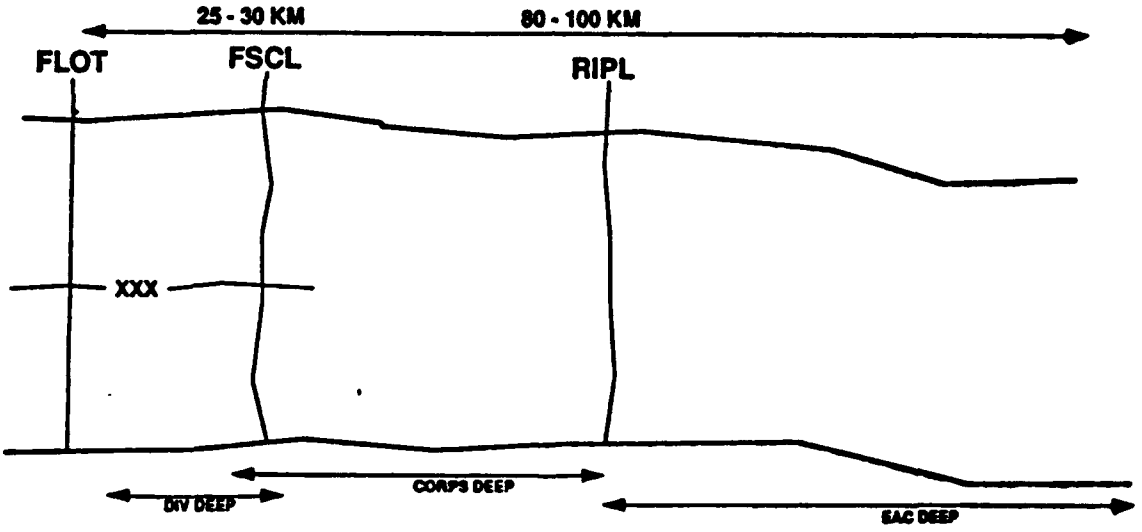


Figure 2. Reconnaissance and Interdiction Planning Line (RIPL). Source: U.S. Army, *COMUSARCENT'S Army-Air Force Lessons Learned* (Fort McPherson, GA: Headquarters, 3rd Army, November 27, 1991) 5.

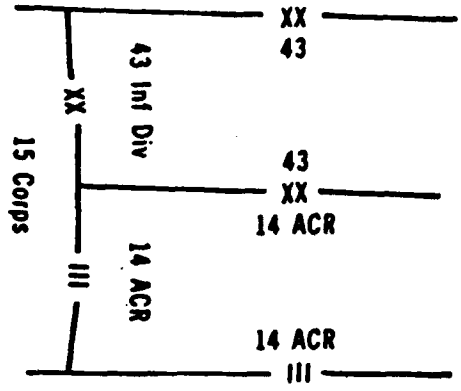


Figure 3. Boundaries. Source: U.S. Army, FM 101-5-1 *Operational Terms and Symbols*, (Washington D.C.: Headquarters, Department of the Army, 1985) 2-32.

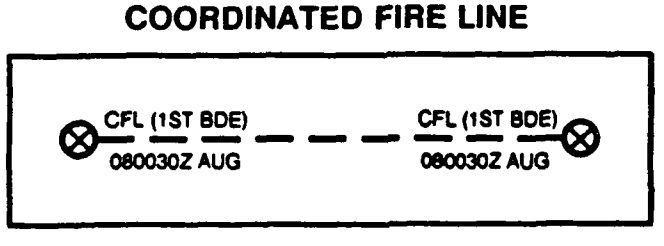


Figure 4. Coordinated Fire Line (CFL). Source: FM 6-20-30, F-2.

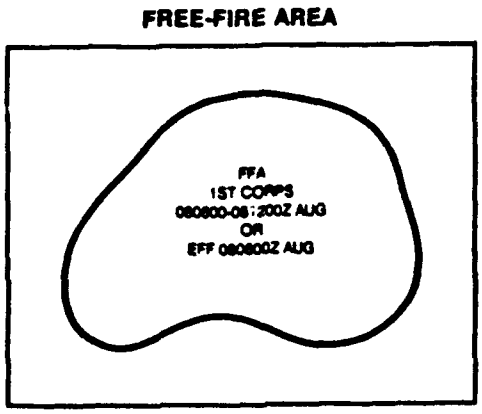


Figure 5. Free Fire Area (FFA). Source: FM 6-20-30, F-4.

