

AD-A215 797

**FIELD ARTILLERY:
LENDING A TOUCH OF CLASS
AT THE OPERATIONAL LEVEL**

**A Monograph
by
Major Keith D. Gordon
Field Artillery**

DTIC
ELECTF
DEC 20 1989
S B D



**School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas**

Second Term 88-89

Approved for Public Release; Distribution is Unlimited

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S)			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION School of Advanced Military Studies, CGSC		6b. OFFICE SYMBOL (If applicable) ATZL-SW ¹	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Fort Leavenworth, Kansas 66027-6900			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
11. TITLE (Include Security Classification) Field Artillery-Lending a Touch of Class at the Operational Level					
12. PERSONAL AUTHOR(S) MAJ Keith D. Gordon, USA					
13a. TYPE OF REPORT Monograph		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 89/5/15	
15. PAGE COUNT 52					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) operational fires operational commander emerging technology		
FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number) This paper proposes a greater role for artillery in the conduct of operational fires. Current US artillery has the capability to participate in the conduct of operational fires at the lower end of the operational-tactical level of war. Emerging technology has the potential to increase the importance of artillery in this role. There is a great difference between between how the US and the USSR conduct operational fires. The paper addresses the difference to see if there is anything the US can learn from the Soviets. The analysis includes a review of historical development of the use of artillery by both parties in this century to explain the different paths the two nations have followed. Declining budgets and improved technology enhance artillery's capabilities.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL MAJ Keith D. Gordon			22b. TELEPHONE (Include Area Code) (913)-651-6595		22c. OFFICE SYMBOL ATZL-SW

Field Artillery:
Lending a Touch of Class at the Operational Level

Major Keith D. Gordon
Field Artillery

School of Advanced Military Studies
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas

15 May 1989

Approved for public release ; distribution is unlimited.

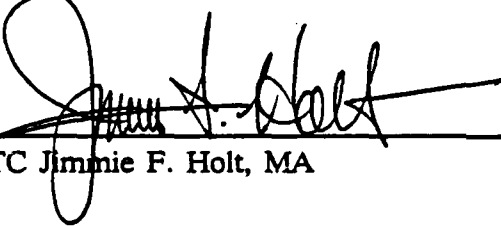
SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

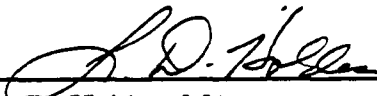
Name of Student: Keith D. Gordon, MAJ, Field Artillery

Title of Monograph: Artillery's Role as an Operational Fire Asset

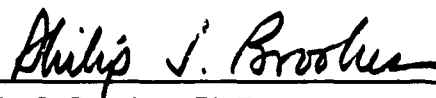
Approved by:



LTC Jimmie F. Holt, MA Monograph Director



COL L. D. Holder, MA Director, School of
Advanced Military
Studies



Philip J. Brookes, Ph.D. Director, Graduate
Degree Program

Accepted this 15th day of May 1989

ABSTRACT

FIELD ARTILLERY: Lending a Touch of Class at the Operational Level. by Major Keith D. Gordon, USA, 52 pages.

The purpose of this paper is to explain why US artillery should have a greater role in the conduct of operational fires. Current US artillery has the capability to achieve operational effects, but Army doctrine almost ignores the capability. As a result, artillery force structure is inadequate to support the operational level commander.

The Soviet Union, on the other hand, sees artillery as the mainstay of its fire support system at the tactical and operational levels. Soviet Artillery is organized and equipped to support both operational and tactical plans simultaneously.

This paper evaluates the respective US and Soviet approaches to the use of artillery at the operational level. Historical and current approaches are included in the evaluation. Additionally, the paper looks at emerging technology which may influence US Army doctrine concerning the employment of artillery at the operational level.

Artillery cannot accept responsibility for conducting all operational fires. It is not necessarily the best asset for conducting operational fires. But it currently has the ability to enhance the operational fires provided by the US Air Force and Army Aviation. Emerging technology promises even greater capabilities for the artillery. The paper recommends that the Army reassess the use of artillery as an operational fires asset in view of its current and emerging capabilities to enhance operational fires. Failure on the part of the Army to do so may result in increased risk of defeat in a war with the Soviets.

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

Table of Contents

<u>Section</u>	<u>Title</u>	<u>Page</u>
I	Introduction	1
II	Understanding Operational Fires	3
III	US/Soviet Artillery Force Structure Asymetry	14
IV	Soviet Rocket Troops and Artillery and Operational Fires	20
V	US Artillery and Operational Fires	30
VI	Improving US Artillery Capabilities	35
VII	Conclusions and Implications	38
	Endnotes	43
	Bibliography	49

I. Introduction

The US Army appears to be courting failure in a future war against the Soviets by failing to develop completely its own capability to perform a key operational function: conducting operational fires. Specifically, Army doctrine ascribes the major responsibility for the conduct of operational fires to the Air Force and virtually ignores the capability of its own Field Artillery in this role. It is not the purpose of this paper to argue that artillery should now assume major responsibility for operational fires, or that artillery is necessarily the best weapon to conduct operational fires. Indeed, with the currently limited range capabilities, the contribution of artillery to operational fires would be minimal. However, recent and emerging advances in cannon and missile technology hold promise for the US artillery forces to significantly enhance the operational effects attained by other operational fires assets, e.g. Theater air assets and Army attack helicopters. As the Army seeks to develop its operational warfighting capability, it should consider the best method to take advantage of these emerging capabilities. This paper evaluates the provision of a ground-based indirect fire system to the operational commander and concludes that it is a viable course of action the Army may wish to follow in order to take advantage of the emerging capabilities of these weapons.

The process of evaluation includes a review of the historical use of artillery in the US Army since World War II to seek an explanation of why artillery is not currently considered in the conduct of operational fires. The evaluation also includes a review of Soviet use of artillery at the operational level due to their significantly different approach to the matter and because of the threat their vast quantity of artillery poses to the US and NATO. The paper also addresses current Army and fire support doctrine and force structure issues to determine if there is anything the US Army can learn from its potential Soviet foe to improve its own warfighting capabilities. Finally, the paper looks at emerging technology to determine what developments may change the US Army's traditional approach to the conduct of operational fires. The conclusion

follows that providing a ground-based indirect fire system to the operational commander appears to be an effective method of offsetting several disadvantages.

It should be obvious that it is beyond the scope of this paper to prove that the US Army must change a doctrine and methods that it has followed for over forty years. The intent of the paper is to present for consideration reasons why the Army may wish to reconsider its traditional approach to take advantage of the emerging capabilities of its own artillery. Scoffers will no doubt be many in number, but healthy debate of the points presented herein may result in significant improvements of the Army's ability to win a future war on the European landmass.

