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Form SF298 Citation Data

Report Date ("DD MON YYYY")	Report Type	Dates Covered (from... to) ("DD MON YYYY")
00061999	N/A	

Title and Subtitle Fire Support Coordination Measures by the Numbers	**Contract or Grant Number**
	Program Element Number
Authors Horner, John P.	**Project Number**
	Task Number
	Work Unit Number
Performing Organization Name(s) and Address(es) School of Advanced Airpower Studies Air University Maxwell AFB, AL 36112	**Performing Organization Number(s)**
Sponsoring/Monitoring Agency Name(s) and Address(es)	**Monitoring Agency Acronym**
	Monitoring Agency Report Number(s)
Distribution/Availability Statement Approved for public release, distribution unlimited	
Supplementary Notes	
Abstract	
Subject Terms	
Document Classification unclassified	**Classification of SF298** unclassified
Classification of Abstract unclassified	**Limitation of Abstract** unlimited
Number of Pages 87	

FIRE SUPPORT COORDINATION MEASURES

BY THE NUMBERS

BY

Major John P. Horner

A THESIS PRESENTED TO THE FACULTY OF

THE SCHOOL OF ADVANCED AIRPOWER STUDIES

FOR COMPLETION OF GRADUATION REQUIREMENTS

SCHOOL OF ADVANCED AIRPOWER STUDIES

AIR UNIVERSITY

MAXWELL AIR FORCE BASE, ALABAMA

JUNE 1999

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Acknowledgements

I give sincere thanks to those on the staff and faculty at SAAS. They vastly improved my communication skills. Colonel Stephen D. Chiabotti, my thesis advisor, and Professor James S. Corum, my primary reader, both played a vital role in getting my writing up to academic standards.

Most of all, I thank Kimberly, my wife and our boys, Tommy and Sam, for their immense patience and support. Their presence allowed me to keep a broad perspective while staying motivated in the oft-futile attempt to help those land and air warriors getting the day-to-day job done in harm's way, while I read and write.

Abstract

Fire Support Coordination Measures (FSCMs) can significantly increase or decrease the efficiency of joint combat operations. This thesis examines use and placement of the Fire Support Coordination Line (FSCL). The line helps ensure that firepower directed at a surface commander's area of operations (AO) is properly coordinated toward objectives assigned by the Joint Force Commander (JFC). Research suggests that an effects-based analysis of the various fires supplied by the land and air components offers an appropriate means to determine FSCL location. Short of the FSCL, where land forces typically supply the preponderance of effects, the ground commander should act as coordinating authority. Beyond it, when established at the depth where air forces tend to provide the preponderance of effects, the Joint Forces Air Component Commander (JFACC) should assume coordination responsibility. Hence, forces assigned to the land and air component commanders would coordinate their employment with that component providing the dominant battlefield effects.

Operation Desert Storm presents several case studies that tend to support the idea. Khafji (defensive operations to repel an attack), 73 Easting (offensive operations against a defending enemy), and attacks on the "Highway of Death" (operations against a withdrawing enemy) provide reinforcing evidence. Analysis indicates that an FSCL based on the preponderance of effects takes into account the various situation-specific factors mentioned in joint doctrine. If an effects-based FSCL were used in the Gulf War,

fires may have been better coordinated and more potent. Staffs planning for future combat operations should advise on a FSCL placement based on the preponderance of effects, which incorporates factors such as forces available, the scheme of maneuver, enemy array, targeting plan and other key issues.

This thesis correlates optimal joint employment conditions with a preponderance-of-effects-based FSCL used to delineate coordinating authority. It recommends:

1. Doctrine be altered to clarify command relationships associated with land AOs, including guidance regarding control, support and *coordinating authority*, which the FSCL can delineate.
2. Doctrine be adapted to identify the preponderance of effects as a primary consideration in FSCM use and FSCL placement.
3. The FSCL definition in JP 3-09 be corrected for consistency with other doctrine and also reflect its use in delineating the coordinating authority of forces. It currently misstates that forces supporting the land component are under the "control" of the surface commander.

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Chapter 1

Introduction

> *The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow.*[1]
>
> —General John M. Shalikashvili
> *Joint Vision 2010*

Operation Desert Storm demonstrated the overwhelming firepower that US military forces bring to war. Technology continues to make modern weapons faster and more lethal at greater depths on the battlefield. Joint doctrine must evolve to fully exploit new capabilities and ensure that firepower from US air, land and sea forces supports the objectives of our leadership. Future success will hinge on the ability of our commanders to orchestrate joint fires and maneuvers to a degree unmatched by the enemy.

Fire Support Coordination Measures

Fire Support Coordination Measures (FSCMs) facilitate effective joint force integration. Paramount among these is the Fire Support Coordination Line (FSCL), defined in Joint Publication (JP) 3-09, *Doctrine for Joint Fire Support*, as:

> A fire support coordination measure that is established and adjusted by appropriate land or amphibious force commanders within their boundaries in consultation with superior, subordinate, supporting, and affected commanders. Fire support coordination lines (FSCLs) facilitate the expeditious attack of surface targets of opportunity beyond the coordinating measure. An FSCL does not divide an area of operations by defining a boundary between close and deep operations or a zone for close air support. The FSCL applies to all fires of air, land, and sea-based weapon systems using any type of ammunition. Forces attacking targets beyond an FSCL must inform all affected commanders in

> sufficient time to allow necessary reaction to avoid fratricide. Supporting elements attacking targets beyond the FSCL must ensure that the attack will not produce adverse effects on, or to the rear of, the line. Short of an FSCL, all air-to-ground and surface-to-surface attack operations are controlled by the appropriate land or amphibious force commander. The FSCL should follow well defined terrain features. Coordination of attacks beyond the FSCL is especially critical to commanders of air, land, and special operations forces. In exceptional circumstances, the inability to conduct this coordination will not preclude the attack of targets beyond the FSCL. However, failure to do so may increase the risk of fratricide and could waste limited resources…[2]

Although this current definition is lengthy, it does little to identify where a FSCL should be established or whether it should be used at all. JP 3-09's supporting text is equally nondescript. These issues often invoke contentious debate among those representing air and land forces.

Books reviewing military operations in Desert Storm often assert that inappropriate FSCL use and placement caused significant problems. As a result, US commanders failed to achieve one of their stated objectives.[3]

Today, effective coordination measures are even more important. Firepower is, and continues to get, more lethal. Both air and surface forces must be considered during FSCM implementation. Their success or failure is may be at stake.

From the ground commander's view, coordination measures such as the FSCL are intended to facilitate attacks supporting the land battle. Those with an airpower perspective have a different view. They see the measure as a means to maximize desired effects on the enemy. Specific scenario characteristics will determine where and how much airpower will *support* the land battle. It is important for land component commanders and their staffs to share this view. They are charged with assigning the measures.

Should the magnitude of the effects provided by the ground and air forces be appraised, compared and used as a primary consideration in determining FSCL depth? As such, the line

could delineate the authority to coordinate fire directed at the enemy. Therefore, the land or air component commander making the most significant effect-based contribution to the fight would be charged with doing the coordinating.

This study presents a word-by-word detailed analysis of *fire support coordination measures* to assess the plausibility of an effects-based FSCL. It appraises the value of the line established at the depth where effective firepower supplied by the air component dominates over that of the land component. Such a measure might enhance coordination efforts and increase the efficiency of joint combat operations.

For joint and combined operations on the scale of a major theater war (MTW), the FSCL definition's "appropriate land or amphibious commander" is invariably the Joint Force Land Component Commander (JFLCC). The overall Joint Force Commander (JFC) designates this ground commander, who directs land operations intended to achieve specific operational objectives. Although targets and desired effects are not necessarily based on terrain, objectives usually aim at compelling an enemy to accept our will by destroying his means or resolve to resist, or by controlling his territory. According to doctrine, the ground commander is the "supported" commander for joint fire support in the land component's area of operation (AO), which is a terrain-based concept.[4] Other functional commanders, such as the Joint Force Air Component Commander (JFACC), often play a "supporting" role in achieving JFLCC objectives. They do this by providing maneuver forces and firepower. Of course, these commanders typically have other objectives assigned to them.

The ground commander uses the FSCL and other measures to integrate fires that support an envisioned land maneuver scheme, such as a rapid attack in zone or a static defense that blocks an enemy advance. In general, supporting airpower fires that occur inside the line must be authorized and closely coordinated. This is accomplished by elements of the air component's theater air control system (TACS), aligned with the land component staff and headquarters.

Procedural controls ensure friendly positions are not inadvertently attacked or adversely affected, and target engagement efforts are unified in support of the ground scheme of maneuver.[5]

As the FSCL definition in Joint Publication 3-09 points out, joint forces can generally attack targets beyond the line without detailed land component integration. Conventional land forces are not operating there. Nonetheless, coordination remains a critical requirement. It helps avoid targeting redundancy and prevents the unintended conflict of weapons and combatants—namely the airmen operating in and above the AO with the weapons fired from the friendly ground forces.

Prior to the Gulf War, the FSCL was typically utilized as a "permissive" fire support measure.[6] The ground commander's limited ability to acquire and engage targets between the FSCL and AO forward boundary permitted the various joint forces to engage targets beyond the line without significant land component interaction. However, some significant technological and doctrinal developments have impacted the use and placement of the FSCL. Advances in technology have significantly enhanced the ground commander's ability to conduct operations throughout the depth of the land component's AO (see Figure 1).

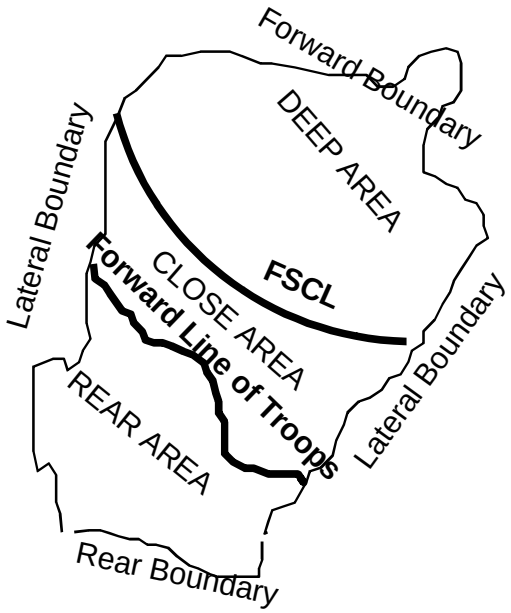


Figure 1. The JFLCC Area of Operations

US Army doctrine has evolved to exploit new weapons designed for deep operations. The Army Tactical Missile System (ATACMS), with an effective range of 300 kilometers, is designed to be employed well beyond the FSCL norms delineated in AirLand Battle doctrine, a doctrine developed primarily for a US-USSR land war in Europe.[7] Land component attack helicopters are increasingly seen as a deep maneuver asset and can often operate throughout the depth of the AO, well beyond the forward line of own troops (FLOT).[8] In fact, AH-64 Apaches conducted strikes in the Gulf War on Iraqi early warning radar sites *beyond* the land AO and helped achieve air component objectives before land offensive maneuvers began.

In conjunction with greater ground commander emphasis on deep operations, the FSCL has been increasingly implemented as a "restrictive" measure to land forces attacking beyond it. The number and variety of other joint forces operating there demands this. Hence, the ground commander is doctrinally required to coordinate with other functional commanders when land forces fire or move beyond the line, unless precluded by exceptional circumstances.[9]

Evolving weapons and tactics make US military forces increasingly interdependent and the JFLCC shares extensive battlespace beyond the FSCL with the JFACC. This commander is also designated by the Joint Force Commander and directed to achieve certain campaign or operational objectives. In determining who will act as the air component commander, the JFC typically considers the amount and type of air forces participating in the operation and the service leadership available to command them. Invariably, the JFACC is from the service with the preponderance of the air assets and the command and control (C2) means to direct them. The other component commanders typically support the JFACC in achieving specific JFC-assigned objectives.[10]

In addition to directing theater-wide counterair operations such as the suppression of enemy air defenses (SEAD), the JFACC will normally function as the supported commander for the JFC's theater interdiction and air interdiction (AI) efforts. A variety of these missions can occur in the ground commander's operating area.[11] The resulting overlap of battlespace and fires can potentially blur control, support, and coordinating authority relationships in the land AO.

In one approach to the problem, the JFLCC can place the FSCL at the maximum range of organic fire support systems, ensuring these fires always occur inside it. In this case, there is no requirement to coordinate with the air component.[12] Unfortunately, this option can place a significant and undue burden on airpower assets operating inside this "deep FSCL" in support of both commanders' assigned objectives. If the land component's long-range acquisition and attack assets are limited, a sanctuary for enemy forces exists.

Conversely, a FSCL that is established close to the friendly land forces in the AO would tend to maximize air component flexibility and the potential for successful airpower attacks. Uninhibited by extensive land component coordination requirements, the JFACC's forces could engage the enemy with impunity. However, coordination restrictions on land fires and maneuver beyond this FSCL might place an undue and unacceptable burden on land forces in the AO or, if

restrictions were not implemented, put air component forces in harm's way due to friendly land-based firepower. Both cases tend to inhibit overall joint effectiveness and limit potential success.

US Army high-tempo offensive maneuvers exacerbate the problem. Land forces are capable of and plan on movement at speeds that require fire support systems to detect and engage enemy forces much deeper in the AO. Corresponding FSCLs must be placed further forward and adjusted more often or, in the interest of simplicity, be initially established significantly deeper in the land AO.[13] Unfortunately, this option can and has caused problems. According to General Charles A. Horner, the JFACC in Desert Storm,

> I had trouble with the FSCL placement. For the first five weeks, the FSCL was the border with Saudi Arabia. At one point after the ground war started, the FSCL was [moved to a position] well north of the Tigris River, yet all the Iraqi army was on the interstate highway between Kuwait City and Basra approaching the river from the south, making the river an ideal FSCL….The Iraqi army was getting across the river, giving them a free ride since we [the air component forces] had to attack under close air support rules with no FACs [Forward Air Controllers] in the area.[14]

Apparently, coordination measures, including more appropriate FSCL use, could have denied Iraqi land forces an opportunity to avoid engagement during the Coalition's land offensive. Future land and air component commanders must understand and consider the factors that impact FSCM use and appropriate FSCL placement.

Hypothesis

Post-Desert Storm efforts have attempted to resolve problems with joint fire integration.[15] However, a recent US Army joint wargaming exercise presented evidence that coordination measures are still inappropriately used. FSCLs continue to be established at the maximum employment range of the JFLCC's organic fire and aviation systems, maximizing land force effectiveness but limiting overall joint support to the JFC.[16] Joint doctrine provides considerations regarding FSCL establishment but offers little definitive guidance on an optimal range beyond the FLOT.

The land and air commanders control a variety of forces operating in and around the area of operations—often designed to achieve distinct effects on the enemy. These forces provide diverse capabilities in terms of maneuver, protection, and firepower. In the context of this thesis, the term *preponderance of effects* is used in an effort to define and measure the sum of effects supplied by land and air forces on potential enemy targets, which ultimately contribute to the achievement of operational objectives. Ownership of the forces providing the preponderance of effects (POE) identifies the component providing the most significant firepower at a given depth in the AO. Determining POE ownership requires a calculated assessment of relative combat power at various locations and depths on the battlefield. Assuming POE can be measured and compared, the question becomes *"Should the preponderance of effects provided by the JFLCC and JFACC be a primary consideration in determining FSCL placement?"*

The ground force invariably provides the preponderance of effects close to the FLOT while the air component usually provides preponderance deep in the AO. This is not always the case with each situation being unique. The ground commander might provide a preponderance of effects throughout a small AO. Joint and functional commanders and their staff officers can discuss the objectives and planned operations to determine which forces will attack where. Concurrently, the location of a preponderance-of-effects based FSCL (henceforth called "POE-based FSCL") can be approximated. Such a FSCL would be established in the AO at the depth where ownership of the predominant firepower engaging the enemy shifts from the ground commander to the air commander. As such, the commander in control of the most significant force at any depth could be charged with coordinating the operations of other forces intending to operate there. Is this practical and appropriate in the effort to maximize the effectiveness of joint combat operations? This thesis assesses whether or not the depth at which the POE transfers should determine FSCL placement.