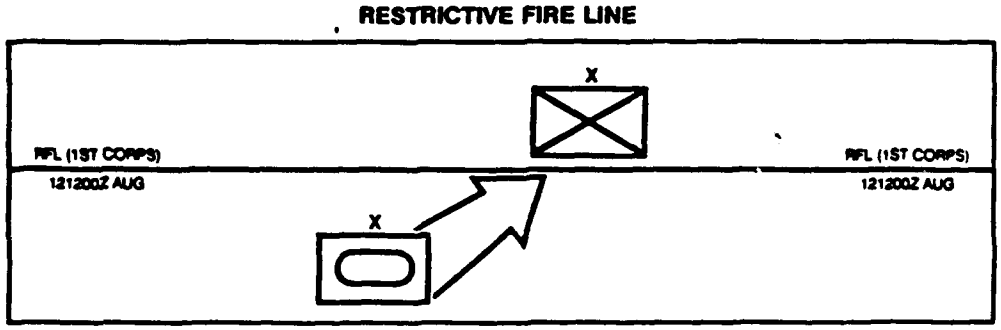


Figure 6. Restrictive Fire Line (RFL). Source: FM 6-20-30, F-5.

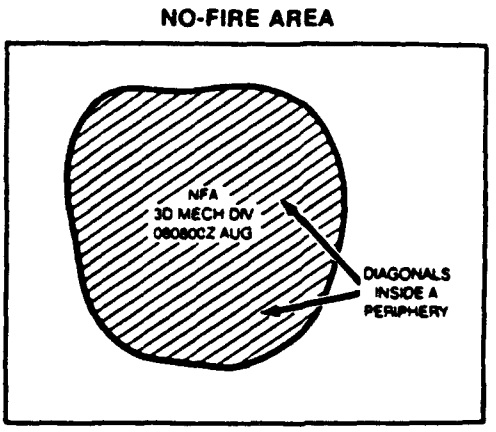


Figure 7. No Fire Area (NFA). Source: FM 6-20-30, F-6.

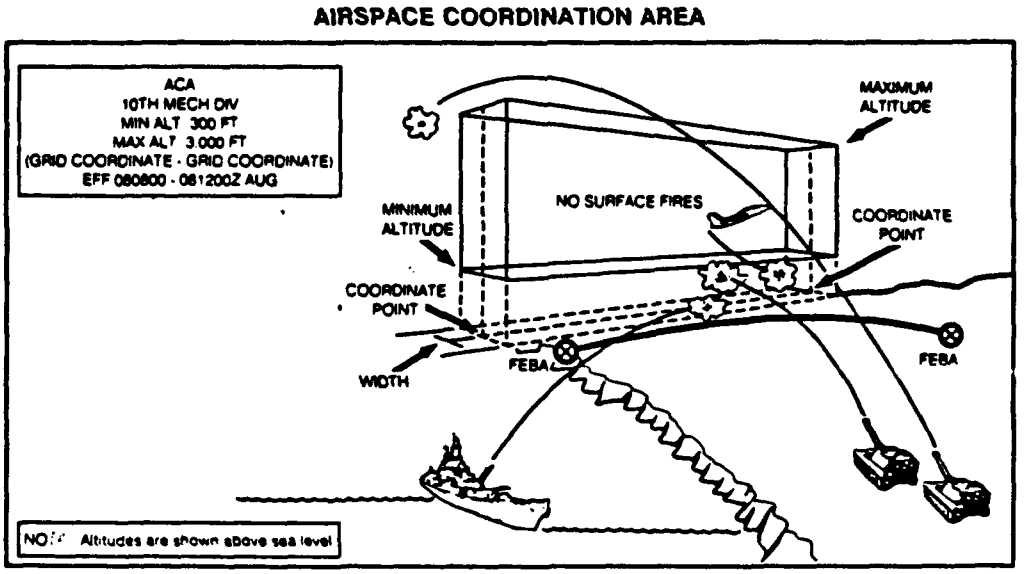
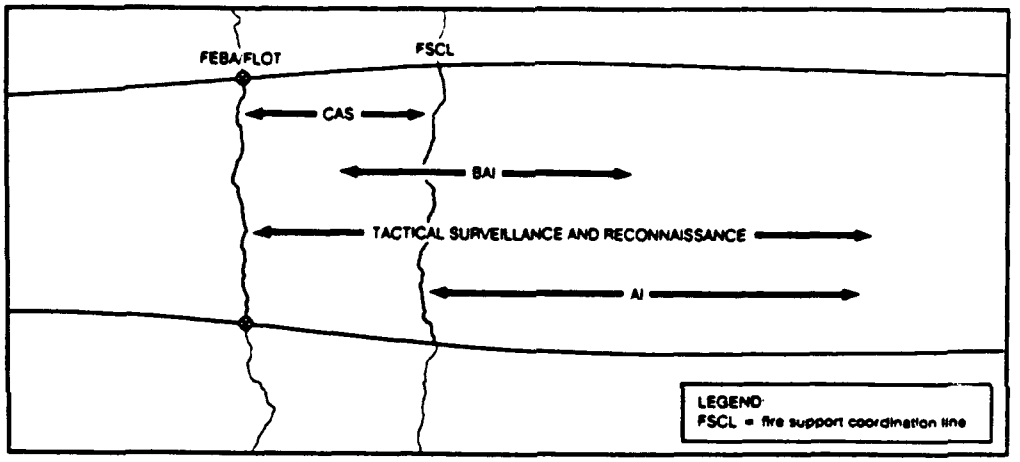