II. Understanding Operational Fires

Since the end of World War II, the US Army has been primarily concerned with conducting war at the tactical level. Only recently has the Army renewed its interest in waging war at the operational level. Behind the Army's renewed interest is the concern that the US's most powerful potential foe, the Soviet Union, already has an ability to conduct war at the operational level and continues to upgrade its doctrine, training, and force structure for doing so. The Soviets intend to maintain the potential ability to crush any opponent as they did the Nazis on the Eastern Front in the Second World War. The US Army correctly perceives a need to possess an operational warfighting capability to counter the Soviets in any future conflict on the European landmass.

Critical to the development of an operational warfighting capability is the possession of doctrine describing how to wage war at the operational level. Field Manual (FM) 100-5, Operations, is the Army's capstone manual for warfighting. It describes how the Army intends to conduct war at both the operational and tactical levels to defeat potential enemies. FM 100-5, Operations, distinguishes the operational level of war—the design and conduct of campaigns and major operations—from the tactical level which deals with battles and engagements.¹ FM 100-6, Large Unit Operations, adds that many functions traditionally associated with tactical operations have analogues at the operational level.² Certain of these functions allow the operational commander to directly influence the outcome of an operation. These functions are intelligence, maneuver, fires, sustainment, and deception.³ Each function is a co-equal component of the overall operational scheme. Successful campaigns or operations result from achievement of the operational objectives for each function.

As one of the components of the operational scheme, operational fires is little understood throughout the Army. Many Army officers equate operational fires to fires planned at the operational level and executed at a certain range. Instead, operational fires are a function of the level at which they are planned and the intended effect to be achieved through their execution. Range is not the key consideration. Current range capabilities limit artillery.

but the fact that FM 100-6 ascribes major responsibility for operational fires to the Air Force has potential to perpetuate non-consideration of artillery in this role, even though improved artillery capabilities may support such usage.

Much of the current disregard for use of artillery at the operational level, besides its limited range, results from inadequate and imprecise fire support doctrine concerning the conduct of operational fires. The current inadequacy of US Army fire support doctrine follows many years of concentrated effort on purely tactical level planning and execution. As a result, there is inadequate artillery force structure to provide simultaneous and continuous support of tactical and operational fire plans. The real discrepancy exists in the wording of doctrine which indicates that artillery must be able to support both plans, even though that may not have been the original intent. In spite of the obvious problem, the requirement leads to pondering how the artillery might contribute.

To arrive at the conclusion that artillery can enhance the operational commander's ability to influence the outcome of the campaign or major operation, it is necessary to first ascertain what exactly constitutes operational fires. FM 100-6 offers a clear, but very general and incomplete, description of operational fires. The discussion in FM 100-6 recognizes theater air forces' major responsibility for the conduct of operational fires. However, FM 100-6 doesn't identify any differences between operational fires supporting major operations and operational fires supporting campaigns. Just as there are differences between the planning and execution of tactical and operational fires which doctrine overlooks, there are also differences between fires in support of major operations and fires in support of campaigns, or theater fires. The former category indicates that the fires occur in support of an operation and that the effects are cumulative and integral to the successful outcome of the operation. Campaigns may consist of successive operations. Fires in support of such campaigns will obviously have effects that accrue over an even longer time frame and may be phased throughout the campaign to ensure ultimate success. As a consequence of current range limitations, artillery presently appears to be more suited to support of major operations. This paper primarily concerns the

use of artillery to support operations, but advances in missile technology give artillery the potential capability to even support campaigns.

Operational fires are originated by the operational level commander as either objectives or specific targets which can have a decisive effect on the campaign or major operation. The objective of fire support at the operational level is to destroy, neutralize, or suppress high-payoff targets affecting the outcome of the campaign or operation.⁵ In practical terms, General Sir Martin Farndale, former Northern Army Group (NORTHAG) commander, stated that the goal of conventional operational fires was to stop the fight before nuclear weapons were the only alternative, or to at least buy time so that the nuclear decision was not rushed.⁶

Operational fires are self-contained operations designed to achieve a single, operationally significant objective. Operational fires are not fire support, but rather a co-equal component of the operational scheme. For that reason, operational fires are normally furnished by assets other than those required for the routine support of maneuver. In contrast to tactical fire planning in which fire plans are cumulated and reconciled at successively higher levels, operational objectives are established and targets designated by the operational commander, then passed to subordinate units for execution. Complete failure of operational fires to achieve the objective set by the commander will result in significant, if not decisive, negative effects on future operational plans.⁷

Since World War II, operational fires have focused on three tasks: facilitating maneuver to the operational depth by the creation of an exploitable gap in the tactical defense; isolating the battlefield by the interdiction of uncommitted enemy forces and sustaining support; and destroying critical functions and facilities having operational significance.⁸

Examples of these forms of operational fires include the carpet bombing that preceded the breakout of American forces from the Normandy beachhead. Planned as a separate operation and conducted by strategic and tactical air units and synchronized at army group level, the bombing blasted a three-mile hole in the German defense opposite Major General Lawton's VII Corps. Even

though Collins received twenty nine of the 1st Army's forty seven artillery battalions to assist in creation of this gap, shortage of artillery ammunition forced Collins to rely on the air units.⁹ Current doctrine tasking the Air Force to accomplish this task reflects this historical deficiency.

Similar "fire strikes" were common on the Eastern Front.¹⁰ A key difference was that the Soviets relied heavily on their artillery to blast gaps in the German defenses. Frequently massing over two hundred guns per kilometer of front in the breakthrough areas, the Soviets created exploitable gaps in the German lines. Entire German units disappeared in the Soviet artillery offensives.

Typical of the second operational fires task identified are battlefield air interdiction operations such as the isolation of Normandy in 1944, Operation STANGLE in Korea, and US efforts to cut the Ho Chi Minh trail in Viet Nam. While not wholly successful, each operation sought operational impact. While attriting the enemy force, the major contribution of interdiction fires is reduction of the enemy's freedom of movement. Current doctrine labels this deep operations by fire support and Joint Attack of the Second Echelon (J-SAK). Similar to the first category, doctrine assigns this task to the US Air Force.

FM 100-6 identifies the third task as almost exclusively the role of tactical airpower: attack of a critical function or facility having operational impact.¹¹ Air operations to deny the enemy use of the air exemplify this task. Other functions such as C² and logistics are also critical. Joint Suppression of Enemy Air Defense (J-SEAD) and deep operations by fire support provide other examples of operational fires which fit this category.