Subordinate Questions and Analysis

To address the primary question, several subordinate questions must be answered: *"What **fires** are available to the JFLCC and JFACC and what are their intended effects?"* An analysis of the attack assets fielded for a given scenario provides insight into an effects-based preponderance comparison.

*"Whom do these fires **support** and where?"* Planners must grasp the command structure and operational objectives established by the JFC. Control of assets and supported/supporting relationships impact the effectiveness of operations and associated coordination measures. In particular, the ground commander's objectives and the size of his AO will affect where and how supporting forces operate and which FSCMs are appropriate. Command relationships are a critical consideration.

*"What degree of **coordination** is required and what coordination means are available?"* Guidance from joint doctrine provides the JFC leeway for interpretation and use. When employing FSCMs, doctrine calls for component commanders either to "consult with," "coordinate," or merely "inform" affected commanders regarding various aspects of integration. There is also the caveat that the inability to coordinate will not typically preclude attacks in exceptional circumstances. An understanding of the coordination resources and requirements is vital to appropriate FSCM use.

*"Upon comparing a POE-based FSCL with other potential FSCLs, which **measure**, in terms of depth, most suits joint employment?"* Of the variety of potential placements, we must determine whether or not a POE-based FSCL accurately reflects the other situation-specific factors and decide if it enhances joint operations.

An analysis of Operation Desert Storm, the US military's most recent major land combat, may shed some light on these issues. To calculate and assess the plausibility of a POE-based FSCL, the number and type of land and air component forces applying **fire** in the AO and their

employment locations must be reviewed. Historical records and after-action reports (AARs) provide the details as well as the existing command relationships, which determined who the various fires would **support**. Documentation of the criteria for **coordination** is also available for analysis and a review of this information allows for an overall evaluation of the hypothesis.

A review of current doctrine will determine if using a POE-based FSCL is legal, possible and practical today. A survey of this guidance will also ascertain if there are more appropriate ways to apply FSCMs, including or excluding linear measures.

Related Issues

Several other issues affect FSCL placement and must be considered in the context of an effects-based analysis. The component commander controlling the forces that provide the preponderance of effects in a region may not be the most capable of coordinating with the other forces employed in the region. For instance, the ground commander may be able to focus enormous combat power from ATACMS into a free-fire zone deep in the AO but possess little capability to orchestrate a near real-time re-targeting effort with his air counterpart. When assigning a functional commander, such as the JFACC, joint doctrine directs the JFC to consider a preponderance of forces and the ability to command and control them.[17] Coordination capability may not correspond to the preponderance of forces or effects, as in a free-fire-zone scenario. Furthermore, ownership of the preponderance of forces does not directly imply an ability to provide the preponderance of effects.

Who should determine FSCL location? As US military forces become more interdependent, the importance of joint fire integration measures increases. If the ground commander is designated the "supported" commander for all fires inside the AO, he should retain responsibility for placement. The JFLCC should not delegate this authority to subordinate tactical commanders, as it can result in coordination problems with the air commander, including

ragged coordination boundaries between sectors of lower-echelon land forces. The component command structure makes FSCL placement an operational-level issue.

Although FSCL placement occurs in the ground commander's operating area, it impacts joint forces that support both land and air component operations and objectives. The JFLCC must work closely with his air counterpart to ensure the FSCL meets both their needs and coordination measures enhance a seamless joint operation. Shared perspectives are the result of interaction. The Joint Force Commander must ultimately determine placement when any component commander expresses sufficient concern that a location is unduly biased to the land force.

The increased positional awareness of the air and land forces and the increased use of digitization makes coordinate and grid-line related FSCLs possible and, in many cases, practical. If used at all, should the FSCL follow "well-defined terrain features" on the modern battlefield, as the doctrinal definition asserts? In the next war, the airspace coordination order (ACO) may simply contain a statement directing pilots to use certain procedures when attacking within a given distance of friendly ground positions, which are readily available and known by the pilot. The utility of the FSCL as a predominate coordination measure comes into question.

Thesis Assumptions and Limitations

This work assumes that US military operations follow the current doctrinal guidance provided in the Joint Publications (JPs). FSCL location is situation-specific and ultimately dependent on factors such as mission, enemy, terrain and weather, troops and time available (METT-T).[18] A POE-based FSCL should reflect these environmental factors. Correspondingly, the preponderance of effects is assessed as a primary consideration after objectives are assigned, operations planned, and targeting decisions made. It should reflect the other factors outlined in the JPs.[19]

This study emphasizes FSCM use in major wars. Discussion is limited to US Army and US Air Forces with application towards the US Central Command (CENTCOM) and Combined

Forces Command-Korea (CFC-Korea) Areas of Operational Responsibility (AORs). Other service and coalition forces or systems such as the Tomahawk Land Attack Missile (TLAM) are not considered. The conclusions of this study may not apply to operations in other AORs or to smaller scale contingencies with unique missions and objectives.

The analysis is intended for use in FSCL determination at the operational level, based on available resources in a given scenario. It does not attempt to influence force acquisition programs or address future force structure needs. The argument is further limited to fielded forces providing long-range, lethal weapons effects. These are predominantly aircraft, aviation, field artillery, and rocket or missile systems. Other nonlethal systems that operate in and around the AO, such as surveillance and reconnaissance platforms, are critical to the success of operations and factor into the potential for fratricide.

The targeting process is not directly addressed. It could be argued that the FSCL has been used by the ground commander to gain greater control of air forces and make fire support more responsive to land component needs.[20] Discussion of this view is beyond the scope of this paper, but the importance of an effective joint targeting process needs to be acknowledged.

This study does not attempt to resolve the issue of how to quantify a "preponderance of effects" or exactly where POE changeover occurs or transfers between components. The limited scope of this paper assumes that potential problems in comparing diverse air and land force systems and effects are manageable. The current emphasis on joint employment drives a need to compare a variety of air and land systems and capabilities.

Summary

FSCMs significantly affect the US military's ability to attain campaign and operation objectives, and the FSCL is a measure of particular importance to both land and air forces. This study evaluates the plausibility of a POE-based FSCL. Chapter Two reviews coordination measures as they were applied in Operation Desert Storm. Chapter Three presents the pertinent

doctrinal literature produced in the aftermath of the war. Chapter Four merges this information to present a contemporary FSCM construct and conclusions. It also proposes recommendations for change and areas for further study.

Notes

[1] US Department of Defense, *Joint Vision 2010* (Washington, DC: Office of the Joint Chiefs of Staff, 1996), Inside Cover: Chairman's Message.

[2] US Department of Defense, Joint Chiefs of Staff Pub 3-09, *Doctrine for Joint Fire Support* (Washington, DC: Office of Joint Chiefs of Staff, 1998), 167. This definition was incorporated into the 10 February 1999 amendment to Joint Pub 1-02, *DOD Dictionary of Military and Associated Terms*.

[3] For instance, see Michael R. Gordon and Bernard E. Trainor, Lieutenant General (Retired), USMC, *The General's War: The Inside Story of the Conflict in the Gulf* (Boston: Little, Brown and Company, 1995), 199 through F2. They contend that poor FSCL placement directly contributed to the escape of Republican Guards forces along the Basra highway during the land offensive. These forces were specifically targeted for destruction.

[4] US Department of Defense, Joint Chiefs of Staff Pub 3-56.1, *Command and Control of Joint Air Operations* (Washington, DC: Office of Joint Chiefs of Staff, 1995), II-3.

[5] JP 3-09, III-1.

[6] JP 3-0, III-34.

[7] Patrecia S. Hollis, "Making the Most of Airpower," *Field Artillery Journal* (September-October 1996): 4. Effective range is for Block 1A ATACMS.

[8] US Army, Field Manual 100-5, *Operations*, Final Draft, (Washington, DC: Department of the Army, 5 August 1997), 6-1 through 6-3.

[9] JP 3-0, III-34.

[10] US Department of Defense, Joint Chiefs of Staff Publication 3-03, *Doctrine for Joint Interdiction Operations* (Washington, DC: Office of the Joint Chiefs of Staff, 1997), II-7 to II-8.

[11] JP 3-56.1, II-3.

[12] JP 3-0, III-34.

[13] Ibid.

[14] Charles A. Horner, General, USAF (Retired), electronic mail correspondence with the author, Shalimar, FL, 11 February 1999. CENTCOM's challenges were compounded by an employment concept that used the FSCL to delineate close air support, normally reserved for air operations in close proximity to friendly land forces, and air interdiction. Such use is addressed in current FSCL definition and is no longer approved.

[15] Dennis J. Reimer, General, USA, and Ronald R. Fogleman, General, USAF, "Joint Warfare and the Army-Air Force Team," *Joint Force Quarterly*, Spring 1996, 10.

[16] Horner, e-mail correspondence regarding a Fall 98 Wargaming Exercise in Europe where the FSCL was typically established 100 to 150 kilometers beyond the FLOT.

Notes

[17] JP 3-56.1, II-2.
[18] JP 3-0, III-34.
[19] Ibid.
[20] Horner interview.

Chapter 2

FSCM Use In Operation Desert Storm

> *Everyone must use and understand common terms—maneuver commander, and fire supporter, Army and Air Force, and our allies. The most important and misunderstood term in this war [Operation Desert Storm] seemed to be the FSCL.*[21]
>
> —24 Mechanized Infantry Division AAR

Military operations and FSCM applications in the 1991 Gulf War are fairly well documented.[22] This chapter reviews the fires available to coalition commanders, the designated support relationships, the coordination requirements and the measures used to coordinate fire support. For simplicity in developing trends regarding FSCL locations, combat operations are divided into three distinct periods, characterized by the general type of Coalition land action. They are Period One (17 Jan to 23 Feb), the air campaign with Coalition land forces in defense; Period Two (24 to 26 Feb), the Coalition land offensive with the enemy in defense; and Period Three (27 to 28 Feb), Coalition operations with the enemy withdrawing.

General H. Norman Schwarzkopf, Commander-in-Chief (CINC), USCENTCOM, was the Joint Force Commander during Operation Desert Storm. His stated objectives for the operation were:

-Attack Iraqi political-military leadership and command control.

-Gain and maintain air superiority.

-Sever Iraqi supply lines.

-Destroy known chemical, biological and nuclear production, storage and delivery capabilities.

-Destroy Republican Guards forces in the KTO [Kuwaiti Theater of Operations].

-Liberate Kuwait City.[23]

CENTCOM planners developed a four-phase course of action suited to the situation and objectives with significant emphasis on airpower.[24] The Coalition massed an extremely capable joint force to ensure success.

Fires

In 1991, the US armed forces possessed a variety of lethal and nonlethal weapons systems and readied many of them for use in the Gulf War. Some would make their combat debut. Combined with the assets of other countries and services, the US Army and Air Force attack platforms would provide diverse capabilities to their land and air component commanders.

Land Component Assets

The US Army was in an enviable position during the build-up of forces for combat operations. An end to the Cold War freed numerous combat systems for duty in the Gulf. Relative to previous conflicts, the effective range of systems designed for close fighting was significantly greater. Among a variety of other systems, the M1 tank 120-millimeter guns and the tube-launched, optically tracked wire-guided heavy antitank missiles (TOW) systems provided lethal fire to a range of 4 kilometers (km).[25] When employed, these and other direct-fire land systems invariably provided the ground commander with a preponderance of effects to this range beyond the FLOT.

The US Army deep attack assets fielded for combat are more pertinent to analysis. Mortars, in sizes up to 120 mm, were used to support the close fight with an 8 km maximum range. These indirect-fire weapons had limited accuracy and lethality, and were most effective against lightly protected personnel.[26]

The most readily available deep-fire asset was the field artillery cannon, with a multitude of 105mm and 155mm howitzers drawn on to provide organic fire support to the land force. Their

maximum ranges varied from 11 to 24 km, and could be further extended on a limited basis to 30 km using rocket-assisted projectiles (RAP). They provided accurate, massed and sustained fire support within these ranges and the self-propelled versions were particularly suited to movement and firing from positions near the FLOT.[27]

The multiple launch rocket system (MLRS) was developed with a maximum effective range of 30 km.[28] Designed for counterfire missions and suppression of enemy air defenses (SEAD), its limited availability and logistical constraints reduced the potential for its use throughout the battlefield.[29] However, a high rate of fire combined with the potential to mass available assets, increasing lethality. The system was capable of providing overwhelming effects at desired times and places on the battlefield.

ATACMS extended the lethal range of land component fire support to more than 165 km (with certain firing modes and associated ranges being classified).[30] The system, employed in combat for the first time in Desert Storm, was optimized for attacks on soft and semi-fixed targets. ATACMS was generally reserved for high-value targets such as tactical surface-to-surface missiles, air defenses and C3 systems.[31] It was available in very limited numbers—a trend that will continue into the future. ATACMS projectiles transit extensive airspace with limited means for deconfliction (i.e. unlike aircraft, airspace users must clear the way for it). This adverse characteristic is offset by its ability to provide the ground commander with a means to achieve effects deep in his AO on very short notice.

Land component aviation operations in the Gulf War were markedly different from those of previous conflicts. Attack helicopters often conducted cross-FLOT maneuvers, directly attacking enemy defenses in depth. Depending on configuration and mission, airframes such as the AH-64A Apache could potentially attack 200 km behind enemy lines. At more reasonable depths, these airframes gave presence in the form of station time and direct, sustained attack, which like Air Force attack systems, allowed shooters to selectively target enemy assets. This ability to discriminate is particularly important when the desired effect is target destruction.

Air Component Assets

A variety of aircraft flying in the joint operations area were available to furnish effects in the form of lethal fire into the land AO. A-10, AC-130, F-4G, F-15E, F-16, F-111, F-117 and B-52 airplanes were tasked and equipped with an assortment of direct and indirect attack weapons. They predominately employed bombs, aimed visually and containing high explosive charges or submunitions (cluster bomb unit bomblets). A variety of laser-guided bombs and other precision munitions, such as the Maverick missile, were also utilized.

A detailed analysis of the weapons and tactics, to include their potential effects is beyond the scope of analysis. In general, air forces were sufficient to mass over the land area of operations at ranges beyond ground-based direct-fire weapons, providing preponderance of effects at various times. It was at the discretion of the CINC and his component commanders as to when and where this massing would occur. Missions in the land AO included CAS, AI, and offensive counterair, specifically SEAD.

Preliminary Comparison

Once land attacks were initiated, the component providing the preponderance of effects inside the range of organic tube artillery was rarely in question. The ground commander supplied the majority of effects to this depth from G-day forward. In light of the limited number of ATACMS, the JFACC provided the POE beyond the maximum range of MLRS and aviation operations. Further analysis, presented in the “Measures” section, reviews the situation-specific operations to determine POE ownership between these extreme ranges.