Figure 8. Airspace Coordination Area (ACA). Source: FM 6-20-30, F-6.

AI, BAI, AND CAS ON THE BATTLEFIELD



CHARACTERISTICS OF AI, BAI, AND CAS

	AI	BAI	CAS
Target	Indirect	Directly affecting friendlies	
Area	Beyond FSCL	Both sides FSCL	Close proximity
Coordination	Joint planning and coordination		Detailed integration
Control	None required		Direct or indirect

Figure 9. CAS, BAI, and AI Geometry. Source: FM 6-20-30, 3-3.

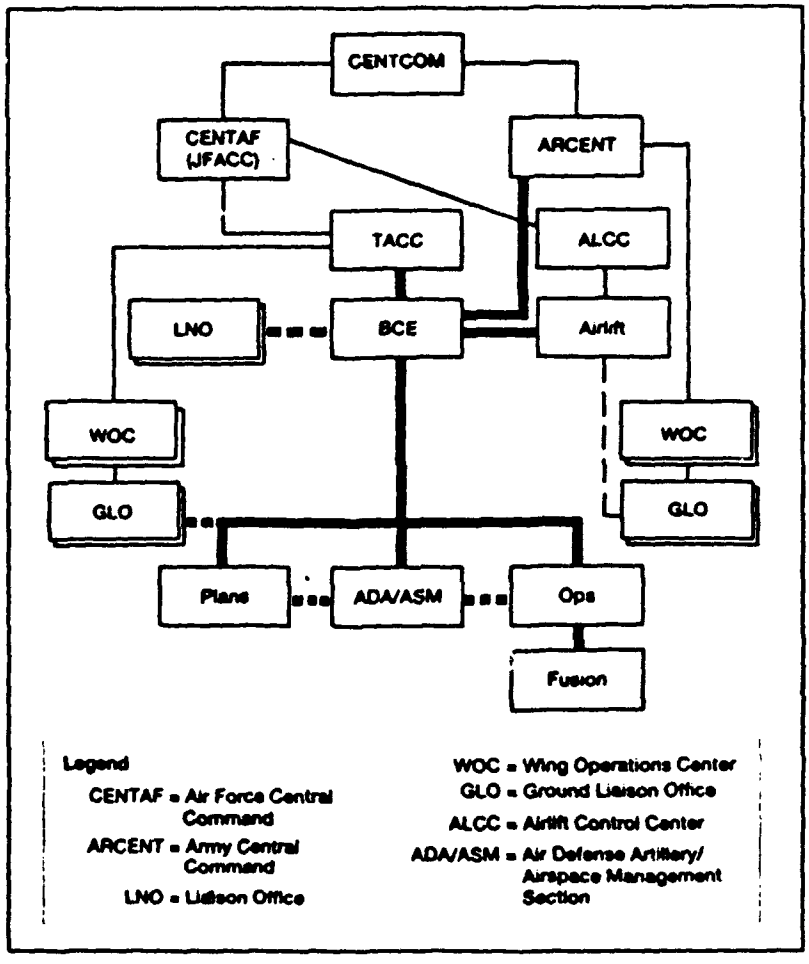