Understanding who qualifies as an operational commander is just as important in gaining an understanding of operational fires. Identifying the operational level commander at this time in regards to a projected war on the Western European landmass also facilitates subsequent discussion. The operational level commander can be one of several individuals. When discussing campaigns, the operational commander is either the Supreme Allied Commander Europe (SACEUR) or one of his principle subordinates, the Commanders-in-Chief of Allied Forces North (AFNORTH), Allied Forces Central (AFCENT), or Allied Forces South (AFSOUTH). In discussing major operations in Western Europe, the operational level commanders are the commanders of Northern and Central Army

Groups (NORTHAG and CENTAG, respectively). The operational commander determines what objectives are critical to the success of his major operation and how operational fires can assist in attaining these objectives. Once the operational level commander determines that a specific operation is critical, the fire support system must be able to support that operation. The Fire Support Officer (FSO) at army group level has the primary responsibility of advising the commander of the operational aspects of fire support capabilities. This includes apportionment, the allocation of fire support assets, logistical considerations, and nuclear/chemical fire planning.¹²

To some army officers ascribing a minimal role to the artillery is of seemingly minor consequence. There is little doubt that most Army officers recognize the tactical value of artillery on the battlefield. But amid the myriad of tasks assigned to the US artillery, there is no delineation between operational and tactical tasks. This has potential to create problems which are discussed later. The following are only a few of the tasks laid upon the US Field Artillery:

Support forces in contact. Support battle plans. Synchronize all fire support. Support and sustain operations. Conduct preparations. Suppress Enemy Air Defense and Anti-Tank fires. Block. Screen. Conduct counterfire. Interdict. Support the scheme of maneuver. Delay. Disrupt. Destroy enemy weapons, facilities, and formations, and fires from the enemy rear. Execute nuclear missions. Destroy appropriate Threat soldiers, their equipment, and their will to fight. Conduct close, deep, and rear fires. Orient on the enemy and not terrain. Support deception plans by fire.¹³

These tasks appear overwhelming. The generic approach to identifying artillery tasks hinders resolution of the problem of providing simultaneous and continuous fires to the tactical and theater commanders. On one hand doctrine says that artillery will support both the operational and tactical schemes.¹⁴ On the other hand, however, there is no clear explanation provided as to how the artillery should do this and do it adequately in both instances. Army doctrine doesn't say how to do it, and fire support doctrine is no better at clarifying the problem. If the intent is to expressly separate the responsibility for operational fires to the Air Force and to limit artillery to the conduct of

tactical fires, that should be clearly stated. As currently written, doctrine is unclear in its intent. If, on the other hand, it is not the intent to so limit the use of artillery, the means should be provided to accomplish operational level objectives. It is a puzzle that threatens to cause the misapplication of limited artillery assets as artillerymen attempt to meet all the requirements in piecemeal fashion.

By failing to make this delineation, current doctrine also perpetuates many commanders' belief that artillery has only the capability to provide tactical fire support. Current training practices reinforce this belief. The potential danger of this situation is the possibility of US officers not recognizing the important changes in capability as new artillery weapons with increased ranges, accuracy, and lethality become available. Such failure results in doctrine not changing to keep pace with new capabilities, and subsequently in weapon systems not being used to their full potential.

Specific examples of how doctrine is unclear in describing responsibility for operational fires include FM 100-5 stating that at the operational level, fire support disrupts the enemy's movement, fire support, command and control (C²), and sustainment.¹⁵ FM 100-5 also says that commanders should use firepower to delay, disrupt, and destroy units and facilities throughout the enemy's depth.¹⁶ Likewise, FM 100-5 says the principle targets are enemy freedom of action, coherence, and the tempo of operations.¹⁷ Fire support doctrine from the US Army Field Artillery School tells the artillery to isolate enemy echelons, to attack deep to block follow-on forces and reserves.¹⁸ Fire support doctrine also tasks artillery to destroy the enemy fire support before it is in range of US defensive positions, to fire in support of deception operations, to fire to create holes in the enemy's defenses, to attack his forces in depth before he (the Soviets) can develop his full combat potential, and to react to enemy initiatives such as movement of reserves to reinforce.¹⁹ But at no time do any of these manuals adequately explain the cutoff of responsibility. The question that arises is "How to do it?". By its very lack of specificity on responsibility, doctrine makes it impossible to determine precisely who does what. By stating that operational fires is largely the role

of air assets, doctrine does nothing to explain who or what is responsible for that portion that doesn't fit under the term "largely". Does that mean artillery? Clarification would help resolve the uncertainty and provide guidance for further artillery developments. A second question which follows close on the heels of assigning responsibility for operational fire "largely" to air assets is "Who takes over when fixed and rotary winged aircraft can't fly, particularly in view of frequent bad weather conditions in Western Europe?" Improved artillery weapons and munitions may provide an answer to that question.

FM 100-15, Corps Operations, adds to the melee that reserves are usually reinforced with artillery when committed.²⁰ NATO is currently concerned with creating operational reserves. If one extrapolates from FM 100-15 that reinforcement with artillery is also desirable at the operational level, where does the operational commander get the assets to do it? What may be doctrinal deficiencies conceals the inadequacy of current artillery force structure required to accomplish tasks such as this. In considering how to support a deception program at the operational level, one must question where the artillery assets, both in type and quantity, will come from to convince the Soviet target of the deception that a corps is still in position, or that a corps is coming on one avenue of approach indicated by the volume of fire exhibited? The assets do not appear to be available to support such actions. Instead, US doctrine states that the operational level commander must plan operational fires by ground-based support systems and pass on the requirements to the corps for execution. Our highest level tactical unit, the corps, is already heavily outgunned by the Soviet Front it faces in most scenarios and can be expected to have a difficult time just supporting the tactical battle. The Corps Commander's artillery assets will be stretched even thinner by having to fire the operational fires that the Army Group commander may pass on to the corps for execution. Prioritization of missions in the Operations Order may alleviate the problem, but it cannot change the overwhelming quantitative, and perhaps even qualitative, superiority in artillery possessed by the Soviets.