Support Relationships

The CINC designated the JFACC as supported for the first four objectives articulated in the Desert Storm operations plan. These objectives basically aimed at achieving strategic-level effects through the direct attack and interdiction of the Iraqi deployed land force and other key targets. Upon commencement of offensive land operations, the land component was supported in

the effort to achieve the final two objectives, which would restore the international border and specifically target the Republican Guards for destruction. The VII Corps was identified as the main effort to achieve these aims.[32] There were several unique command relationships established.

In lieu of appointing a JFLCC, General Schwarzkopf, as the overall Joint Force Commander, retained direct authority over the land forces. This decision seems somewhat appropriate when considering the scale of operations and the political sensitivities involved with the large multi-service and Coalition land force.[33] On the other hand, it produced challenges in target selection, coordination and communication between the corps commanders and the JFACC.

The command arrangement also had to some negative side-affects regarding coordination measures. Doctrinally, General Schwarzkopf, as the JFLCC, was the "appropriate land or amphibious commander" directly in charge of FSCL placement. However, he effectively subordinated this task to the corps commanders during the land offensive.[34] During this time, the CINC directed his efforts toward JFC duties at the theater level, such as minimizing the impact of Iraq's scud missile operations in the JOA. To some extent, this JFC/JFLCC arrangement effectively by-passed the leadership and staff of Lieutenant General John Yeosock, commander of the US Army Forces Central Command (ARCENT), an otherwise reasonable candidate for ground commander duties.[35]

The AO structure tended to facilitate air employment, sometimes to the perceived detriment of land force operations. First, there was no forward boundary designated. Instead, the JFC used the FSCL to delineate command authority and support between the air and land component commanders. The ground commander was supported short of the FSCL, and the JFACC was supported beyond it.[36]

Operations Desert Storm did not utilize the NATO concept of allocating Battlefield Air Interdiction (BAI) missions to the ground commander. Used previously by VII Corps and other units in the central European region, BAI missions were distributed to support the land

component with a near-term impact on the land close battle but without the "detailed integration due to close proximity" CAS requirement.[37] These missions could have been flown on either side of the FSCL, with the JFLCC having more say in their attack guidance.[38] Instead, a Joint Targeting Coordination Board (JTCB), eventually under the direction of the deputy JFC, Lieutenant General Calvin Waller, USA, determined the interdiction targeting plan and priorities. The need to employ fires on targets with near-term effects on the ground operation was addressed in the context of the overall targeting plan with joint emphasis on unity of effort.[39] Figure 2 shows the Desert Storm land AO construct in the joint operations area.

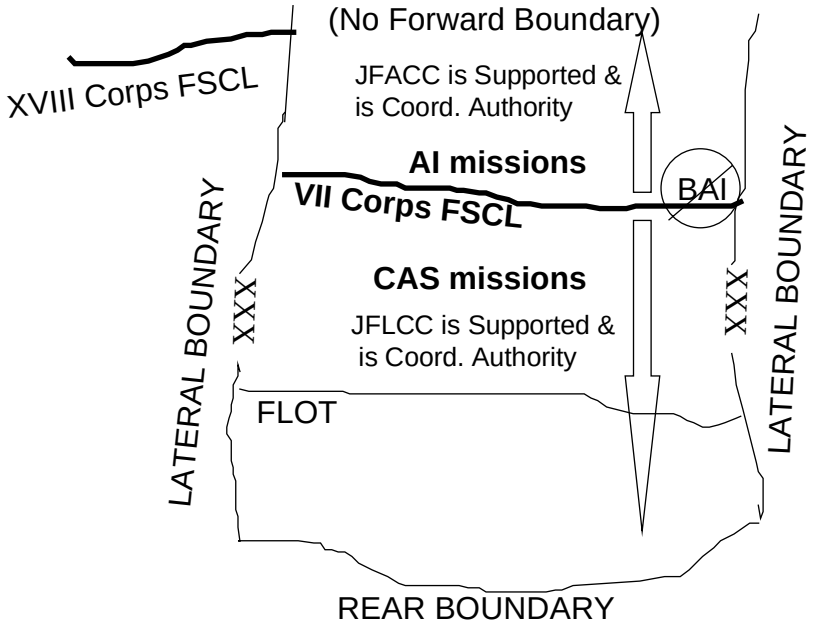


Figure 2. Example of CENTCOM JOA/JFLCC AO Construct

Coordination Requirements

Within this construct, the supported commander was also designated the coordinating authority. Land component fires long of the FSCL required JFACC coordination "100% of the time."[40] This was the first major war with the FSCL effectively applied as a "restrictive" coordination measure to land component fires. Coordination was defined as "informing and/or

consulting with" the JFACC.[41] The VII Corps staff perceived and implemented an even more restrictive application. According to Colonel Stanley F. Cherrie (now Brigadier General, Retired), VII Corps G-3, "Beyond the FSCL was Air Force, and no fires could be delivered in that area without *clearance* [emphasis mine] by the Air Component."[42] The integration of land-based firepower in the JOA effectively hit a wall at the line intended to coordinate fires.

By standard doctrinal convention, air component missions applying firepower short of the FSCL required coordination with the land component. CENTCOM directed that the FSCL also be used as the routine means to delineate close air support (CAS) missions, as those flown short of the line, and air interdiction (AI) missions, as those flown long of the it.[43] The basis for this decision was that CAS missions supported the JFLCC effort and required "detailed integration" and "close proximity" land-force coordination, whereas AI missions supported the JFACC and required air force integration to the theater interdiction effort.[44]

The absence of a dedicated ground commander led to problems in FSCL coordination. Tactical FSCLs with jagged edges along the corps' lateral boundaries often resulted as the four corps commanders attempted to establish and coordinate lines in their individual zones of operation.[45] To make matters worse, these commanders were often required to make FSCL changes directly with the small Army Battlefield Coordination Element (BCE) at the air component headquarters in Riyadh.[46] There was no standardized timing or tempo for calling in line changes. In the absence of a coherent operational-level coordination line, it is useful to analyze FSCL placement in the VII Corps AO. Throughout Operation Desert Storm, issues in the realm of command, control and communications had a significant impact on where the FSCL would be placed and how it would be used.

Measures to Coordinate Fire Support

It is important to note the position of the FSCL relative to the forward line of troops for the three distinct periods. Placement can later be compared to the depth at which a changeover in

ownership of the preponderance of effects occurred. Battles that typified operations for each period are presented in greater detail: Khafji, 73 Easting and the "Highway of Death" attacks.

Period One-Khafji

The first thirty-eight days of Desert Storm primarily focused on achieving the objectives assigned to the air component. From 17 January to 23 February, air forces were also tasked to destroy the Republican Guards in order to decrease their strength by approximately fifty percent in preparation for the land offensive.[47] During this period, VII Corps forces deployed and prepared for the forthcoming land offensive while defending the Saudi border.

The JFACC employed forces to provide the preponderance of effects throughout the JOA. Air component combat aircraft from the USAF flew thousands of counterair, strategic attack, and counterland/air interdiction missions. During the Battle of Khafji, JFACC forces also provided close air support to the land component. Ground forces had limited participation in this period with AH-64 Apache and field artillery (FA) forces conducting occasional raids and feints in support of the air component and in preparation for the land offensive.[48] US Army forces also launched thirty-two Army tactical missiles in support of both JFACC and JFLCC objectives, but in the enormity of the ongoing air operations, they went "largely unnoticed."[49]

During Period One, the FSCL was established at the berm along the northern Saudi Arabian border.[50] Land force involvement in the delivery of effects through offensive operations was limited. The location of the line corresponded to an air component ownership of the preponderance of effects throughout enemy territory. When land forces did participate, temporary adjustments to the measure were preplanned and coordinated. While providing short-notice indirect fire beyond the berm, FSCL changes were instituted directly with the air component C2 elements. This usually entailed land component firepower being annotated, scheduled, or flowed into the JFACC's air tasking mechanism.[51]

Based on post-Desert Storm AARs, FSCL placement and use did not appear to hinder joint operations.[52] The limited raids and artillery action were effectively integrated with the air forces, which carried the weight of the Coalition offensive operations. In addition to several firings by the newly fielded ATACMS, land component operations included the highly successful AH-64 raid in support of the JFACC objective to destroy Iraqi C2 capabilities.[53] ARCENT ATACMS units did report some lost opportunities to engage time-critical high payoff targets (HPTs), with coordination times often taking between thirty minutes and two hours.[54]

The only significant land combat to occur in Period One was during the Battle of Khafji. This battle allows for the analysis of FSCL placement in a defensive operation.

On the night of 29 January, three divisions from the Iraqi III Corps launched toward the town of Al Khafji near the Saudi border.[55] The Iraqi objectives were to seize the initiative, cause Coalition casualties, and start the ground war prematurely.[56] The Coalition would defend Saudi Arabia by denying and containing any enemy penetration. Although US Army participation in the battle was limited, US Marines under the control of the ground commander fought in the battle, and their control parties directed JFACC firepower. USAF forces under JFACC control, including A-10, F-16 and AC-130 gunship aircraft, flew 267 AI and CAS sorties. These sorties accounted for approximately 300 enemy vehicles destroyed, including 90 Iraqi tanks and armored personnel carriers (APCs).[57]

According to one postwar independent analysis, the battle showed that "airpower can provide the heavy punch needed to stop enemy armored thrusts dead in their tracks."[58] More significant to an analysis of the preponderance of effects, the sorties flown during this battle accounted for only seventeen percent of the JFACC's 1568 AI missions applying firepower throughout Kuwait.[59] Airpower employed on a massive scale could achieve dominant effects. Unfortunately, reports detail several incidents of fratricide, including two during air force attacks, although FSCL placement was not pertinent to these incidents.[60] The Marines, with limited land-based deep attack assets, maximized the use of CAS and were heavily supported by AI.

The Battle of Khafji provides evidence that when ground forces are in a defensive posture with limited firepower available, the FSCL should be placed as close as practical to friendly positions. Coincidentally, airpower provides the preponderance of effects beyond "close proximity." At Khafji, commanders used the FSCL to effectively integrate air and land firepower.

As the ground offensive approached, the VII Corps commander expressed concern that insufficient air interdiction efforts were focused on the enemy artillery in range of the border crossing points.[61] ARCENT leadership wanted airpower to reduce the enemy artillery capable of reaching the breach areas by ninety percent![62] Perceptions held that the targeting priorities did not sufficiently support the impending land offensive. Judging from his troop guidance message, General Franks was particularly displeased with the conduct of the "centrally orchestrated" air campaign at echelons above corps. From his vantage, they ignored the impending tactical operations.[63] On 26 January, General Schwarzkopf, confident that a successful breach would occur, rejected this view.[64] Other targeting concerns beyond the scope of this analysis were addressed without an impact on FSCL location, and air component efforts continued to shift towards facilitating an effective land penetration.[65]

Period Two-73 Easting

Period Two analysis begins with Coalition land forces commencing sustained offensive maneuvers. Due to the extreme rate of advance in the 100-hour ground operation, research of this period focuses on FSCL use in operations against Iraqi units considered capable of mounting a credible defense. Based on objectives assigned by the JFC, Lieutenant General Frederick M. Franks, Jr., Commander, VII Combined Corps, tasked his unit with the following mission statement:

> On order, VII Combined Corps attacks to envelop and penetrate Iraqi defenses and destroy the Republican Guards forces in zone; be prepared to defend northern Kuwait border to prevent re-seizing Kuwait.[66]

The Corps objectives were to close with these units and destroy them as well as cut-off their retreat into Iraq.[67] This would restore the border and largely remove Iraq's future offensive capability. Accordingly, the first days of the land offensive focused on breaching the enemy lines, penetrating the forward Iraqi forces, and conducting movement to make contact with the Republican Guards Divisions. Within the KTO, the air component predominantly played a supporting role, supplying CAS sorties and focusing air interdiction missions on the enemy ground units adjacent to the advance. The VII Corps zone contained the most prepared and well-defended Iraqi positions, especially in the vicinity of Republican Guards.

In addition to the large number of armored vehicles that clearly provided the preponderance of effects to close operations within several kilometers of the FLOT, the JFLCC focused deep-fight forces in the VII Corps zone, the land force's main effort. Resources included attack helicopters from an aviation brigade and FA forces from five artillery brigades, with numerous artillery cannons and ten MLRS batteries.[68] A limited number of ARCENT ATACMS were available to support corps operations. USAF aircraft operating in the VII Corps zone consisted of A-10, F-16, F-111, and B-52 aircraft flying AI and CAS missions.[69]

For Period Two, the land component generally supplied the preponderance of effects in the VII Corps zone to the maximum employment range of MLRS, about 15 to 25 km beyond the FLOT. In addition to the vast field artillery fire support at and inside this range, attack helicopter operations under the control of the JFLCC's subordinate commanders supplied this preponderance.[70] The air component's ASOC elements aligned with the Corps ensured close air support could be readily coordinated in support of operations in this zone. Beyond the range of MLRS, AI assets heavily outnumbered the limited ATACMS available to support Corps operations and achieve effects associated with the assigned objectives. Company-sized elements of attack helicopters occasionally operated beyond this "preponderance" range, striking 50 to 60 km beyond the FLOT at one point.[71] However, the majority of this land component firepower was concentrated within 25 km of the leading land combat elements.

During the initial land offensive, the Corps typically placed the FSCL just beyond the maximum range of organic artillery assets, approximately 25 to 35 km beyond the forward line of troops.[72] The Corps adjusted the line every 12 hours, on average, and established it deep enough to facilitate the next twelve-hour window's advancing land maneuver.[73] The VII Corps staff developed and employed a series of "on order" FSCLs (preplanned and pre-coordinated with the other forces) corresponding to Corps phase lines, which ensured the line could be moved before it inhibited land-force maneuver or organic fire support.[74]

Based on AARs, this FSCL placement tended to enhance joint operations and mission success. The rapid advance resulted in an accordion effect, where a new line's location would be initially be deeper than optimal and, as land forces advanced, become closer than optimal. But according to one review, "expeditious attack of HPTs [by AI] beyond the FSCL continued to have a major impact on the ability and desire of Iraqi forces to come out of their holes."[75] Other participants reported that this FSCL effectively balanced the land force maneuver space requirements with conditions facilitating AI mission success.[76] FA cannons were never restrained by the measure, and the firing of MLRS was only occasionally inhibited.

In Period Two, the close-combat skills of the US Army were tested in action such as the fabled "Battle of 73 Easting." Demonstrating success in the extreme, the 2d Armored Cavalry Regiment of VII Corps attacked elements of the Republican Guards' elite Tawakalna Division. The defending Iraqi commander later remarked that after he had lost only two of thirty-nine T-72 tanks in the five-week air assault, the 2d Cavalry had "annihilated his entire command in fewer than six minutes."[77] Among other factors, the better US equipment and training proved to pay-off consistently in the conflict's close operations.

Success in the close fight is usually prepared by and dependent on a successful deep fight. "Shaping of the battlefield" was under the joint direction of the land and air component commanders. Unfortunately, the AARs note several times when ATACMS missions were inhibited by delays in coordinating attacks on targets long of the FSCL. As a typical example,

one brigade fire support officer reported, "Firing beyond the FSCL was painful/difficult to get permission."[78] The statement does not indicate whether or not JFACC assets serviced these intended targets, but does imply that the land component ATACMS might have achieved the desired effects had they not been delayed.