Figure 10. BCE Interrelationships. (Note: TACC (Tactical Air Control Center) is now the AOC.) Source: William G. Welch, "Observations on Joint Combat Operations at Echelon Above Corps", *Field Artillery Journal* (June, 1992): 16.

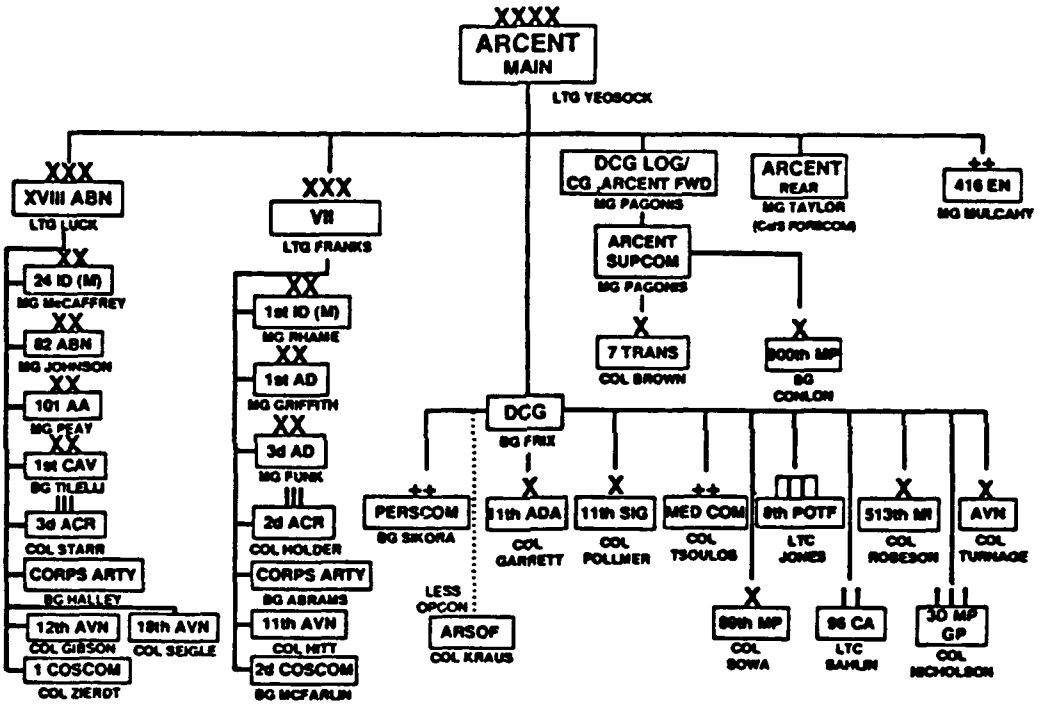


Figure 11. ARCENT Command and Control. Source: U.S. Army, *COMUSARCENT Daily Briefing* (Riyadh, Saudi Arabia: Headquarters, USARCENT, March 29, 1991) 10.