Doctrine recognizes the lack of force structure to accomplish every assigned task. Fire support doctrine discusses the assignment of relative target values just to handle the number of high-payoff targets. FM 100-15 adds that weapon systems for deep attack will usually be limited and that their use must be planned efficiently.²¹ Hines and Petersen support the argument that NATO's army groups have limited reserves and firepower to support the corps.²² It is difficult to understand how the Army can fight operationally without providing a means to the operational commander to directly influence the battle and shape the future battlefield. While agreeing that current artillery has limited ability to conduct operational fires, emerging weapon systems would allow the operational commander to begin shaping the battlefield early and hand off a delayed, and hopefully disrupted and attritted, enemy to the corps commander. Otherwise, all the Army does by fielding new systems with greater abilities to tactical level units is extend the forward boundaries of NATO's corps. The battle is still tactical; just the depth is different.

To support providing a ground-based indirect fire system to the operational level commander, the comments of one former and one current NATO army group commander follow. General Sir Martin Farndale, NORTHAG commander from 1985 to 1987, claims that the army group needs a long range system to make the enemy face a continuous, rolling attack as he advances. GEN Farndale would use the system against bridges, headquarters, logistics facilities, C², and operational units.²³ General Hans Henning von Sandrart, current NORTHAG commander, adds that attacking at the right time implies a need for a short-term reaction at the operational level.²⁴ General von Sandrart identifies a need for an organic weapon system at the army group level, and for the army group to be better able to control and coordinate the use of corps assets across boundaries.²⁵ From their comments, doctrine and force structure appears inadequate. Consideration for alleviating the shortcomings may be warranted.

Current Army doctrine is slow at recognizing and taking advantage of the change in artillery capabilities. The slow change is a recognition of the fact that change is expensive. The financial burden of reequipping units and creating additional force structure is prohibitive. Responding to army group commanders' requests are difficult, especially when their own governments balk

at spending more for defense. It is dangerous, however, to deliberately ignore the change in artillery capability and to not be prepared to update forces and doctrine, as required. Historically, a nation which sees the potential impact of technology and is willing to make the sacrifice to acquire and correctly employ new weapons has a marked advantage over an opponent who doesn't.

Unfortunately, current US artillery doctrine is no better at clarifying the issue of artillery's role in conducting operational fires or of recognizing the impact of advances in technology. As the source of truth for fire support matters, the Artillery School must take the lead in correcting this problem. Some efforts to do so appear to be underway. As the Artillery School Commandant, Major General Raphael J. Hallada, points out in the December 1988 Field Artillery Journal, "We must provide fire support at the tactical and operational levels."²⁶ He further confirms that refined doctrine is necessary before this can occur.

The current US and Soviet approaches represent a significant difference in doctrine and a wide discrepancy in force structure at the tactical and operational levels in favor of the Soviets. The rationale for the development of the opposing US/Soviet views on field artillery is enlightening. The Soviets recognize the artillery as the mainstay of the Soviet operational fire support system.²⁷ Soviet artillery, often referred to as the "Red God of War", is estimated to outnumber all NATO artillery assets by as much as 8 to 1. Soviet commanders at the operational level have sufficient artillery forces assigned to their units to conduct operational fires, as well as to augment tactical fires when necessary.

Analysis of the current capabilities and force structures allows a subsequent determination of whether or not there is anything the US Army can learn from its potential foe to improve its own ability to conduct operational fires and to overcome this apparent Soviet advantage. The analysis is particularly relevant in view of General Maxwell R. Thurman's description of the Soviet artillery as the "most serious of the panoply of threats facing NATO, based on the conventional force structure asymmetry between us."²⁸

The US Army expects its attack helicopters and the Air Force to overcome a portion of the problem. Both the Air Force and Army aviation have opposition to overcome similar to that faced by the US artillery, e.g. massive Soviet air forces and air defense systems, as well as Soviet army aviation assets. General Glenn K. Otis highlighted the problem resulting from relying solely upon attack aircraft in the operational role, "If we depend solely on aircraft for attacking deep echelons, we depend on the right weather, the right aircraft, the right timing, and the right intelligence."³⁰ Added to that consideration is the assumption that advancements in Soviet air defense capabilities, especially in surface to air missiles, represent a significant increase in the vulnerability of any aircraft once across the Forward Line of Troops (FLOT).³¹ Until and unless the US Air Force and Army Aviation overcome their own respective opponents on the future battlefield, the massive quantities of Soviet artillery at the tactical and operational levels pose a problem that US and, in turn, NATO artillery is currently unable to overcome.

In spite of the overwhelming numbers of Soviet Field Artillery, there are vulnerabilities in Soviet artillery which US Field Artillery can exploit. Battlefield success may result from attacking these vulnerable areas. Failure to provide a ground-based indirect fire system to the operational commander may result in failure to exploit these Soviet vulnerabilities. The Soviets claim that a vulnerability not exploited is not a vulnerability.³²

If technology allows the artillery to enhance operational fires, the Army must determine if it needs to make changes to its doctrine and force structure to take advantage of the field artillery's improved capabilities. Subsequently, the Army must determine if such changes are feasible and financially achievable within current budget constraints. Failure to address this issue automatically deprives the operational commander of the potential enhancement of his ability to attack the enemy's most important forces at the right time and place with the right weapon, attriting him and disrupting the tempo of his offensive. In spite of current predictions of a reduced Soviet threat and subsequent reductions in US Army force structure, now is the time for

the Army to reconsider a greater role for the artillery in the conduct of operational fires.

III. US/Soviet Artillery Force Structure Asymmetry

Wartime experiences have taught the Soviets and Americans much about artillery in war. Statistics show that artillery caused over 50% of all casualties in World War II.³² If air power then caused 40%, then the maneuver arms only produced 10%. An American soldier's comments support this, "We let the artillery fight the war as much as possible."³³

Entry into the world of nuclear weapons changed the US Army's perception of the requirement for artillery in future wars. Colonel Harry Summers noted in a recent editorial that "Forty years ago there were those who believed that nuclear weapons had rendered the field artillery obsolete and that there would be no need for cannons on future battlefields."³⁴ Although the two World Wars had been artillery wars in the sense that artillery had proven decisive in critical engagements, future wars would see little of massed artillery operations.³⁵ In spite of the fact that artillery was instrumental in stopping Chinese advancement in the Korean War, nuclear weapons were thought to be the way of the future.³⁶ The US devoted itself to acquiring and maintaining a superior nuclear arsenal to deter Soviet aggression. This kind of thinking proved to have a negative impact on the development of American artillery. The results of this mindset surfaced later in Viet Nam as the Soviet D-30, 130mm howitzer, outranged all classes of American artillery used there.³⁷