Time delays in the JFACC's air tasking order (ATO) planning cycle exacerbated perceptions that the FSCL was effectively a fire support "wall" to long-range land component fires. Highly mobile land operations made target planning projections difficult forty-eight hours prior to execution, when the JFACC's staff would begin their planning and tasking process. Although fires beyond the line could be flowed into the current and implemented ATO, the volume of operations and the C2 mechanisms of the era required time, often in excess of thirty minutes. Ground forces attempting to employ JFLCC deep assets against fleeting mobile targets considered this unacceptable.[79] However, Coalition forces in this situation were not normally in direct peril from these deep HPTs, as might hypothetically be the case in targeting a scud loaded with a chemical warhead and aimed at a major command post. The targets did not represent an immediate threat, and shooters did not invoke the doctrinal provision declaring that "in exceptional circumstances, the inability to coordinate will not preclude firing."[80] With numerous Coalition forces operating in the areas above and beyond the FSCL and deep AO, proper firing discipline on the part of these operators contributed to the absence of surface-to-air fratricide incidents.

In Period Two, there were also increasing beyond-the-FSCL targeting issues in which the VII Corps commander perceived too little say in the deep fight and AI targeting plan.[81] General Franks had deployed from the European AOR and was used to a distribution of BAI. He did not feel the joint targeting board offered a satisfactory means to determine target priorities within the VII Corps zone.[82] However, an analysis of AARs relates different perspectives. One report stated "continued air attacks of targets over the FSCL were directed…reducing a unit forming to attack the VII Corps by 80 percent before it could get into action."[83]

From the perspective of the JFACC, coordination and movement of the FSCL started to become an issue in Period Two. As all four corps began to transition to the offense, the FSCL moved with little consistency in timing or distance. The fluid nature of the tactical land battle and the limited ground commander (JFC) oversight in FSCL matters contributed to this dilemma.[84] There was a distinct tradeoff between a close line moving often and a deep one moving infrequently. In light of the command and control mechanisms utilized at the time, the requirement for moving the FSCL at twelve-hour intervals and placing it at an average depth of the organic fire support for that time period appears reasonable.

Regardless of the source, deep firepower in Period Two enabled ground forces to close with and destroy any enemy units that the VII Corps encountered in zone.[85] The Iraqi forces soon realized a retreat out of Kuwait was their only reasonable option.

Period Three-The Highway of Death

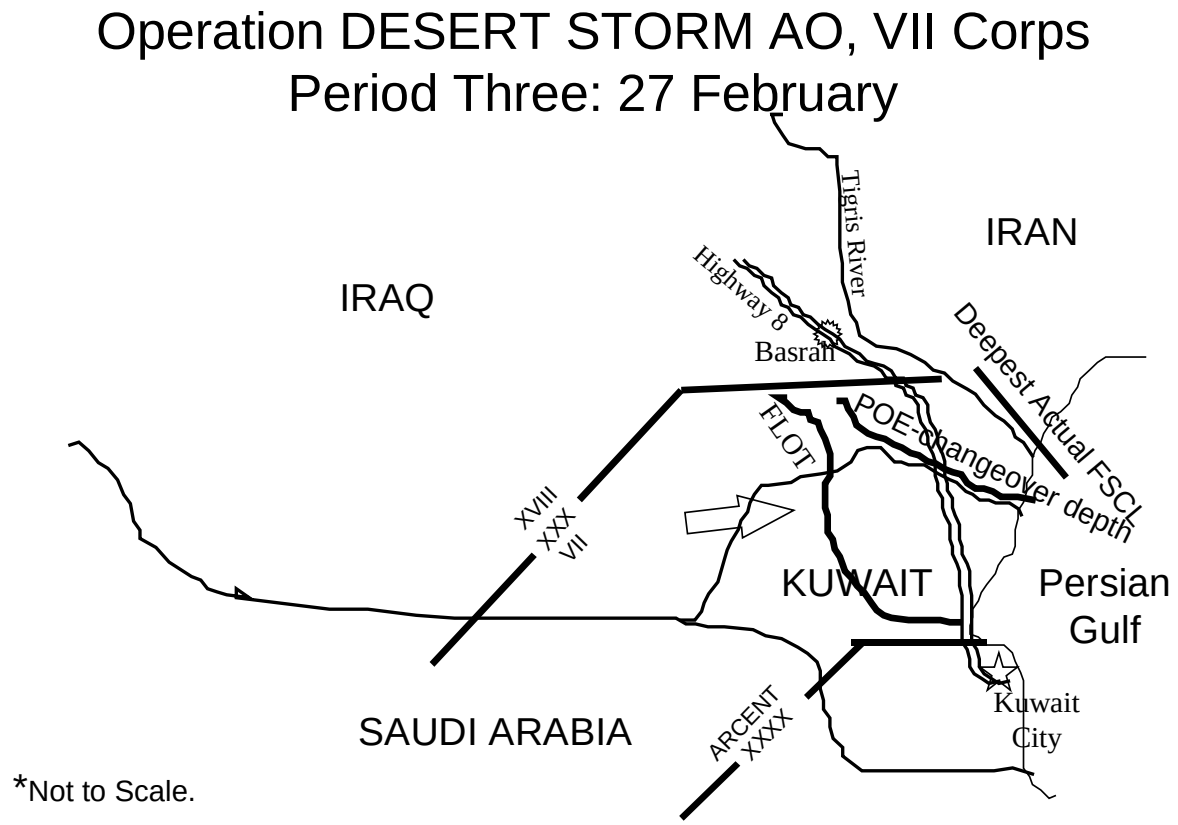
In the final days of the Desert Storm, land offensive maneuvers fully focused on the destruction and defeat of the Republican Guards.[86] Period Three analysis begins when the Iraqi forces began to withdraw in earnest and General Schwarzkopf ordered the VII Corps to "shut the back door at all costs."[87] In this timeframe, adverse weather became a significant problem and the CINC could not count on airpower to put the "cork in the KTO bottle."[88] The Coalition fought during the region's worst weather in fourteen years and, complicating matters, massive oil well fires severely adverse prevailing winds restricted visibility within Kuwait.[89] As the VII Corps' forces made contact with the enemy, their reaction would determine the means of destruction. Against those attempting to withdraw, "massive CAS and AI, AH-64 cross-FLOT operations and artillery fires" would be key.[90]

Even though a large portion of enemy was retreating during this period, VII Corps armored forces continued to see some significant resistance in close operations. Their forward advance shifted from north to eastward as units began to flank Iraqi forces occupying central Kuwait. For

the deep fight, VII Corps extensively employed MLRS and elements of the aviation brigade, which attacked deep into the KTO on 26 and 27 February.[91] USAF A-10, F-15E, F-16 and F-111 aircraft flew CAS and AI in the VII Corps zone. However, the poor weather limited medium altitude operations throughout the region and the low visibility caused by the burning oil wells within Kuwait degraded airpower effectiveness, even at low-level. The impact on CAS, which required visual identification of friendly forces in close proximity to the targets, was significant.[92] Air interdiction effectiveness within Kuwait was also degraded, as most of the weapons and targeting systems employed at the time did not have a poor-weather, precision-delivery capability.

In light of these factors, the depth at which either component supplied the preponderance of effects would vary across the VII Corps zone, whose eastbound advance straddled the Iraq-Kuwait border. This border would generally delineate levels of air and land component effectiveness. North of the border, the JFACC generally provided the preponderance of effects beyond the range of artillery systems organic to the corps, approximately 15 km past the northern FLOT. South of the border where the visibility was poor but with less enemy resistance, the JFLCC generally provided the preponderance of effects out to the coast, especially during several multi-battalion deep aviation operations, beginning on the night of 26 February.[93] Figure 3 shows a diagram conveying the preponderance of effects changeover depth in the VII Corps zone.

On 26 February, land component forces attempted to extend the depth of attack helicopter operations and FA fires, including ATACMS, to engage the withdrawing enemy. Frustration with a FSCL closer than this depth is evident in AARs. For example, one artillery officer stated, "In one instance, the battalion was passed 10 targets while moving and told to fire when within range. Closing into position, 1-27 FA [MLRS] reported ready to fire with eight of the ten targets in range and received instructions to stand by for airspace coordination. After waiting more than an hour, clearance was granted to fire on only two of the targets."[94]



Based on Figure 5-5 of *Certain Victory*[95]

Figure 3. Operation Desert Storm Ao, Vii Corps Period Three

The lack of an airpower presence in the Kuwaiti Theater, which was often diverted north due to the poor weather, and the success of aviation attacks fueled temptation to place the FSCL northeast of the Tigris/Euphrates River, beyond the forward limit of the land maneuver scheme.

Brigadier General Robert H. Scales, Director of the US Army Desert Storm Study Project provides in *Certain Victory* more detail regarding the night of 26 February:

> The Air Force attacked the area east of the 20 grid line with a series of single FB-111 strikes [or most likely strikes by formations of F-111F aircraft[96]], where each dropped four 2,000-pound laser-guided bombs approximately every 20 minutes…. If every bomb hit a vehicle, only 12 of several thousand would be knocked out each hour…. Just one battalion strike with 18 Apaches could kill more than 100 vehicles in half an hour. Unfortunately...ARCENT could not portray to CENTCOM how successful Franks' deep attack had been and how devastating a strike east of the 20 grid line would have been.[97]

Although some evidence relayed in *Certain Victory* appears inaccurate, General Scales' assertion is clear—in this scenario, air forces could not match ground forces in terms of combat power. The land component could provide greater effects. He further contends that the air forces' "rather porous gauntlet" along Highway 8 from Kuwait City to Basrah directly led to the escape of the Republican Guards.[98]

In the context of the thesis, these assertions bring into question where transfer of ownership of the preponderance of effects actually occurred, or should have occurred. Along Highway 8 within Kuwait, about 60 to 90 km beyond the FLOT on the 26th, attack helicopters should have been the dominant forces and, accordingly, supplied the preponderance of effects. A FSCL beyond this depth could have facilitated their successful employment, especially during the periods of their attacks. Of course, this might have been unnecessary with proper cross-FSCL coordination of the AH-64 operations, even when considering the limited C3 capabilities in service at the time.

Lieutenant Colonel Jim Green, an A-10 squadron commander, provided an air perspective of operations that occurred north of Kuwait, where the burning oil wells did not obscure air-to-surface visibility:

> [My formation weather-diverted north toward] Basrah, to the highway along the Euphrates River where a convoy of about two hundred vehicles--mostly tanks--were trying to escape. When we got there it was like a feeding frenzy with A-10s, F-16s and F/A-18s all trying to get in to destroy that convoy. I ended up orchestrating the affair since we were beyond the army and the ground FACs. The Iraqi guys jumped out of their vehicles and ran while the mix of planes in the area just systematically decimated that column.[99]

Neither perspective refutes the case for preponderance but merely asserts ownership of the preponderant force at a given location. These accounts clearly imply that ownership of the force providing the preponderance of effects is critical in the assigning of coordination measures—at issue is where this ownership occurs, be it at 5, 25, or 75 km beyond the FLOT. In any case, the FSCL "wall," as perceived in the VII Corps' zone, put significant limits on the employment of land component deep attack assets and inhibited their destruction of the enemy.

On 27 February, things got worse. VII Corps placed its FSCL well ahead of its forward line of troops across the zone of advance. This occurred throughout the ARCENT area of operations, in coordination with adjacent land forces to the northwest. There, the XVIII Airborne Corps wanted to establish a significantly deeper FSCL, but with a different mission, objectives, deep attack assets, and less enemy resistance.[100] The corps commanders took this action to enhance the ability to shape deep operations in zone, where the land component could not supply the preponderance of effects. By gaining the "close support" of all available CAS sorties, which were any sorties inside the FSCL by CENTCOM's construct, the VII Corps Commander apparently felt the deep attack targeting plan would be more receptive to the corps' inputs and needs. This placement also minimized coordination problems in the deep employment of the AH-64.

According to one report, "The Iraqi forces were well beyond the range of organic corps assets and it was impossible to get eyes on the target."[101] Coalition aircraft, "the most effective and capable system for this destruction," were forced to operate under CAS rules. The result was an escape of fifty to sixty percent of the Republican Guards divisions as joint firepower was inhibited rather than coordinated. [102]

Analysis accomplished by the Independent Research and Information Services (IRIS) Corporation tends to confirm this and accuses the VII Corps Commander of overly restricting air component operations. "By placing the FSCL north of the Euphrates River, neither organic land fires nor available air assets could be brought to bear."[103] This excessively deep FSCL created a sanctuary between the maximum range of the corps FA assets and the FSCL. AI sorties could not attack inside the line and air component elements aligned with the land force to control CAS sorties were not in position to direct employment.

The resulting safe haven allowed the Iraqi forces to withdraw into Iraq, unhindered by air or land fires.[104] A significant number of these waited for the cessation of hostilities within the city of Basrah and were not targeted due to concerns of collateral damage to civilians.[105] In all, one

mechanized and two armored Iraqi Republican Guards Divisions were able to flee through the area and successfully avoided Schwarzkopf's scheme of maneuver.[106]

The deep fight that offered significant means to delay and disrupt, as well as destroy the withdrawing enemy was unsuccessful. The land maneuver forces were never afforded the opportunity to close with the enemy and cause their total defeat.

In Period Three, FSCL placement occurred in the context of rapidly advancing ground forces and withdrawing enemy forces. Inhibitions to joint force employment contributed to the escape of the Republican Guards, and JFACC efforts to interdict these forces were constrained and largely unsuccessful due to misapplied coordination measures. Land component deep attack assets were limited by range and quantity, and close-fight forces were unable to make contact with and destroy the retreating enemy prior to the cease-fire. Iraq's future offensive capability, in the form of the Republican Guards forces, survived.

Although VII Corps did not complete the envelopment prior to the cease-fire, significant and lasting damage was inflicted on Iraq's elite fighting force. Focusing analysis strictly on FSCL placement oversimplifies the problems faced by Coalition forces. Other analyses have demonstrated that the ground commander's scheme of maneuver was not fully communicated, understood, or effectively implemented by several subordinate commanders (designed "to cut off" versus "to push out" the enemy). Additionally, the potential public outcry over the "Highway of Death" and a premature cease-fire decision and conditions probably facilitated the Republican Guards' escape.[107] This analysis, however, supports the widespread perception that shortcomings in FSCM applications were a detrimental factor.

Summary

The US military learned a myriad of lessons in the wake of Desert Storm. Many reviewing its successes heralded the occurrence of a revolution in military affairs. Battlelines were drawn during the postwar military cutbacks, with the services trying to justify those resources identified

in the Gulf War as essential to success. Doctrine needed modification to address the shortcomings of FSCMs, and, in some areas, it required major revisions.

Notes

[21] Dewayne P. Hall, Lieutenant Colonel, USA, "Integrating Joint Operations Beyond the FSCL" (Monograph/Maxwell Paper No. 12, Air War College, Maxwell Air Force Base, AL, 1997), 8.

[22] Material, which is continues to be declassified and available, can be found at sources such as: http://www.gulflink.osd.mil/declassdocs/.

[23] Department of Defense, Conduct of the Persian Gulf Conflict: An Interim Report to Congress (Washington, DC: Department of Defense, 1991), 2-3.

[24] Scales, *Certain Victory*, 106.

[25] US Army Command and General Staff College, Student Text 100-3, *Battle Book* (Fort Leavenworth, KS: US Army Command and General Staff College, 1997), 2-18 to 2-19.

[26] FM 6-20-10, B-12.

[27] FM 6-20-10, B-12.

[28] Future upgrades will extend this range.

[29] FM 6-20-10, B-12.

[30] Ibid.

[31] Ibid.

[32] Horner interview.

[33] Scales, 140-141.

[34] Ibid.

[35] Barbee, 47.

[36] Ibid., 48.

[37] Zook, 116.

[38] Horner interview.

[39] Barbee, 14.

[40] Ibid., 25.