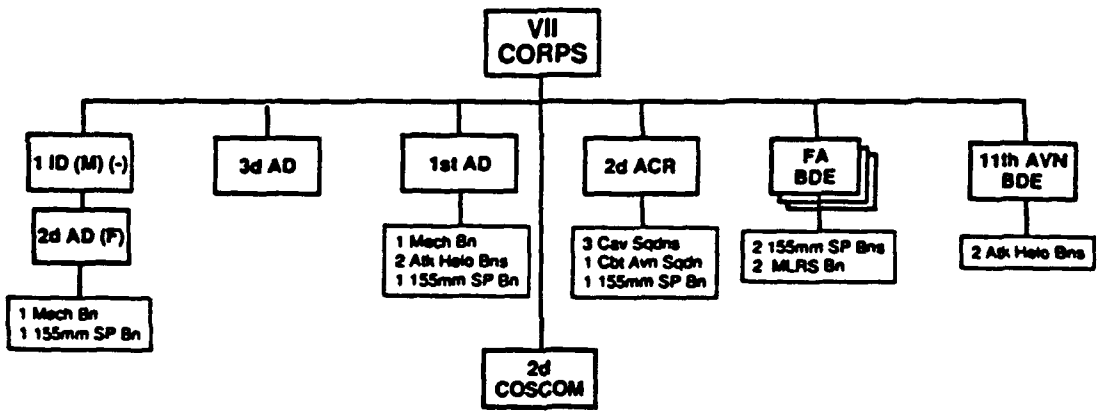


Figure 11. VII Corps Command and Control. Source: *COMUSARCENT Daily Briefing*, 14.

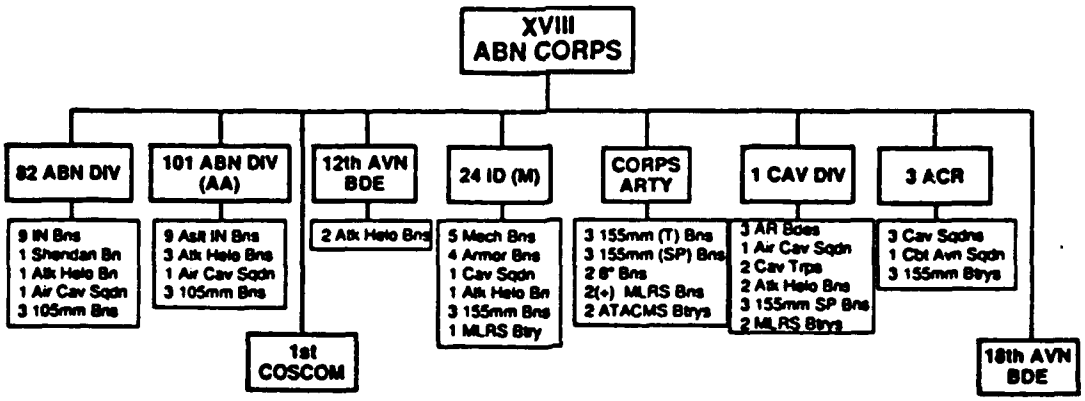


Figure 13. XVIII Airborne Corps Command and Control.
Source: *COMUSARCENT Daily Briefing*, 12.