As time passed after the advent of the nuclear weapon age, the overwhelming American superiority in nuclear weapons vanished. The US Army conventional superiority remained only slightly longer. Peace and the American isolationist tendency, abetted by calls to improve social programs, aided the decline of conventional weapons. The US desire to maintain military superiority was replaced by opting for parity and the hope of achieving stability.³⁸ This did not bring a similar response from the Soviets. Instead, it appeared to be an open invitation to the Soviets to surpass us.³⁹ They did so, and not just in artillery. In addressing the change in the respective Soviet and American military fortunes, General Jack Merritt noted prior to his retirement, "We don't have enough artillery in NATO."⁴⁰ The cost of personnel and other programs

widened the gap. General Merritt continued, "Earlier, we could have neutralized their (Soviet) artillery quickly, but that isn't true anymore."⁴¹

The Soviets' cumulative wartime experience dictates that artillery is vital to success in any military undertaking. The dictum "Too much is not enough." aptly describes their structure, as well as their obedience to the dictates of experience.⁴² The Soviets have learned and heartily support Lenin's notion that quantity has a quality all its own. Soviet artillery totals are as follow: 48,000 artillery pieces, comprising cannons, rocket and missile launchers, and mortars.⁴³ Depending on the source quoted, this amounts to estimates ranging from a 5:1 to an 8:1 ratio in artillery weapons facing NATO, achieved after a twenty year buildup.⁴⁴ Comparatively, the US has only achieved a 9% increase in the last 12 years against the USSR's increase of 133%.⁴⁵

The typical Soviet maneuver division now has more artillery battalions than infantry. The addition of the 82mm Vasilyek automatic mortar at the motorized rifle battalion level significantly increases the suppressive capability and flexibility of the battalion.⁴⁶ The nine Multiple Launch Rocket Systems (MLRS) at the US division level matched up to the fifty-four Army level BM-27 launchers, which may possibly be allocated in the sector of the main Soviet attack, seem paltry by comparison.⁴⁷

But fighting outnumbered and winning is a philosophy embedded in the minds of American officers throughout their military education, even though this philosophy is one without much historical precedence. In the face of such massive Soviet artillery, it is only fitting that the US and NATO consider how best to defeat this opponent's conventional force advantages.

Past experience shouldn't be ignored in determining whether or not there is an operational fires role for US artillery in seeking solutions to this disadvantage. What appears to be most consequential is the constraint imposed by logistics. Highly mobile situations exacerbate the problem of resupplying ammunition to units. Increased expenditure rates are an additional consideration, even though Soviet and US studies indicate that increased maneuver rates result in decreased artillery ammunition consumption rates.⁴⁸ The Soviet response has been to increase its ammunition stocks. For the US and

NATO, however, the shortage continues to be a problem. Sixty percent of the artillery ammunition stored in Europe is old high explosive (HE), not the highly efficient, improved technology rounds available now or currently under development.⁴⁹ This is one problem that the US and NATO have to address just to support the current force structure.

Other constraints include the effects of hostile air and artillery attacks, as well as the reduction in available artillery due to displacement. Due to these reasons and a variety of other factors, the Soviets maintain that only 50 to 70% of available artillery will ever support the maneuver units, and then only for a limited time.⁵⁰ The quantity of Soviet artillery and missile units compensates for this shortcoming. If the US and Soviet fixed and rotary wing forces counter-balance each other, the Soviet artillery may be expected to be used to break the resulting stalemate. The extensive array of missile units at the operational level in the Soviet army provide the continued ability to conduct operational fires in the event of such a stalemate.

Like the Soviets, the US recognizes that any future war in Europe will require continuous operations. The quantity of Soviet artillery allows continuous support of operations. Problems arising from the perceived need for continuous operations include the fatigue of men and equipment. As the artillerymen tire, the rate of fire decreases. Constant firing results in higher maintenance problems and tube wear. Other factors, such as weather, seasonal changes, and friendly or hostile air superiority also effect the artillery's output.⁵¹ These problems will affect the US and Soviet artillery in similar fashion. With the quantity of artillery available to the Soviets, however, they have the option of resting crews and of replacing artillery units without degrading the tactical battle. At the same time, they maintain the ability to conduct operational fires. The same is not possible for US artillery and leads to the potential for the fire support provided to American maneuver units to degenerate more quickly than that of the Soviet's.

Finally, there must be accurate and timely intelligence to support the artillery attack of high-payoff targets. This alleviates two problems. Ammunition which may be short is not wasted, and response times improve. Each

of these lessons will influence decisions concerning the future role of artillery as an operational fires asset.

Current Army doctrine recognizes that Armies and Army Groups are allocators of resources and planners of campaigns and operations.⁵² But artillery assets for fire support allocation at Echelons Above Corps (EAC) are nil.⁵³ There are no assets held in reserve to handle the operational commander's requirements. He has no ground-based system to influence the operational or tactical battle. He has no reserve artillery to allocate to operational reserves to support their actions. He knows his Soviet counterpart, on the other hand, has reserves and additional fire support means. His counterpart is also not hampered by a multitude of national doctrines that hamper coordination of operational fires. Consequently, he knows the Soviet operational commander's options are not as limited as his own. Hines and Petersen emphasized in their article "Is NATO Thinking Too Small," that a command without reserves or firepower to affect the battle is no command at all; it is simply a switchboard or a bottleneck.⁵⁴

Within NATO, fire support requirements from EAC are passed to the Corps for execution. Doctrinally, EAC fire support requirements only become priority missions for the corps at the corps commander's direction. Some commanders may argue whether or not there is any room for discretion in such a situation, but success or failure of an operation may ride on corps artillery assets performing exactly as requested. The fog and friction of war assure that plans will very seldom occur as written or coordinated. Yet another drain on the corps' already limited pool of assets may further hamper success. "Things take longer than they do." may aptly describe why expecting corps to conduct operational fires in a timely manner may be inappropriate.⁵⁵

The 1st (US) Armored Division learned a lesson concerning counterfire that has potential applicability in the conduct of operational fires. Although not considered an operational level unit, the 1st (US) Armored Division demonstrated during its 1987 Iron Star Exercise that separating responsibility for the counterbattery mission and the close support mission achieved significant results in destruction of enemy artillery. Attrition rates of enemy assets rose

from 4:1 to 13:1.⁵⁶ Determining whether or not the artillery can attain similar results against high-payoff Soviet targets at the operational level by clearly defining the tactical and operational fire support missions and providing the operational level commander with adequate artillery forces to engage these targets may be a worthwhile undertaking for the US Army.

The difficulties inherent in planning and coordinating an operational level fire plan is staggering. Inexperience on the part of the US Army in planning and executing artillery fires at the operational level and limited assets decrease the likelihood of success. To amplify the challenge, one needs only to consider the additional difficulties that arise at the operational level from NATO corps using different national military doctrines. Personalities and cultural conflicts also have potential to degrade the process.