[41] Zook, 114.

[42] Ibid., 4.

[43] Horner interview.

[44] Ibid.

[45] Ibid.

[46] The BCE has since been replaced by a Battlefield Coordination Detachment (BCD) to facilitate the timely and efficient integration of operations.

[47] Zook, 113.

[48] Scales, 200-204.

[49] Ibid., 369.

[50] Zook, 114.

[51] Ibid.

[52] Ibid., 116.

Notes

[53] Scales, 107.
[54] Zook, 117.
[55] Independent Research and Information Services (IRIS) Corporation, "Airpower and the Iraqi Offensive at Khafji," On-line. Internet, 11 March 1999, Available from http://www.irisresearch.com/khafji.htm.
[56] Ibid.
[57] Ibid.
[58] Ibid.
[59] Ibid.
[60] Keaney and Cohen, *Gulf War Air Power Survey Summary Report*, 20. They occurred inside the FSCL.
[61] Zook, 124.
[62] Scales, 178.
[63] "VII Corps Commander Guidance No. 12, 8 Feb 91," On-line. Internet, 18 March 1999, Available from http://www.gulflink.osd.mil/declassdocs/army/19970107/970107_jun96_decls13_002.html.
[64] Scales, 180.
[65] Zook, 125. For instance, the Joint Target Coordination Board guided air employment priorities.
[66] Ibid., 101.
[67] Ibid., 102-103.
[68] Scales, 226.
[69] Horner interview.
[70] Zook, 129-131.
[71] Scales, 243.
[72] Zook, 127-128.
[73] Ibid., 169.
[74] Ibid., 127.
[75] Ibid., 130-131.
[76] Ibid., 131.
[77] Scales, 262.
[78] Zook, 6.
[79] Barbee, 50.
[80] JP 3-0, III-34.
[81] Barbee, 13.
[82] Ibid., 50.
[83] Zook, 138.
[84] Horner interview.
[85] Scales, 244-245.
[86] Zook, 132.
[87] Scales, 252.
[88] Ibid.

Notes

[89] Keaney, 171.
[90] Ibid.
[91] Scales, 287-291.
[92] Keaney, 172.
[93] Ibid., 112.
[94] Mark S. Jensen, "MLRS in Desert Storm," *Field Artillery* (August 1991): 33.
[95] Scales, based on the diagram and details in *Certain Victory*, Figure 5-5.
[96] Luxion, Stephen, Major, USAF, personal interview with the author on 25 February 1999. He related that the obsolete FB-111, incapable of delivering precision weapons, did not participate in the Gulf War and F-111Fs tactics dictated they fly in formations of two, as a minimum. He was an F-111 weapons and tactics officer flying in Operation Desert Storm and participated in the Highway 8 attacks.
[97] Scales, 290.
[98] Ibid., 315.
[99] William L. Smallwood, *Warthog, Flying the A-10 in the Gulf War* (New York: Macmillan Publishing Company, 1993), 204.
[100] Rebecca Grant, Doctor, "The Origins of the Deep Attack Weapons Mix Study," IRIS, On-line. Internet, 17 Mar 1999, Available from http://www.irisresearch.com/dawms2.htm.
[101] Zook, 4.
[102] Ibid., 3-4.
[103] Grant.
[104] Ibid., 141.
[105] Keaney, 115.
[106] Grant.
[107] Keaney, 156.

Chapter 3

FSCM Guidance in the Post-Storm Era

> *We have a moral obligation to ensure military force is applied in the most effective and efficient manner in order to save lives, shorten the conflict period and achieve victory.*
>
> —*JFACC Primer, 1994.*[108]

The doctrine developed during the height of the Cold War to support a massive land battle in Central Europe was inappropriate for combat operations in Southwest Asia. Although the Coalition scored a stunning victory in Desert Storm, those charged with updating doctrine were quick to speak to deficiencies in matters such as the measures to coordinate fire support. The Joint Publications Library, the most extensive source of the doctrine used in joint operations, received particular emphasis.

Today, Joint Publications (JP) guidance is authoritative and must be followed unless exceptional circumstances dictate otherwise.[109] This guidance takes precedence over service doctrine, which tends to augment it while emphasizing unique service perspectives. Unified command materials discuss FSCMs in specific context, as in the CENTCOM AOR, and relate FSCL placement to operational theaters. Following a review of these codified sources of guidance, we will survey several pertinent theses and monographs to highlight contemporary FSCM issues.

Joint Publications

The JPs define the terminology and employment concepts that are mutually understood and agreed upon by the US armed forces. JP 0-2, *Unified Action Armed Forces (UNAAF)*, dated 24 February 1995, provides guidance in establishing command relationships, a particularly vital factor in the use of coordination measures. This JP details the JFC's authority to organize forces and assign responsibilities to subordinates in order to achieve unity of effort.[110] Typically, the JFLCC and JFACC are designated and assigned various types of control over forces. They are also tasked to achieve operational objectives.

To assist in the attainment of objectives, the JFC assigns support relationships. The functional component commanders pursuing operational objectives are *supported* by the other commanders. This unique form of authority, which is less than control, allows that commander to convey priorities and specify requirements for assistance.[111] Specifically, JP 0-2 states that a *supported* commander has "the authority to exercise general direction of supporting effort," including the designation and prioritization of targets and objectives, and providing instructions necessary for coordination and efficiency.[112] The *supporting* commander then "determines the forces, tactics, methods, procedures, and communication to be employed in providing this support."[113] Typically, most CAS and some AI missions, under the control of the JFACC, support the ground commander in achieving aims.

In addition to appointing subordinate commanders, assigning responsibilities and delegating command and support relationships, the JFC can establish "coordinating instructions" for the component commanders.[114] *Coordinating authority* is a "consultation relationship between commanders, but not an authority by which command can be exercised."[115] It is assigned "based on the mission and capabilities of the command or organizations involved."[116] This authority need not necessarily rest with the supported commander, and depending on capabilities, it may not be appropriate.

The support relationships are vital in determining who exercises the general direction of forces operating in the land AO. However, the JFC can specify certain activities of functional commanders that are partially or wholly exempt from the authority of an area commander.[117] This typically allows the JFACC to conduct theater-wide interdiction operations without regard to established surface AOs. "Such exemptions do not relieve the commanders of functional commands of the responsibility to coordinate with the affected area commanders."[118] Thus, JP 0-2 provides an appropriate command construct for the application of a preponderance of effects-based FSCL.

JP 3-0, *Doctrine for Joint Operations*, dated 1 February 1995, provides the fundamentals for planning joint operations and describes the roles of the JFC, JFACC, and JFLCC in greater detail. It reemphasizes the requirement for the JFC to establish supported and supporting relationships between components.[119] Coordination measures are discussed in Chapter III, including guidance on the FSCL. It states that this line is "permissive" and established or adjusted by the appropriate land or amphibious force commander inside the ground commander's forward boundary.[120] The publication provides general guidance as to where the FSCL should be placed, stating careful consideration must be placed on factors such as the location of enemy forces, the anticipated rates of movement, tempo of operations and weapons capabilities.[121] It relates that the measure is normally positioned closer to the FLOT in the defense than in the offense but that exact placement is situation-dependent.[122]

JP 3-0 additionally states, "By establishing an FSCL at sufficient depth so as to not limit high-tempo maneuver, land or amphibious force commanders ease the coordination requirements for attack operations within their AOs by forces not under their control, such as naval gunfire or air interdiction."[123] This direction clearly conveys that optimal placement must balance maneuver space and firepower limitations. It also implies that air interdiction fires within the land AO do not necessarily support the JFLCC.

Finally, JP 3-0 dictates that commanders employ restrictive measures to enhance the protection of friendly forces beyond the FSCL, apparently refining the degree of "permissiveness." The publication cautions that coordination is critical to avoiding conflicts and redundant attack operations beyond the line, but allows that "in exceptional circumstances, the inability to conduct this coordination will not preclude the attack of targets beyond the FSCL."[124]

As part of the doctrine revision process, JP 3-0 is currently being reviewed and updated by the J-7, Joint Staff. Changes are forthcoming, and rewritten doctrine corresponding to areas of operation and coordination measures will incorporate or supercede guidance provided in lower echelon publications such as JP 3-09. In all probability, land commanders will still use measures such as the FSCL to coordinate forces not under their control.[125] Assuming it takes into account situation-specific factors, a POE-based FSCL will conform to JP 3-0 guidance.

JP 3-03, *Doctrine for Joint Interdiction Operations*, dated 10 April 1997, provides the fundamental considerations and guidance for interdiction operations. Interdiction is defined as "an action to divert, disrupt, delay, or destroy the enemy's surface military potential before it can be used effectively against friendly forces."[126] Unlike close air support, air interdiction is a counterland function accomplished at such a distance from friendly forces that detailed integration of each air mission with the land force is not required.[127] The publication relates that "synchronizing interdiction and maneuver and their joint fires enhances the ability for each to more fully contribute to a successful outcome of a campaign or major operation."[128] Enforcing the need for the ground commander to fire deep into an area of operations, JP 3-03 states that supported commanders "usually attempt to strike interdiction targets with organic assets first."[129]

The publication reiterates JP 3-0 guidance regarding FSCL placement considerations. It also suggests the JFC assign Joint Operations Area (JOA)-wide interdiction operations to the "component commander with a preponderance of the interdiction assets with theater- and/or JOA-wide range and the ability to control them—in most cases, the JFACC."[130] Although this addresses assets and not effects, this guidance reinforces the notion that preponderance can be

determined and used in assigning objectives and responsibilities. Finally, JP 3-03 cautions that "Establishment of the FSCL too far forward of friendly forces can limit the responsiveness of air interdiction sorties."[131]

JP 3-09, *Doctrine for Joint Fire Support*, published 12 May 1998, is the most recent and applicable JP available for review. It establishes doctrine and procedures for planning, coordinating, and executing joint fire support, to include common FSCMs and allocation of fire support efforts. The publication's stated purpose is to ensure that all forces are coordinated in their efforts to meet operational objectives and support the joint force commander's plan.[132] However, the document is clearly oriented toward the support of land component operations.

The pub provides several pertinent definitions:

> Fires - The effects of lethal and non-lethal weapons.
>
> Joint fires - Fires produced during the employment of forces from two or more components in coordinated action toward a common objective.
>
> Fire Support. - Fires that directly support land, maritime, amphibious, and special operations forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives.
>
> Joint Fire Support - Joint fires that assist land, maritime, amphibious, and special operations forces to move, maneuver, and control to territory, populations, and key waters.[133]

Furthermore, JP 3-09 points out that joint fire support is a key factor to the success of joint operations.[134] It emphasizes the need for detailed airspace and ground coordination, regardless of the delivery asset used.[135]

JP 3-09 differentiates operational *fires* and *fire support*, as defined above, and emphasizes the role of fire support in achieving land component objectives.[136] It points out that "while some fires will support operational and tactical movement and maneuver by land, maritime, amphibious, and special operations forces, other fires are independent of maneuver and orient on achieving specific operational and strategic effects that support the JFC's objectives."[137] In lieu of other JFC guidance, the JFLCC is *supported* by all *fire support* in the land AO and has the

authority to designate priorities, effects and timing of attacks. However, other fires, such as those supporting the JFACC's air interdiction efforts or counterair operations (e.g. suppression of enemy air defenses), can also occur within the AO. Unity of effort and the avoidance of fratricide are paramount.[138]

Chapter II of JP 3-09 covers the coordination system extensively. For large operations, the land component will normally have a Deep Operations Coordination Cell (DOCC) to oversee the planning, synchronization and execution of deep attacks supporting the JFLCC.[139] A Battlefield Coordination Detachment (BCD) provides an interface with the JFACC staff in the air operations center (AOC). In other words, the ground commander's deep operations cell will work through this detachment at the air component's headquarters to coordinate land-based fire support and corresponding FSCMs.

For the air component's part, coordination of fire is normally accomplished through the Air Force Theater Air Control System (TACS). The JFACC uses the TACS to exercise operational control over his forces. To interface with the land component when providing fire support (e.g. integrating close air support missions with the land battle), the JFACC utilizes an Air Support Operations Center (ASOC). This agency, usually collocated with the ground force, works closely with land component elements to ensure fire support efforts are coordinated and integrated.[140]

Chapter III of JP3-09 explains how the various agencies coordinate fire support. During the planning phase, commanders develop the scheme of maneuver and concept for fires, thus determining how to shape the battlefield with fires to assist maneuver and how to use maneuver to exploit the use of fires.[141] It is important to note that the establishment of coordination measures should not occur until after the fires and their effects are assigned to targets.

Maneuver commanders position and adjust FSCMs consistent with the location of friendly forces, the concept of the operation, anticipated enemy actions, and in consultation with superior, subordinate, supporting, and affected commanders. The primary purpose is to facilitate the attack

of targets. With the exception of the FSCL, permissive measures normally require no further detailed coordination for the engagement of targets with conventional means.[142]

Typically, much of a commander's fire support does not come from organic assets, but instead is provided from non-organic resources.[143] Airpower is invariably requested when organic fire support (e.g., mortars, rockets, aviation, and artillery) is not sufficient to support all assigned missions.[144]

Appendix A of the current version of JP 3-09 condenses the guidance of numerous service manuals regarding coordination measures and FSCL placement in particular. Guidance on use, although consistent with JP 3-0 and appropriately general, is arguably too vague and subject to misapplication. JP 3-09 does clarify that the FSCL does not divide an AO. This implies that it does not delineate control authority between component commanders, signify supporting/supported relationship zones, act as a barrier between deep and close operations, or CAS and AI missions. With regard to timing and depth, the publication states that six hours is generally adequate for coordinating FSCL changes.[145] It cautions that "placing the FSCL at greater depths will typically require support [which appears to imply concurrence] from higher organic headquarters and other supporting commanders."[146]

JP 3-09 allows for FSCL application in nonlinear joint operations, through use of curved or enclosed lines.[147] Whether these measures span the AO or form shapes within it is less relevant than the distance from land forces they are placed. A standard caveat is repeatedly mentioned—FSCL depth is situation-specific. The publication does allow that "corps level commanders may establish an FSCL to support their operations….[However,] a single FSCL facilitates air support, accommodates subordinate deep operations requirements, and eases coordination of FSCL changes."[148]

In one aspect, the FSCL definition provided by JP 3-09 is clearly inconsistent with its supporting text and other guidance, possibly due to oversight (the definition has grown to forty lines of text). It states that "Short of an FSCL, all air-to-ground and surface-to-surface attack

operations are *controlled* by the appropriate land or amphibious force commander. [emphasis mine]"[149] This contradicts JP 3-0 and the supporting text, indicating that authors probably meant to convey "coordinating authority" to the land commander. Otherwise, the publication's guidance does not preclude using a POE-based FSCL to delineate coordinating authority.

JP 3-09.3, *Joint, Tactics, Techniques and Procedures for Close Air Support (CAS)*, dated 1 December 1995, discusses CAS, a primary means of delivering fire support to the land component. It describes it as "a tactical level operation" under the purview of the JFACC who "exercises command and control over assigned forces through the TACS."[150] By definition, the close proximity of friendly land forces inherent to CAS requires detailed integration, which ASOC elements provide. This high degree of integration is not required for air interdiction operations. The publication mentions several means with which to coordinate and prevent the conflict of forces and fires. However, it details no new definitive guidance on how to use coordination measures.[151]

JP 3-56.1, *Command and Control for Joint Air Operations*, dated 14 November 1994, provides guidance on the JFACC's authority and command relationships. In Chapter II, it states "the JFC will normally assign JFACC responsibilities to the component commander having the preponderance of air assets and the capability to plan, task, and control joint air operations."[152] It is important to reemphasize that the JFACC is not necessarily from the USAF and that air component forces are not exclusively provided by the USAF or any other single service. The fact that the "preponderance of air assets" is considered here lends credence to the idea that the preponderance of effects is a valid consideration in some applications of doctrine and may provide a useable means to delineate coordinating authority.