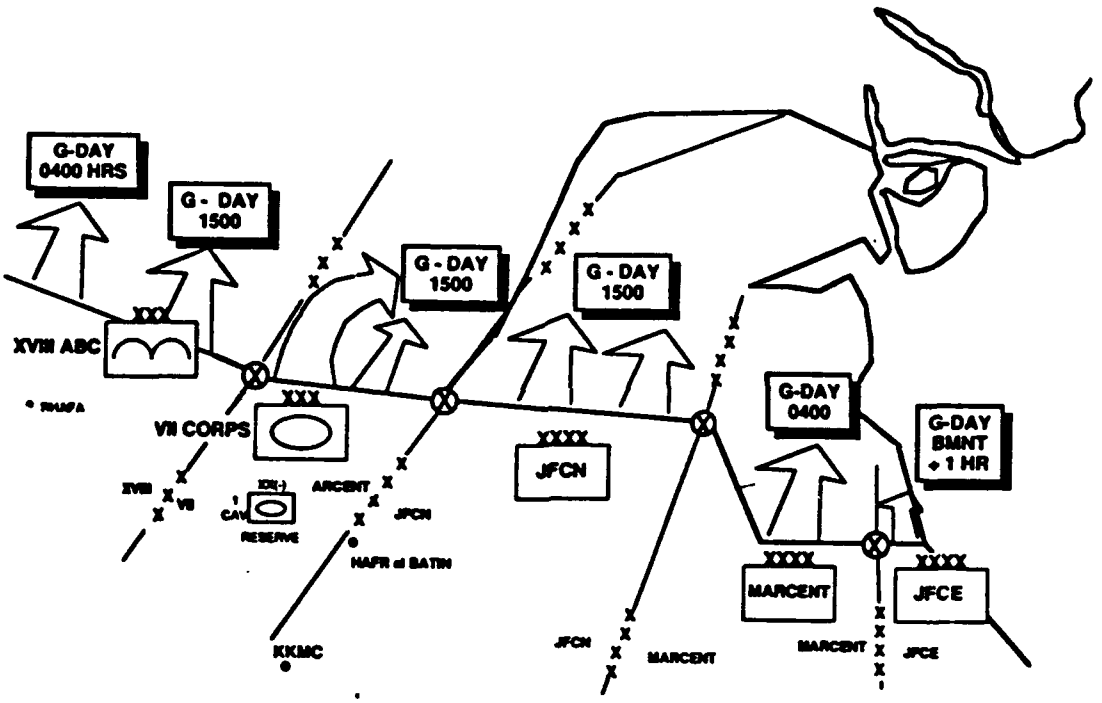


Figure 14. KTO Geometry. Source: *COMUSARCENT Daily Briefing*, 22.

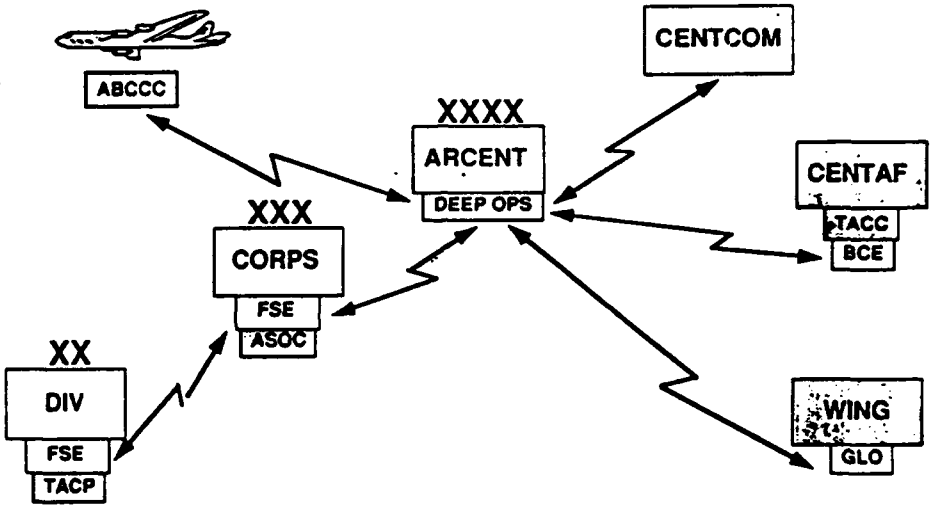


Figure 15. Deep Operations Cell. Source: *COMUSARCENT'S Army-Air Force Lessons Learned*, 7.