The US relies on the promise of technological superiority to overcome these problems as well as to overcome the Soviet quantitative edge. But the technological advantage can easily disappear, especially when the Soviets seem to display a marked ability to borrow or otherwise acquire and field new technology faster than NATO.

More than mere numbers and weak doctrine effect the future of artillery and its potential as an operational fires asset. Premier Gorbachev, speaking before the United Nations (UN) in December 1988, explained his plan to unilaterally reduce Soviet Forces in Eastern Europe by 500,000 men, 10,000 tanks, 8,500 artillery pieces, and 800 aircraft.⁵⁷ Soviet forces would still retain a significant force advantage. This unilateral offer by the Soviets has the potential to induce reduction or to slow down US and NATO efforts to overcome the disadvantage in artillery forces.

US politicians prone to wishing away the horror of war and seeking election or reelection by promising defense budget cuts could hardly ask for a greater windfall. It appears to them that with such an enlightened ruler at the Soviet helm, the risk of war is negligible. Thus, there is no need to increase or improve our Army's capabilities. Programs aimed at reducing the conventional artillery gap suddenly seem less important. One can only speculate how Gorbachev's offer will affect US and NATO willingness to upgrade conventional arms capabilities.

However, the problem did not originate with Gorbachev's proposals. As CACEUR, General Bernard W. Rogers described in 1987 his problems related to the fielding and sustaining of adequate forces to defend NATO.⁵⁸ He noted that current forces had to be brought up to standard in training, equipment, and force structure. Equipment and ammunition stocks were also inadequate. He added that those who claimed that NATO could be defended conventionally usually chose to ignore such facts.⁵⁹ Although the present threat of general war in Europe may be low, that situation could change quickly. The Soviets could attack. Their doctrine is offensively oriented. Even though Premier Gorbachev claims that the Soviet armed forces will attain a totally defensive posture by 1991, the past two hundred years show the Soviets on the offensive in thirty-six of thirty-eight campaigns.⁶⁰ The risks associated with being ill-prepared to meet a Soviet invasion require the member nations of NATO to maintain credible conventional forces. Steps taken by the US Army to improve the capabilities of its artillery make NATO's defense more credible. But if the US Command and General Staff College motto, "In time of peace prepare for war," is true, US Artillery has a lot of work ahead.

IV. Soviet Rocket Troops and Artillery and Operational Fires

The fortunes of American artillery, as with other branches of the US Army, are a reflection of the country's own mood and character. In times of war, the services receive the funds necessary to develop and build the forces required to win. At other times, the funds flow less freely. The people expect the country's monies to be used for social programs to improve the quality of life. This penchant for mobilizing for war with rapid reductions in forces at the conclusion of hostilities historically leaves the US unprepared at the outbreak of the subsequent war. Americans boast of their ability to mobilize and bring the full brunt of their power to bear and crush an enemy. However, the expected short duration of any future war in Europe may not permit such a time-consuming mobilization of American industry.

That is not true with the Soviet Union. The Russian people have always sacrificed, willingly or not, to provide a military force capable of defending the homeland. The Soviet Army has grown in size and stature to keep pace with the Soviet emergence as a world power. But the Russian, and subsequently Soviet, Artillery has always enjoyed a special place in the Russian heart.

Since its use to defend Moscow against the Tartar hordes in 1382 until its decisive role in the defeat of the Nazi invaders of World War II, Russian Artillery has been instrumental in protecting Mother Russia.⁶¹ The Artillery's reputation for preserving the homeland has acquired almost mystic proportions and has earned it a place in Russian folklore.⁶² Other arms might wane in popularity with changing winds of doctrine, but Soviet Artillery remains a standard fixture. Time has only witnessed its growth in size and capability.

In spite of early prophecies of its demise following the advent of airpower, Soviet artillery has continued to play a vital role in the development of Soviet warfighting capabilities. As the Soviets have gained experience in conducting war at the operational level, they have sought to achieve the maximum potential from each arm of service. The Soviets have yet to retreat from their view of the importance of artillery to battlefield success at both the tactical and operational levels, nor do they show any inclination to do so.

Experience since World War I only confirmed to the Soviets the lessons of earlier history. Soviet artillery forces reflect the influence of experience as well as the influence of Russian geography.

The writings of Triandafillov describe the changes which occurred in the artillery forces of the participating nations of World War I. Although most nations had amassed large quantities of artillery, the Germans had achieved surprise with great results on the Western Front in 1918 by concentrating with massed artillery.⁶³

The Soviets point to General Brusilov's brilliant success on the South-West Front in 1916 as the first example of the correct application of massed artillery in World War I.⁶⁴ By stressing detailed planning and combined operations with the infantry, and combining this with the proper concentration of artillery on the breakthrough sectors, the Russians were able to achieve a breakthrough and subsequent advance considered spectacular by World War I standards.⁶⁵

More significantly, the Russians were able to attack into the enemy's depth while providing fire support throughout the assault to the attacking force. The Russians accomplished this by holding artillery in reserve in bunkers built near the front lines and by having light artillery accompany the attacking infantry.⁶⁶ This action clearly foreshadowed the later Soviet concept of the "Deep Operation" and the current emphasis on providing fire support throughout the enemy's depth.⁶⁷

Although Triandafillov emphasized the importance of artillery in defeating the Germans in World War I, his views did not receive unanimous support from the Soviet officer corps. He contrasted particularly with those who claimed that future warfighting would be dominated by combined armor and air weapons, with artillery assuming a lesser role. His detractors foresaw the airplane and the tank as the fire support weapons of the future. To those who argued that tanks could now provide adequate indirect fire support, he advised caution.⁶⁸ In contrast, Triandafillov saw the capability of artillery to destroy both tanks and anti-tank weaponry. The artillery would also provide security through its fires for tank attacks.

But in order to provide operational capabilities to the forces, Triandafillov explained that it had been necessary in the war for all armies to increase the artillery numerically, to increase the quantity of howitzers at the expense of guns, and to increase the numerical strength of the heavy artillery.⁶⁹ The numerical increase alone had made it possible in offensive operations to concentrate the artillery necessary for breakthroughs.⁷⁰ In this case the belligerents concentrated artillery through movement of weapons into the breakthrough sector, and not through the massing of fires. Fortunately for the Soviets, the far-sighted Triandafillov left a legacy of ideas that would serve them admirably in the Second World War.