JP 3-56.1 asserts that the JFACC functions as the "supported" commander for the JFC's overall air interdiction effort. However, "interdiction target priorities within the land or naval force areas of operations (AOs) are designated by the land and naval component commanders," which the JFACC will use in planning and executing the AOR-wide interdiction effort.[153] The

JFACC functions as a supporting commander, "as directed by the JFC," for CAS and AI within the land and naval component AOs.[154] In other words, the JFC will generally be directive as to whether the AI missions in the land area support JFLCC operations and objectives or JFACC objectives.

JP 3-52, *Doctrine for Joint Airspace Control in the Combat Zone*, published 22 July 1995, states that the JFC should normally direct the JFACC to perform airspace control authority (ACA) and area air defense duties. With a focus on unity of effort, these duties normally include the responsibility to coordinate and integrate forces of the various components that use the airspace of the JOA. Of course, this does not imply operational or tactical control over these assets. It does convey that the JFACC normally commands the preponderance of forces using JOA airspace and also operates the most capable airspace C2 systems. The publication further relates that the ACA is responsible for the airspace control plan, which should include FSCMs.[155] The implication is that all forces operating in shared vertical battlespace, including ground-based missile, rocket and artillery systems, should coordinate through the air component's C2 systems, as the JFACC provides the preponderance of effects there. In practice at the unified command level, a typical airspace plan would likely permit fires inside the FSCL without further coordination with the JFACC, but not beyond it.

Unified Command Publications

The unified commands apply the JP guidance to theaters and contingency plans. Within the scope of this thesis, CENTCOM and Combined Forces Command-Korea (CFC-K) instructions regarding FSCL placement are particularly pertinent.

USCENTCOM Regulation 525-1, *Warfighting Instructions*, applies joint doctrine to forces operating in the Central Command AOR, which includes the Persian Gulf. Chapter III contains guidance for the employment of joint fires and asserts that indirect fires over the FSCL will be cleared through the Theater Air Control System (TACS), "100% of the time."[156] In this

command, the FSCL acts as a "restrictive" measure to land component deep fire support. CENTCOM FSCL applications are consistent with the operations reviewed earlier.

Korean theater deep operations are outlined in the *Deep Operations Primer-Korea*. In Chapter II, the primer details the responsibilities of the functional components, tasking the JFACC to "synchronize and integrate all air operations and fires beyond the FSCL."[157]

The primer defines an additional coordination measure in chapter VI--the Deep Battle Synchronization Line (DBSL). This line, which augments the FSCL, is normally established 40 to 50 kilometers from the FLOT.[158] In the context of joint doctrine and this thesis, this line equates to the forward boundary of the AO in its delineation of command relationships.[159] The JFLCC is the supported commander short of the DBSL except for air component operational AI missions, and the JFACC is the supported commander beyond it. However, the Primer designates the JFACC as the coordinating authority for operational fires between the FSCL, which is normally within 20 km of the FLOT for defensive operations, and the DBSL (see Figure 4).[160] The ground commander is required to coordinate with the JFACC prior to employing organic fires beyond the FSCL.[161]

General Ronald R. Fogleman, USAF (Retired), former Air Force Chief of Staff, applauded this arrangement.[162] The construct in Korea implies that the JFACC has the better command and control means over the fires into the area between the FSCL and DBSL, but that the ground commander has the primary interest in the interdiction and targeting plan there.

The command relationships proposed by this thesis, including coordinating authority, are consistent with the Korean construct. Although this theater is unique, the construct could very possibly have applications elsewhere. Time will tell.

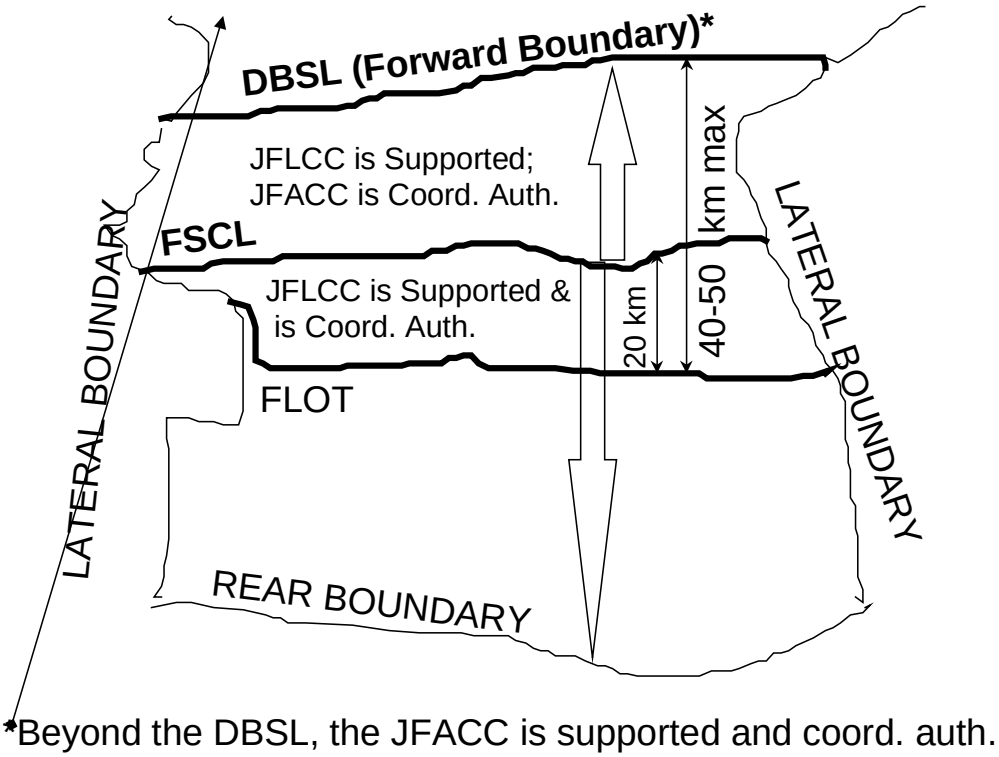


Figure 4. CFC-Korea AO Construct

Service Publications

The USAF's *JFACC Primer* offers an in-depth discussion of the FSCL issue and provides differing Service views on interdiction and deep operations. The following, while extensive, is taken verbatim to add emphasis:

> AIRMAN'S PERSPECTIVE: The component commanders with forces at risk beyond the FSCL are the JFACC and the Special Operations Component Commander. The JFACC's C3I architecture is uniquely capable of planning and controlling operations in territory occupied by hostile forces. The JFACC is responsible for a number of missions, none of which is geographically bounded. Responsibility for synchronizing theater interdiction assets should be vested in the commander who has the preponderance of attack assets and the C3I capability to conduct these operations; for interdiction it is normally the JFACC.
>
> ALTERNATE PERSPECTIVE: Longer range weapons such as Army Tactical Missile Systems (ATACMS) and the ability to see deeper with systems like JSTARS increase the capabilities ground commanders possess to influence the battlefield at greater ranges. Corps Commanders should be responsible for controlling all operations within their areas of operations.

> COMPARISON: Just as synchronization of all attack assets is critical to the land component commander (JFLCC) for all fires inside the FSCL, so it is critical to the Air Component Commander for all attacks beyond the FSCL. All operations inside the FSCL are restricted by control requirements for troop safety. For example, artillery fires use Danger Close procedures while a Forward Air Controller must control air operations. The FSCL should be placed to maximize risk to the enemy. In the late stages of the Korean War the bomb line was placed as little as 300 meters from the front line of troops. When the FSCL was placed beyond the Euphrates River, well in advance of friendly forces, in the last stage of Desert Storm, this effectively created a sanctuary for Iraqi Republican Guards forces escaping the Coalition army's advance. Maneuver force boundaries could also affect the joint force effort, depending on where they are placed and the maneuver commander's method of synchronizing maneuver, fire support, and supporting interdiction operations. Several factors influence maximizing risk to the enemy. Ground force artillery locations are influenced by enemy counter-battery capabilities; longer range weapons are expensive and scarce; it becomes difficult or impossible to determine the effectiveness of artillery and missile systems when they fire at targets that can't be observed.
>
> CONCLUSION: *The most reliable way to maximize the enemy's risk is to place the FSCL at the range where artillery and missiles stop being the greatest threat to the enemy and air attack becomes the greatest threat.* All operations beyond the range of observed fires should be under the purview of the JFACC when friendly forces aren't maneuvering. (emphasis mine)[163]

Air Force Doctrine Document 2-1.3, *Counterland*, is in final draft form for coordination.[164] It details Air Force efforts to directly affect the land fight using AI and CAS, the two missions that comprise the counterland function. Guidance complements the JPs while emphasizing the role of airpower and its decisive potential in the joint land battle. "Counterland operations can support overall theater strategy in two ways; they may provide support to friendly surface operations, and/or they may directly achieve theater-level objectives as the decisive force maneuvering against enemy surface combat power."[165] The JFC's strategy and guidance will dictate. "In some circumstances, ground maneuver may support aerial maneuver by forcing the enemy into a position that is more vulnerable to air attack, which then delivers the vital blow."[166]

The JFACC's ability to successfully execute counterland operations depends greatly on the type and quantity of aerospace assets available.[167] Of course, this will impact the air component's ability to supply the preponderance of effects.

Chapter Two of AFDD 2-1.3 thoroughly covers AI, re-iterating that the desired effects of interdiction are to destroy, disrupt, or delay the enemy—missions and objectives normally assigned to JFACC. Air interdiction can directly support the ground commander but does not necessarily need to, and interdiction sorties can be flown short of the FSCL, but not in close proximity to friendly land forces.[168]

Chapter Three details close air support. Due to its complexity, CAS is generally less effective than AI, but a necessary application of airpower.[169] "The authority to redirect aircraft to or from missions beyond the FSCL should remain centralized at the AOC, while the authority to flow CAS assets to and from the shallow AI targets short of the FSCL is often delegated to the ASOC or TACP [tactical air control party]."[170] This assertion is in line with the use of an FSCL to delineate coordinating authority for optimal joint employment.

Chapter Four of AFDD 2-1.3 reviews the command and control of counterland operations. It offers the hypothesis analyzed in this study as a means of FSCL use to effectively coordinate firepower. It provides the additional insight that the air operations center normally directs the ASOC, which is co-located with the land component to maximize coordination and integration, to control missions short of the FSCL.[171]

Army FM 100-5, *Operations (Final Draft dated 5 Aug 1997)* provides insight into Army "operations in depth" and the importance "deep operations" play, especially with respect to high tempo maneuvers.[172] FM 100-5 guidance tends to focus on the tactical fight, with emphasis on operations in depth designed to complement the movement of brigades and subordinate units.[173] However, the FM stresses the need for synchronization and unity of effort with joint forces and discusses "interdiction by ground and air maneuver and fires, either singly or in combination" but without providing the details for that integration.[174] FM 100-5 is currently in revision.

FM 100-103-2/ACCP 50-54, *Theater Air-Ground System (TAGS)* is a multi-service publication. It reiterates JP 3-0 guidance and provides discussion of additional coordination measures to facilitate joint fire planning and execution options.[175] Concerning boundaries, the

FM states that "theater air sorties are not constrained by surface boundaries per se; however, since the airspace above surface areas is used by all components of the joint force, JFCs establish airspace control measures."[176] Airspace control measures usually include a coordination *altitude* with FSCL principles applying in the vertical. The discussion implies that preponderance is considered in determining the coordination altitude, with land component assets most significant below it and air assets most significant above it.

The FM also discusses AI, stating that ground commanders can "specifically identify those interdiction targets they are unable to strike with organic assets within their boundaries that could affect planned or ongoing maneuver…to afford added visibility and allow the JFC to give priority to targets directly affecting planned maneuver."[177] The JFACC will then plan and execute the theater-wide air interdiction effort.[178] The publication promotes the concept that as range from the FLOT increases, air forces will be increasingly utilized to provide fire and achieve desired effects. At some depth, a hand-over in capability to engage targets occurs between the land and air components.

Army FM 6-20-10, *Tactics, Techniques, and Procedures for the Targeting Process*, dated 8 May 1996, provides discussion about FSCMs and their impact on targeting. The FM states:

> From the JFC's perspective, a target is selected for strategic and/or operational reasons. A decision is subsequently made whether to attack the target and, if it is to be attacked, which system will attack it. The targets selected or nominated in this process must support the JFC's campaign plan and contribute to the success of present and future major operations. The JFC relies on his tactical level commanders to effectively orchestrate the targeting process. Control measures, such as a fire support coordination line (FSCL), must be repositioned as needed to take full advantage of all assets available to the joint force commander. The JFC best influences the outcome of future tactical battles by setting the conditions for those battles and allocating resources to the service components.[179]

The discussion emphasizes the JFC's role in directing operations and, among other things, determining FSCL placement.

FM 6-20-10 provides an excellent in-depth review of procedures to coordinate operations between the FSCL and forward boundary, including the use of the BCD at the air component's

headquarters.[180] Imbedded in the discussion is the point that an air liaison officer (ALO) will be present in the land component commander's operations center to participate in the war-gaming process and advise on Air Force concerns regarding FSCMs.[181] Planners must thoroughly consider the impact of FSCMs on joint employment. Finally, the FM provides discussion of the various weapons and their capabilities, useful in determining the preponderance of effects.[182]

Theses and Monographs

Major David Zook, USA, deals extensively with the use of fire support coordination measures during Desert Storm in a 1992 US Army Command and General Staff College (CGSC) thesis titled "The Fire Support Coordination Line: Is It Time To Reconsider Our Doctrine?" Major Zook thoroughly reviews and analyzes FSCL issues that arose in and as a result of the Gulf War.[183] The thesis has evidently been a catalyst for doctrinal change as several recommendations have been incorporated into the JPs. For instance, although the FSCL is detailed as a permissive measure, the nature of modern warfare requires it to be implemented with restrictions. Major Zook's work capsulizes many after-action reports and lessons resulting from the conflict.

Major Kent Laughbaum's thesis titled "Synchronizing Airpower and Firepower in the Deep Battle', published by the School of Advanced Airpower Studies (SAAS) in 1997, asserts that current joint doctrine does not provide sufficient and acceptable guidance to synchronize Air Force and Army deep operations.[184] The study chronicles the evolution of deep operations, noting that the air forces were initially held responsible for synchronization. Post-Cold War air and land component commanders must now compete for the responsibility and oversight of deep operations. This competition peaked in the Gulf War with significantly differing views of the deep fight.

Among other things, Laughbaum's study recommends:

1. Assigning the joint force commander the responsibility for establishing and positioning the FSCL.

2. Re-defining the FSCL as a restrictive fire support coordination measure.

3. Including all planned airpower, firepower, and maneuver operations beyond the FSCL on the air tasking order.

4. Positioning the FSCL relatively close to be the FLOT, typically no farther than the tube artillery maximum range.

5. Restricting planned air interdiction missions from targets short of the FSCL.[185]

These recommendations support the JFACC's role in coordinating attacks beyond the FSCL and emphasize that the line's placement must reflect the operating locations of the forces providing the preponderance for effects.