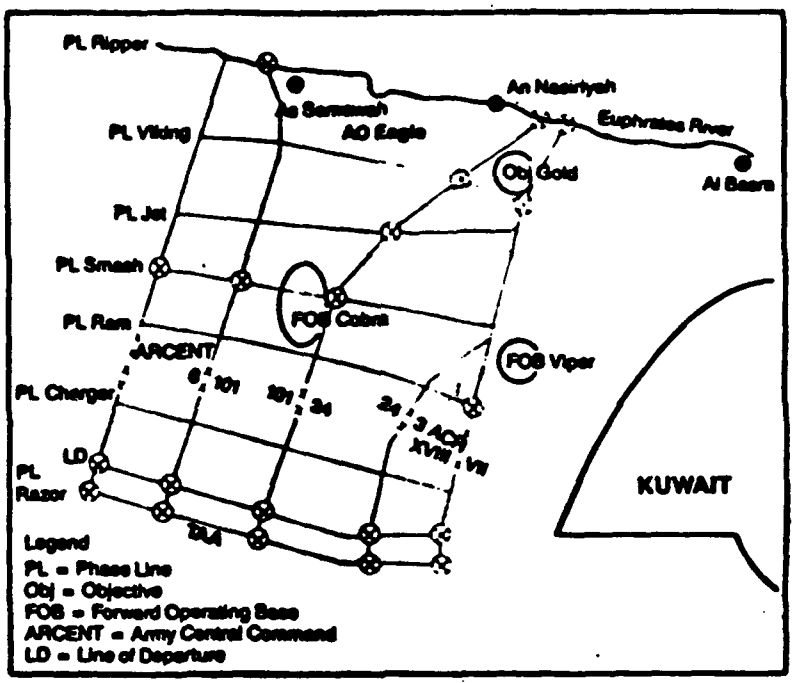


Figure 16. Phase Lines (RIPPER). Source: Randall J. Anderson and Charles B. Allen, "The Lightning of Desert Storm," *Field Artillery Journal* (October 1991): 57.

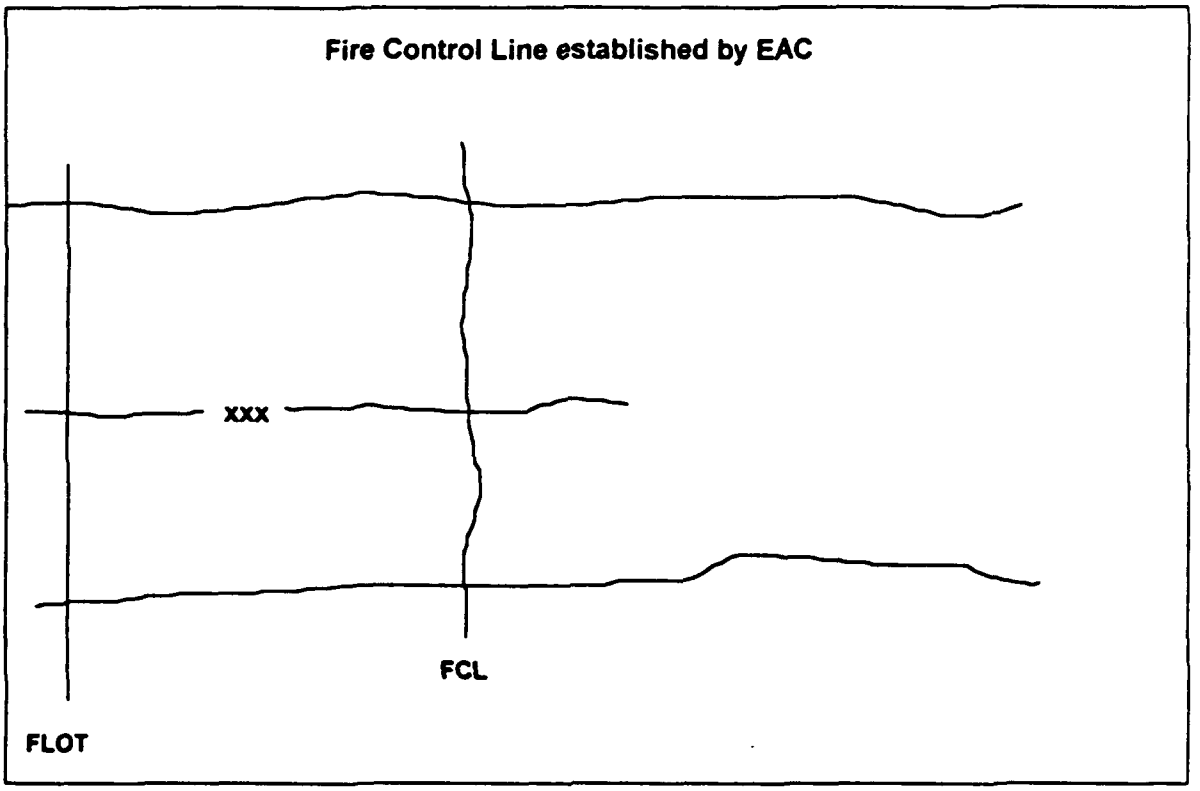


Figure 17. Fire Control Line.

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