Soviet artillery increased rapidly in quantity through the years prior to World War II and stood at about 67,000 pieces (guns/howitzers, mortars, and rocket launchers) by 1941.⁷¹ At war's end that number had increased to about 335,000 pieces.⁷² In contrast to the German preference for aircraft to serve as fire support of the Blitzkrieg, the Soviets kept artillery in their scheme. As Triandafillov had written, the artillery destroyed tanks and anti-tank weapons and also secured the flanks of its tank attacks by fire. In doing so Soviet Artillery learned some valuable lessons. The extensive mobility of the forces pointed out the extreme lack of ability of the artillery to support all its requirements with the numbers available at the beginning of the war. To achieve superiority, it was necessary to mass artillery in great quantities. This required time initially, but less so as the numbers of artillery pieces increased.

The Soviets recorded other lessons which still affect current Soviet artillery doctrine. Included among these lessons is that the time required to mass numerically and the sheer size of the concentrations increased the chances for the enemy to determine what was happening. Since training for rapid shifts and concentration of fires was then only rudimentary, numerical increase proved to be the solution.⁷³

Subsequent to 1941, 70-90% of available artillery was concentrated on breakthrough sectors.⁷⁴ The huge quantities of artillery recorded in Soviet operations was made possible by denuding some sectors and simultaneously

concentrating reserve artillery units and that of second echelon units.⁷⁵ The Soviets were successful in masking the concentration of these artillery forces and achieved surprise by secretly moving these artillery reserves across rear boundaries and concentrating them in breakthrough sectors.⁷⁶

With the large quantity of artillery available in the critical sector, the Artillery was able to influence the success of Soviet operations. Massed fires annihilated entire German units, opening gaps in the defense and easing insertion of Mobile Groups into the enemy's depth. In fact, the Soviet artillery offensive became a hallmark of Soviet operations. As an example, in the Vistula-Oder operation of January 1945, the Soviets massed 200 guns per kilometer. In the ensuing attack the XXIV Corps was virtually annihilated.⁷⁷ In the same operation, a German unit occupying a defensive position at Grobow and which had withstood every Soviet assault, vanished in a 5 minute preparation of 1100 rounds.⁷⁸ The operation was successful, as might be imagined.

As outlined in FM 100-6, the massed Soviet artillery fires served to isolate engaged enemy units from reserves. Massive counterbattery fires protected the attacking force. The same fires enhanced the survivability of the attacking force and artillery simultaneously. Numerous operations succeeded through the weight of the artillery onslaught.

The artillery fires also influenced the success of Soviet deception plans for several operation.⁷⁹ The Soviets were able to influence German actions through the deception achieved by allocating a portion of fires to indicate false avenues of attack. The sheer quantity of artillery available provided the operational commander numerous options and opportunities.

By war's end, the Soviets had amassed over 500 non-divisional artillery units, 149 independent artillery brigades, 90 artillery divisions, and a large number of rocket launcher units.⁸⁰ Stalin declared 19 November, 1944, to be Artillery Day for its having attained dominance on the battlefield, for stopping the enemy at a critical hour, and for paving the way for the infantry and armored forces in the drive for Berlin.⁸¹

The lessons learned from this "Great Patriotic War" have not been lost and are evidenced in current Soviet practices. Included among the many lessons learned and still observed in practice is the need for centralized control for breakthroughs, followed by rapid decentralization for exploitation. The Soviets still maintain and practice moving large artillery reserves to effect surprise. Infiltration and reconnaissance are expected to provide a detailed view of the battlefield so that key targets may be accurately attacked. Numerous moves and extensive use of camouflage enhance survivability. But most significantly, operational and tactical commanders have artillery forces assigned at their levels for the simultaneous accomplishment of tactical and operational fire plans.

By their present configuration for battle, it is obvious that the Soviets expect artillery to be a significant operational player in any future conflict. Although Premier Gorbachev speaks of simple sufficiency and of the Soviets attaining a purely defensive posture by 1991, Soviet history and the massive quantity of Soviet conventional munitions reflect a commitment to the offensive.⁸² General Glenn K. Otis, former CENTAG commander, sustains that view, adding that the 100% increase in artillery at the Soviet army level, as well as increases in other unit capabilities show a force equipped for the offensive.⁸³ The success of the fire support effort is integral to success of that offensive. Y. Ye Savkin writes in The Basic Principles of Operational Art and Tactics:

The chief role in accomplishing maneuver belongs to fire. Now the force of fire has risen so greatly that it becomes possible to use powerful fire strikes to achieve destruction of the enemy to his entire depth and thus insure non-stop advance of troops at high tempo.⁸⁴

The Soviet Army force structure reflects the acceptance of this statement. Advancements in the quality and quantity of artillery throughout the Army support the thrust of achieving overwhelming superiority over the enemy at all levels from the beginning of hostilities until the conclusion in a Soviet victory.⁸⁵ Soviet fire support at the operational level is tasked to blast gaps in enemy defenses, immobilize units, destroy units in depth, to repulse or

destroy enemy counterattacks, and to attrite enemy forces.⁸⁶ The difference is that the operational commander is provided organic assets to accomplish the assigned tasks. He has no need to plan and pass on his mission requirements to a lower echelon for execution. That in itself inherently shortens the planning and execution cycle. Does that equate to agility in the conduct of operational fires? It may.

Currently, 15% of the Soviet Army serves in artillery units, comprised of gun, howitzer, mortar, and rocket and missile forces.⁸⁷ As the Army has grown, artillery units have grown in similar fashion. The Soviets cite the '73 Israeli War as the cause for the increase, noting that the high mortality rate for tanks dictated a need for enhanced suppression of anti-tank weapons.⁸⁸

But the need for suppression does not wholly support the intense effort and money expended to upgrade the Soviet Artillery. Behind the upgrade is the recognition that terrain for maneuver, particularly in Western Europe, is limited. Increased artillery capabilities allow the massing of fires without the formerly requisite massing of artillery pieces. Given the Soviet perception that fire support is the most decisive element in modern combat, it then makes sense for them to modernize fire support systems faster than maneuver systems.⁸⁹

Recent changes in the Soviet artillery at the operational level include the change of the Combined Arms and Tank Army artillery regiment to a four-battalion brigade. The BM-27, a 240mm multiple rocket launcher (MRL), is now fielded in regiments at the Army level. Rocket and missile forces, and high-powered artillery brigades have been upgraded to enhance their ability to reinforce and supplement fires at the tactical level. In many instances the changes are dramatic.