The study thoroughly traces the evolution of the FSCL and discusses the sources of conflict regarding its use in deep attack operations.[186] It also provides a review of contemporary targeting issues, especially with regard to the shortcomings identified during Desert Storm.[187]

Major Mark Eshelman, USA, wrote a monograph in 1993 at the School of Advanced Military Studies (SAMS), titled "JFACC Control of Army Deep Fire Assets," recommending that the ground commander relinquish control of Army deep fire assets at the operational level to support the JFC's interdiction effort.[188] Objectives and responsibility for this effort are often assigned to the JFACC and can occur outside the land AO. Major Eshelman asserts that in order to compensate the JFLCC for loss of the use of these assets, efforts should be directed at ensuring air component interdiction operations focus on supporting the ground commander's scheme of maneuver.[189]

Eshelman delineates the joint battle area, with the US Army called on to "close with and destroy the enemy by means of fire and maneuver."[190] The US Air Force supports this with CAS and those AI missions which have "a near term impact on the close battle, formerly called Battlefield Air Interdiction (BAI)."[191] Correspondingly, Army forces should play a supporting role to the AF responsibility to conduct "operational interdiction"—those missions not in direct support of the tactical close-in fight. One justification is that corps commanders and below

primarily fight tactical battles and that AF assets tend to operate at the operational level.[192] The monograph asks, but does not attempt to answer whether or not the preponderance of forces or effects should apply when assigning the FSCL.[193]

Major Robert D'Amico, USAF, wrote a thesis in 1997 at the Naval War College, titled "Joint Fires Coordination: Service Specialties and Boundary Challenges," exploring the potential need for further demarcation between the deep and close battles. The thesis asserts that joint doctrine was inadequate regarding economy of force and unity of effort when conducting joint fires, especially with respect to the region from the FSCL to the forward boundary. The author recommends the creation of larger coordination elements assigned to the staffs of the supported commanders. Additionally, the piece advocates a FSCL that provides the ground commander with adequate maneuver space to independently conduct deep operational maneuvers.[194] The thesis concludes that "efforts must be placed on synchronizing AI with the ground operational maneuver through liaison elements—communication and teamwork are key."[195] Essentially, this thesis supports a FSCL placement as close as practical to the forward line of troops with emphasis on improving the JFLCC's ability to both maneuver and coordinate organic fires beyond it. Technology can enhance this ability in the form of improved command and control capability.[196]

Colonel Terry L. New, a 1995 student of the Air War College, wrote a monograph titled, "Where to Draw the Line Between Air and Land Battle." This work focuses on measures to delineate the air and land battle with component commander directed to *control* operations on their appropriate sides.[197] He contends that modern warfare should be divided with the JFACC responsible for the "deep and high" battles and the JFLCC responsible for the "close and rear" battles.[198] The monograph suggests that, "with modification, the FSCL can provide an appropriate mechanism to divide responsibilities between air and land commanders."[199] This modification calls for greater JFACC involvement in determining FSCL placement.

Colonel New also asserts a predominant Air Force view that the FSCL is a restrictive measure, with attacks beyond the line needing to be coordinated with the air component.[200] He

provides legitimacy to this assertion by detailing the various air operations and fixed-wing forces operating beyond the FSCL and refuting a common Army perception of minimal fratricide risk associated with a "big sky-little bullet theory."[201] His conclusion: Avoid duplication of effort and ensure unity of command by delineating control at the FSCL.[202]

Major Michael McMahon, USA, contributed to FSCL literature in 1994 with a SAMS monograph titled, "The Fire Support Coordination Line--A Concept Behind Its Times?" This monograph addresses the question of whether or not the FSCL as a coordination measure should be included in future joint doctrine.[203] Major McMahon maintains that the FSCL is being exclusively used to prevent the conflict of fires rather than to emphasize and facilitate the complementary capabilities of the various joint systems. As such, the FSCL should be eliminated, with the ground commanders using the forward boundary as a means to deconflict fires and achieve unity of effort within their AOs. A more efficient command and control means for coordination beyond the land area is needed. The work seems to assume that land forces provide the preponderance of effects throughout the AO.[204]

Major McMahon reiterates that the FSCL is a "permissive" measure according to joint doctrine. However, it is invariably applied in a "restrictive" fashion, as is the plan in the CENTCOM and CFC-Korea AORs.[205] To avoid such restrictions, the author relates that the ground commander can place the line at the maximum range of the ground organic firing assets.[206] Unfortunately, he does not recognize or adequately address airpower's potential role in the land battle, let alone the joint fight.

Summary

The literature regarding FSCMs is vast. It consistently recognizes the potential of FSCMs as a key to success but presents some divergent opinions regarding use. JP 3-09 has clarified some conceptual points and heated the debate on others. The significance and contentiousness of FSCMs are highlighted by the amount of literature, occasionally written along parochial, service-

biased lines. Fortunately, the guidance is general and fairly coherent, providing the means for the synthesis of worthy coordination measures and practical applications.

Notes

[108] US Air Force, *JFACC Primer* (Washington, DC: Department of the Air Force, 1994), iii.

[109] US Department of Defense, Joint Chiefs of Staff Publication 3-0, *Doctrine for Joint Operations* (Washington, DC: Office of the Joint Chiefs of Staff, 1995), i.

[110] US Department of Defense, Joint Chiefs of Staff Publication 0-2, *Unified Action Armed Forces (UNAAF)* (Washington, DC: Office of Joint Chiefs of Staff, 1995), IV-2.

[111] Ibid., III-10.

[112] Ibid., III-11.

[113] Ibid.

[114] Ibid., IV-2

[115] Ibid., III-12.

[116] Ibid.

[117] Ibid., IV-2.

[118] Ibid.

[119] JP 3-0, II-8.

[120] Ibid., III-34.

[121] Ibid.

[122] Ibid.

[123] Ibid.

[124] Ibid.

[125] Scott Walker, Major, USAF, USAF Doctrine Center, interview by author, Maxwell AFB, AL, 15 March 1999.

[126] US Department of Defense, Joint Chiefs of Staff Publication 3-03, *Doctrine for Joint Interdiction Operations* (Washington, DC: Office of the Joint Chiefs of Staff, 1997), GL-2.

[127] Ibid., GL-4.

[128] Ibid., viii.

[129] Ibid., ix.

[130] Ibid., II-7 through II-8.

[131] Ibid., II-15.

[132] US Department of Defense, Joint Chiefs of Staff Pub 3-09, *Doctrine for Joint Fire Support* (Washington, DC: Office of Joint Chiefs of Staff, 1998), i.

[133] Ibid., v.

[134] Ibid., vi.

[135] Ibid., vii-ix.

[136] Ibid., I-1.

[137] Ibid., I-2.

[138] Ibid., II-4.

[139] Ibid., II-7.

[140] Ibid., II-12.
[141] Ibid., III-1.
[142] Ibid., III-13.
[143] Ibid., IV-1.
[144] Ibid., IV-3.
[145] Ibid., A-2.
[146] Ibid., A-3.
[147] Ibid., A-2.
[148] Ibid., A-5.
[149] Ibid., GL-6 to GL-7.
[150] US Department of Defense, Joint Chiefs of Staff Publication 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support (CAS)* (Washington, DC: Office of the Joint Chiefs of Staff, 1995), I-1, II-4.
[151] Ibid., IV-7 through IV-8.
[152] JP 3-56.1, II-2.
[153] Ibid., II-3.
[154] Ibid.
[155] US Department of Defense, Joint Chiefs of Staff Publication 3-52, *Doctrine for Joint Airspace Control in the Combat Zone* (Washington, DC: Office of the Joint Chiefs of Staff, 1995), vi - vii.
[156] Michael J. Barbee, Major, USA, ”Minimizing Coordination Problems Between the JFACC and JFLCC in the Coordination of Joint Fires Between the FSCL and Land Component Forward Boundary” (MMAS thesis, Command and General Staff College, Fort Leavenworth, KS, 1997), 25.
[157] Ibid., 26. CFC-Korea uses “combined forces” (versus joint forces) terminology. Within the scope of analysis, JFACC and CFACC, JFLCC and CFLCC are considered equivalent.
[158] Patrecia S. Hollis, “Making the Most of Air Power, An Interview with General Ronald R. Fogleman, Chief of Staff of the Air Force,” *Field Artillery Journal*. September-October 1996: 3.
[159] Ibid.
[160] Ibid.
[161] D’Amico, 6-10.
[162] Hollis, 3.
[163] *JFACC Primer*, 33-34.
[164] US Air Force, AFDD 2-1.3 *Counterland, Draft V.7--March 1999* (Maxwell Air Force Based, AL: Headquarters, Air Force Doctrine Center, 1999), Title Page.
[165] Ibid., vi.
[166] Ibid., 10.
[167] Ibid., 20.
[168] Ibid., 24-35.
[169] Ibid., 44.
[170] Ibid., 46.

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[171] Ibid., 55.

[172] US Army, Field Manual 100-5, *Operations (5 Aug 1997 Final Draft)* (Washington, DC: Department of the Army, 1997), 7-12.

[173] FM 100-5, 7-13.

[174] FM 100-5, 7-13.

[175] US Army, Field Manual 100-103-2, *TAGS, Multi-service Procedures for the Theater Air-Ground System* (Washington, DC: Department of the Army, 1994), 68-69.

[176] Ibid., 68.

[177] Ibid., 2.

[178] Ibid.

[179] US Army, Field Manual 6-20-10, *Tactics, Techniques, and Procedures for the Targeting Process* (Washington, DC: Department of the Army, 1996), 1-7.

[180] Ibid., 3-16 through 3-27.

[181] Ibid., 3-19.

[182] Ibid., B-11 through B-12.

[183] David H. Zook, Major, USA, "The Fire Support Coordination Line: Is it Time to Reconsider Our Doctrine?" (MMAS thesis, Command and General Staff College, Fort Leavenworth, KS, 1992), iii.

[184] Kent Laughbaum, Major, USAF, "Synchronizing Airpower and Firepower in the Deep Battle" (SAAS thesis, Maxwell AFB, AL, 1997), vi.

[185] Ibid., vi.

[186] Ibid., 15-20.

[187] Ibid., 27-30.

[188] Mark J. Eshelman, Major, USA, "Air Commander Control of Army Deep Fire Assets" (SAMS monograph, Command and General Staff College, Fort Leavenworth, KS, 1993), iii.

[189] Ibid., iii.

[190] Ibid., 8.

[191] Ibid.

[192] Ibid., 9.

[193] Ibid., 34.

[194] D'Amico, ii.

[195] Ibid., 10.

[196] Ibid.

[197] Terry L. New, Colonel, USAF, "Where to Draw the Line Between Air and Land Battle" (Monograph, Air War College, Maxwell Air Force Base, AL, 1995), 5.

[198] Ibid., 1.

[199] Ibid., 6.

[200] Ibid., 12.

[201] Ibid., 13.

[202] Ibid., 14.

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[203] Michael J. McMahon, Major, USA, "The Fire Support Coordination Line, A Concept Behind its Times?" (SAMS monograph, Command and General Staff College, Fort Leavenworth, KS, 1994), iii.

[204] Ibid.

[205] Ibid., 8-15.

[206] Ibid., 20.

Chapter 4

Conclusions and Recommendations

> *Air and ground commanders must be constantly on the alert to devise and use new methods of cooperation…. There can never be too many projectiles in a battle. Whether they are thrown by cannon, rockets, or recoilless devices is immaterial. The purpose of all these instruments is identical—namely, to deluge the enemy with fire.*[207]
>
> — General George S. Patton, Jr.
>
> *War as I Knew It*

In many respects, the meshing of military art and science occurs at the FSCL. Commanders must internalize and account for the factors that make fire support coordination measures effective.

Fires

General Patton would evidently assert that shared and overlapping firepower capabilities are a good thing. The US Armed Forces must stay on the lookout for new technologies and continue to acquire systems that fill-in the holes along over the spectrum of lethal engagement. Clearly defined roles and missions, which dictate the systems the services will acquire, are also important. The Department of Defense must make some tough decisions regarding the fielding of weapons designed to attack deep, such as improved ATACMS. Although the Army and Air Force both have a vital role to play in interdiction and deep operations, fiscal realities will force the services to prioritize competencies. The Army must demonstrate the need for deep fire

systems when tasking often calls for other capabilities. The Air Force must continue to demonstrate its ability to conduct effective interdiction operations.

Regardless of their source, combatants must be able to efficiently integrate precision guided munitions and weapons with increased standoff ranges and lethality. Commanders must develop plans that exploit these systems.

Support

Future Joint Force Commanders should take care to clearly construct relationships that allow subordinates to accomplish the mission. In the vast majority of scenarios, objectives assigned to the land component will require the support of the air commander in the form of CAS and AI. Of course, this may not always be the case. In Kosovo, land forces in the form of Apaches were deployed to support the JFACC's attempts to achieve objectives. Regardless of whom the fires support, coordination should be directed at facilitating the application of force. The JFC must articulate coordinating authority guidance, and the FSCL offers an appropriate means to bound this authority.

Coordination

Critics of the Gulf War operations cite the inability, and possibly even unwillingness, of the component commanders to coordinate as a problem that restricted US firepower. Since the war, the Armed Forces have taken actions to facilitate coordination in the form of better communications equipment and staffing. Future JFCs must field and establish the appropriate coordination means and requirements. The terms "inform," "consult with," and "receive clearance from" define the degree of coordination required, which can significantly impact the effectiveness of the measures used. Most contemporary guidance advises that, unless exceptional circumstances preclude it, component commanders must work through the coordinating authority

before conducting surface attacks. As the number of forces operating throughout the battlespace increases, coordination requirements become more critical.

Measures

The preponderance of effects should be a primary consideration in measuring FSCL depth. As pointed out in joint doctrine, several situation-specific factors (METT-T) influence placement. However, planners already take these factors into account when developing courses of action and reflect their impact in the alignment and use of land and air forces. It is at this point where coordination measures, including FSCL placement, should be applied to enhance the effectiveness of the joint forces and create the conditions for success.

The term "preponderance of effects" is derived from the legalistic jargon currently used in the JPs. Preponderance is an accepted and applied concept in matters such as the delegation of component command authority. The term, as used here, simply implies that the component commander with the forces providing the most substantial effects directed at achieving objectives should be the person charged with coordinating operations in that area. Such effects are not necessarily terrain-based.

Calculating the POE-based FSCL

In order to use a POE-based FSCL, commanders and their staffs must be able to equitably quantify and compare the effects supplied by diverse forces participating in combat operations (e.g., compare two F-16s loaded with cluster bombs on an AI mission with four ATACMS Block I missiles). As a minimum, staffers must use the planning process to identify potential enemy locations and desired effects as well as the component tasked to achieve those effects. Oftentimes, the quantity and maximum range of deep attack land assets must be compared to the projected locations of air component counterland missions. In those joint areas where the attacking force is mixed, preponderance can be debated.

Two scenarios illustrate extreme examples in the use of a POE-based FSCL. In scenario one, land force maneuver and firepower are dominant throughout the AO and no line needs to be established, as it corresponds to the AO forward boundary. Factors such as host nation or political restrictions to land-based airpower, fear of collateral damage, weather, and terrain might put extreme limits on the effectiveness of airpower. In this scenario, most force is applied by or in close coordination with ground forces. An enemy's key terrain or fielded army is probably the center of gravity, and effects are oriented at objectives corresponding to the destruction of enemy resistance. If a large number of ATACMS and aviation assets supply the preponderance of effects throughout the operating area, or the AO dimensions are very limited, then the minimal number of AI and strategic attack sorties should be coordinated with the ground commander. "Deep" FSCLs would correspond to less extreme but similar scenarios.

In the other extreme, airpower might be the dominant force with the FSCL extremely close to ground units possessing limited firepower. Factors such as an aversion to casualties, limited time to project land forces and other political constraints to the fielding of those forces and weapons may put severe limits on ground component capability. Even if a small AO were established, the ground commander's operations would likely support objectives assigned to the air component. In this scenario, extensive air strikes might be used to halt a sudden enemy advance with the land component providing lightly equipped forces in a defensive or force-protection role. Accordingly, air forces provide the firepower and the preponderance of effects across the depth and breadth of the area. This occurred during defensive operations in the Korean War, where the FSCL was placed as close as 300 meters to the forward line of friendly troops.[208] In general, any land forces capable of firing beyond this range would coordinate with the air component. Of course, the inability to coordinate this fire would not necessarily preclude employment in exceptional circumstances.

More realistic scenarios lie somewhere between these extreme situations, and the depth at which ownership of the preponderance of effects transfers must be calculated. The historical

analysis of the Gulf War presented several situations in which a POE-based FSCL could be calculated and compared with other potential placements. As in many scenarios, the isolation and destruction of enemy armored forces were the primary desired effects. Unlike deep attack systems optimized for SEAD or to counter enemy artillery fire, direct attack systems like USAF fighters and the Apache offered the best means to achieve these effects.

For Period One of Desert Storm, the actual FSCL placement had a positive impact on joint operations. AARs and postwar project studies tend to support this determination. Additionally, the success of breaching operations and indications that the enemy was unprepared and unable to mount effective resistance to the Coalition land offensive provide the basis for this assertion.[209] In general, actual placement coincided with a POE-based FSCL placement. Obviously, the effects-based analysis of joint employment in Period One was significantly simplified by the imbalance of joint force participation, which heavily favored the JFACC.

During Period Two, actual FSCL placement tended to match a location based on the preponderance of effects. An analysis of the period's results and AARs reveals that joint operations were somewhat effective. Establishing the line closer to the FLOT would have hindered AH-64 and field artillery attacks on time-critical targets due to coordination delays. Moving the line deeper would have limited AI effectiveness in shaping the battlefield for the close fight and constrained it to the more distant, less lucrative targets. The need for an ability to adjust the FSCL more often did surface. Such a capability could have avoided an accordion effect in which an initial deep sanctuary was followed by constrained land maneuver and fire support.

Period Three was characterized by the poor use of coordination measures. Military effectiveness was degraded when actual FSCL placement differed from a location based on the preponderance of effects. Ground commanders placed the measure beyond the depth at which land forces could supply the preponderance of effects and inhibited airpower. This does not

provide overwhelming proof that a POE-based FSCL would yield optimal results, but it tends to support that conclusion.

The effect of FSCL placement on joint employment success is presented in Table 1. The table depicts initial joint success, especially in Period One, where the actual FSCL location closely matched a POE-based placement. Coalition forces were on the defense. In Period Two, a decrease in joint effectiveness is consistent with a decline in the correlation of line placement to the preponderance of effects, with the measure too close at some times and too deep at others. In Period Three, where forces attacked a withdrawing enemy, an excessively deep FSCL placement inhibited operational success.

Table 1. POE-based FSCL Analysis

	Actual/POE-based FSCL Coincident?			Joint Employment Effectiveness:		
	Yes	/Some/	No	Ineffective/	Effective	/Very Effective
Period I:	X					X
Period II:		X			X	
Period III:			X	X		

Operation Desert Storm showed that when the FSCL corresponded to the preponderance of effects, joint operations were effective and successful. When the FSCL placement did not, joint operations were inhibited and less successful.

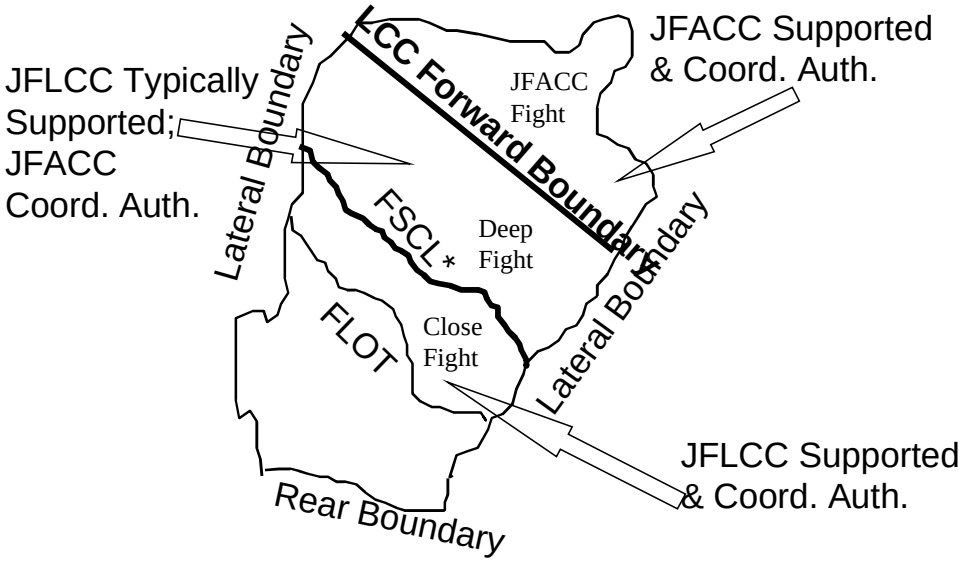
Conclusions

Focusing on the preponderance of effects makes FSCL placement less nebulous in terms of factors to consider. An effects-based analysis tends to maximize the coordinated employment of joint firepower, not inhibit it. Military effectiveness increases. Given the volatility of the FSCL issue, this approach provides a simplified means to derive the appropriate depth for the line. There are still matters to be resolved in the application of coordination measures, which must be addressed in the upcoming release of JP 3-0. Better coordination and integration of forces must occur on both sides of the FSCL.

As always, optimal joint operations are the result of effective teamwork and execution. The ground commander must have an awareness and understanding of all forces operating in and above the AO and act to reduce inhibitors to their effectiveness. "The most reliable way to maximize the enemy's risk is to place the FSCL at the range where artillery and missiles stop being the greatest threat to the enemy and air attack becomes the greatest threat."[210]

Recommendations

Command relationships must be articulated, and coordinating authority can be assigned to facilitate the application of force. Throughout the JPs and particularly in JPs 3-0 and 3-09, writers should modify doctrine to highlight the importance of considering a preponderance of effects when determining FSCL depth. The line's definition in JP 3-09 should be corrected to reflect the command relationship of "support" instead of control. In addition to cutting down and cleaning up its definition, the publications should identify the POE-based FSCL as a means to delineate coordinating authority. Such concepts concur with supporting guidance that cautions strategists to take into account situation-specific factors. This analysis tends to support the construct presented in Figure 5.



*FSCL corresponds to changeover in preponderance of effects

Figure 5. Contemporary Construct with POE-based FSCL

Areas for Further Study

The assignment of a land-based operating area is normally required when the ground commander is directed to achieve operational objectives. AOs need not be fixed for an entire phase of activities. As is done with the FSCL, planners might establish a series of on-order forward boundaries that expand, limit or refine the space required for land combat operations. Strategists should consider the implications of this.

As demonstrated in this analysis, POE-based FSCL determination is somewhat inexact. The magnitude of data can be difficult to manage without an immense processing capability. A current initiative to connect the USAF Contingency Theater Automated Planning System (CTAPS) with the US Army's AFATDS could facilitate a more precise FSCL determination.[211] More digitally advanced and interoperable systems, fielded with the capability to measure

potential effects, might further facilitate the calculation of FSCL depth. Users must consider whether or not such use is practical.

Even if the concept of a POE-based FSCL is accepted, much more research is clearly needed in determining the means to compare effects and quantify forces when deciding which component provides preponderance. Although beyond the scope of this analysis, it may pertain to the priority of objectives, the desired effects and corresponding target characteristics, the number of weapons systems employed, projectiles fired, or the amount of explosive weight delivered. Digital systems might facilitate value determinations in an effects-based analysis.

Future studies should investigate the impact of modern command and control systems on coordination measure use and FSCL placement. In addition to the preponderance of effects, C3 capabilities are an important consideration in FSCL location. It may be presumptuous to assume that the forces providing the preponderance of effects are accompanied by the most capable means of command and control. This C2 capability, not the preponderance of effects, provides unity of effort and the deconfliction of firepower.

Although beyond the scope of this thesis, the review of literature indicated a change in terminology should be considered. Although several valid and descriptive terms have been suggested in recent years, "Joint Fire Coordination Line" (JFCL) might best replace the term currently used. This change may reduce preconceived biases, often along service lines, inherent to the FSCL. Of course, the preponderance of effects should be a primary consideration in JFCL location, and it should be used to delineate coordinating authority. Application would be "restrictive," with the ground commander required to coordinate fires beyond the line with the air component. Land forces desiring to fire beyond the JFCL would have to "consult with" as opposed to merely "inform" their air counterparts. As with the FSCL, an inability to coordinate would not preclude a necessary attack.

Final Remarks

Recent US military operations have highlighted deficiencies in the application of fire support coordination measures. US land and air forces continue to build the capability to fight deeper and with greater lethality. Doctrine must be adapted to maximize the effectiveness of firepower directed at the enemy. The proper orchestration of joint forces will be critical to future success, and commanders must identify the forces providing the largest input in any given situation. Appropriate measures must be implemented to facilitate joint employment. Then and only then can the full US military might be brought to bear quickly, efficiently and successfully.

Notes

[207] George S. Patton, Jr., General, USA, *War as I Knew It* (Cambridge: Riverside Press, 1947), 357.

[208] *JFACC Primer*, 33.

[209] Ibid., 126.

[210] *JFACC Primer*, 34.

[211] Patrecia S. Hollis, "Making the Most of Air Power, An Interview with General Ronald R. Fogleman, Chief of Staff of the Air Force," *Field Artillery Journal* (September-October 1996): 5.

Glossary

A2C2	Army Airspace Command and Control
AAR	After Action Report
ACA	Airspace Coordination Authority
ACC	Air Component Commander
ACO	Airspace Coordination Order
ACR	Armored Cavalry Regiment
AFATDS	Advanced Field Artillery Tactical Data System
AGCL	Air Ground Coordination Line
AI	Air Interdiction
ALO	Air Liaison Officer
AO	Area of Operations
AOC	Air Operations Center
AOR	Area of Operational Responsibility
APC	Armored Personnel Carrier
ARCENT	US Army Component Central Command
ASOC	Air Support Operations Center
ATACMS	Army Tactical Missile System
ATCCS	Army Tactical Command and Control System
BAI	Battlefield Air Interdiction (obsolete)
BCD	Battlefield Coordination Detachment
BCE	Battlefield Coordination Element (replaced by BCD)
C2	Command and Control
C3I	Command, Control, Communications and Intelligence
CAS	Close Air Support
CFC-Korea	Combined Forces Command-Korea
CFL	Coordinated Fire Line
CGSC	USA Command and General Staff College
CINC	Commander-in-Chief
CTAPS	Contingency Theater Automated Planning System
DBSL	Deep Battle Synchronization Line
DOCC	Deep Operations Coordination Cell
DOD	Department of Defense
EA	Engagement Area
EAC	Echelons Above Corps

FA	Field Artillery
FLOT	Forward Line of Own Troops
FSCL	Fire Support Coordination Line
FSCM	Fire Support Coordinating Measure
FSCOORD	Fire Support Coordinator
HPT	High Payoff Target
IRIS	Independent Research and Information Services
JFACC	Joint Forces Air Component Commander
JFC	Joint Forces Commander
JFCL	Joint Firepower Coordination Line
JFLCC	Joint Forces Land Component Commander
JOA	Joint Operations Area
JP	Joint Publication
JULLS	Joint Universal Lessons Learned System
km	Kilometer(s)
KTO	Kuwaiti Theater of Operations
LRST	Long Range Surveillance Teams
mm	millimeter
MMAS	Master of Military Art and Science
MDMP	Military Decision Making Process
METT-T	Mission, Enemy, Troops, Terrain and Weather, and Time Available
MLRS	Multiple Launch Rocket System
MTW	Major Theater War
NATO	North Atlantic Treaty Organization
OCA	Offensive Counterair
OPLAN	Operations Plan
PL	Phase Line
RAP	Rocket-assisted Projectiles
RFL	Restrictive Fire Line
RIPL	Reconnaissance and Interdiction Planning Line (obsolete)
SAAS	School of Advanced Airpower Studies
SAMS	School of Advanced Military Studies at the USA CGSC
SEAD	Suppression of Enemy Air Defenses

SP	Self-propelled
TACP	Tactical Air Control Party
TACS	Theater Air Control System
TAGS	Theater Air-Ground System
TAIS	Tactical Airspace Integration System
TBM	Theater Battle Management
TBMCS	Theater Battle Management Core System
TLAM	Tomahawk Land Attack Missile
TOW	Tube-launched, Optically Tracked, Wire-guided, Heavy Antitank Missile System

Definitions

Air Interdiction (AI). Any operation conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against friendly forces at such a distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required.[212]

Area of Operations (AO). An operational area defined by the joint force commander for land and naval forces. Areas of operations do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces.[213]

Battlespace. The conceptual physical volume in which the commander seeks to dominate the enemy. It expands and contracts in relation to the commander's ability to acquire and engage the enemy, or can change as the commander's vision of the battlefield changes.[214]

Close Air Support. Air action by fixed- and rotary-wing aircraft 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. Also called CAS.[215]

Coordinating Authority. A commander or individual assigned responsibility for coordinating specific functions or activities involving forces of two or more Services or two or more forces of the same Service. The commander or individual has the authority to require consultation between the agencies involved, but does not have the authority to compel agreement. In the event that essential agreement cannot be obtained, the matter shall be referred to the appointing authority.[216]

Deep Operations. Those operations directed against enemy forces and function which are not in contact at the FLOT, line of departure, or friendly perimeter and are between the FLOT or perimeter and the forward boundary of the unit conducting the operation.[217]

Forward Boundary. The farthest limit, in the direction of the enemy, of an organization's responsibility. The organization is responsible for deep operations to that limit. The next higher headquarters is responsible for coordination of deep operations beyond that limit. In offensive operations, the forward boundary may move from phase line to phase line, depending on the battlefield situation.[218]

Interdiction. An action to divert, disrupt, delay, or destroy the enemy's surface military potential before it can be used effectively against friendly forces.[219]

Joint Operations Area (JOA). An area of land, sea, and airspace, defined by a geographic combatant commander or subordinate unified commander, in which joint force commander (normally a joint task force commander) conducts military operations to accomplish a specific mission. Joint operations areas are particularly useful when operations are limited in scope and geographic area or when operations are to be conducted on the boundaries between theaters. Also called JOA.[220]

Maneuver. Employment of forces on the battlefield through movement in combination with fire, or fire potential, to achieve a position of advantage in respect to the enemy in order to accomplish the mission.[221]

Notes

[212] US Department of Defense, Joint Chiefs of Staff Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Office of Joint Chiefs of Staff, 1994 as amended through 12 January 1998), 18.

[213] Ibid., 54.

[214] US Army, Field Manual 101-5-1, *Operational Terms and Graphics* (Washington, DC: Department of the Army, 1997), 1-18 - 1-19.

[215] JP 1-02, 76.

[216] JP 1-02, XX.

[217] FM101-5-1, 1-47.

[218] Ibid., 1-70.

[219] JP 1-02, 221.

[220] Ibid., 237.

[221] Ibid., 262.

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