The Soviets see little need for the massive preparations of the "Great Patriotic War". Huge artillery concentrations only give away intent, ruin any chance at surprise, and allow the enemy to maneuver reserves to prepare for a counterattack.⁹⁰ The time required to amass the quantities of weapons and ammunition, to displace and emplace weapons, and to develop detailed fire support plans reduces the ability to maintain momentum in the attack.⁹¹

The call now is for short, massive fire strikes to disrupt rather than to destroy.⁹² Technology and improved logistics make this possible. Soviet fear of precision guided munitions and standoff acquisition and attack means dictate the need for continuous fires throughout the enemy's depth. Fire strikes instead of long preparations accomplish that mission better.

Despite attempts to upgrade doctrine and procedures, rigid adherence to procedures in the past makes it difficult to effect upgrades.⁹³ Previous conformity to requirements for massive preparatory fires and massed artillery formations yields slowly to new doctrine on short, massive fire strikes and dispersed artillery units. The same conformity, however, bound together with precise Soviet terminology, makes it much easier to coordinate extensive fire support plans at tactical and operational levels.⁹⁴

The purpose behind the ongoing Soviet Union's efforts to maintain its quantitative edge over NATO is a perceived need to be able to achieve fire superiority over any opponent. The Soviets define fire superiority as the ability to implement one's own fire plan while suppressing the enemy's.⁹⁵ This doesn't just mean attacking the enemy's weapon systems. It also refers to attacking the C², logistical support, and other support systems. The Soviets maintain that fire superiority will go to the side that strikes first, thereby achieving surprise, mass, and the ability to maneuver in the enemy's depth.⁹⁶ The Soviets intend to do this by maintaining continuous fire on enemy fire support means whenever and wherever located. Expecting to counter NATO's air forces and attack helicopters by the integrated use of their own attack aircraft, helicopters, and air defense systems, the Soviets believe they have the artillery edge at the tactical and operational level that permits them to attain fire superiority. Only the test of actual combat permits a determination of which side has prepared properly for war through the development of doctrine, the acquiring of materiel, the conduct of realistic training, and the establishment of correct force structure. The Soviet doctrine of fire support and the means available to them to execute fire support according to their doctrine poses a serious challenge to NATO's own ability to fulfill the requirements of modern combat.

The Soviet Army has several vulnerabilities which may be exploited to offset the disadvantage. Exploiting these vulnerabilities can multiply the effect of artillery currently available to our own maneuver commanders.⁸⁹⁷ Consideration of these vulnerabilities reveals suitable targets for attack by operational level fire assets. First on the list is the Soviets' weak logistics system. Although their stated doctrine calls for short, violent firestrikes to support the rapid advance of the attacking forces, the large quantity of artillery indicates that resupply will be very difficult. Additionally, the norms which govern Soviet artillery fires are overprogrammed and redundant, resulting in wasted ammunition.⁹⁸ Fires conducted to disrupt the logistics system can be expected to wreak further havoc on a system that supports peacetime operations with difficulty.

There are other Soviet practices which may be actively targeted to great effect. Perhaps the most significant is the requirement to maintain the tempo of the attack. Many Western military observers do not understand what is meant by the tempo of the Soviet operation. Like a symphony, certain actions must take place for the elements of offensive operations to fit together in harmony. The variety of forces must be at certain places at specific times to insure the continual flow of operations. As a result, any action on the part of the US Army which disrupts this tempo will bring great disorder to the entire offensive process. Direct attacks of Air Defense units, Field Artillery forces, logistic and engineer bridging units will affect the Soviet tempo. The key is in the timing so that the Soviets aren't permitted sufficient time to take corrective action.⁹⁹

The Soviet command structure represents another suitable target for operational fires. The Soviets have a very rigid, autonomous command structure. They are predictable, although not with 100% certainty. Unlike ourselves, the Soviets seldom violate their doctrine. This simplifies targeting efforts to some extent. The rigidity means that casualties among the officer, NCO, and warrant officer ranks can be expected to have more significant effects on operations. Hostile artillery strikes will significantly degrade the effectiveness of Soviet artillery units.

Three Soviet capabilities which NATO must concentrate its efforts against are mobility, survivability, and C². Assets entering the US Army inventory, such as scatterable mines, improve its ability to disrupt Soviet mobility. Used against his logistics, air defense and artillery assets, Soviet tempo rapidly disintegrates. An aspect of survivability that is open to attack is the Soviet maintenance system. Since the Soviets do not deploy maintenance units forward, they are apt to lose many vehicles quickly. Attacking maintenance units will lessen the likelihood of damaged assets returning to the battlefield for a second chance. Attack of Soviet C² may bring the attack to a halt, or at least slow it significantly.

Finally, the Soviets consider unit boundaries inviolable. Once artillery command is decentralized to support maneuver, it becomes very difficult to mass fires. In each sector of attack, artillery support will be limited to the forces assigned to that maneuver commander. Our own concentration of artillery efforts against his fire support could easily grind his attack to a halt. The key for the US Army is to identify the sector of greatest risk in which to concentrate our effort.

It is impossible to calculate the synergistic effect of successfully engaging the individual functions noted above. Success against one target may improve our ability to use other systems more effectively. Supposing we are able to take out the enemy's soft-skinned vehicles, will that result in increased effectiveness of our anti-tank systems? On the operational level, what happens to the Soviet tempo if we successfully neutralize one of his operational systems? We can't afford not to use all available assets to try. The US Army, as part of the forces which will fight for NATO, must continue to look for new and innovative ways to overcome disadvantages. With current budget restraints and the promise held by emerging technology, artillery provides an alternate means of enhancing NATO's operational fires capability that is less expensive than aircraft, potentially more reliable, and available at practically all times. Although artillery may not be the ultimate solution, the Army cannot afford to ignore its artillery as an operational fires asset. The US Army's challenge is to be prepared to counter the Soviet machine until in possession of

the sure means to defeat it. In the meantime, providing a ground-based indirect fire system to the operational commander appears to be a solution that holds much potential for providing NATO a capability to exasperate the Soviets' problems and to disrupt the tempo of the Soviet offensive.

V. US Artillery and Operational Fires

In contrast to Soviet conventional artillery, US artillery has only brushed up against the challenge of developing an operational capability. Emerging systems and doctrinal thought hint that the US Artillery may be aspiring to such a capability, but the goal seems elusive. The US Artillery's experience provides illuminating evidence why this is so.

Considering only the artillery developments since World War I, the opportunity to achieve status as an operational fire asset existed, but circumstances and the American tendency to reduce its armed forces at the conclusion of war intervened. The near approach to greatness in line with that of Soviet Artillery died in infancy.

Following World War I, the Army Chief of Staff, General Peyton C. March, appointed a board to draw up recommendations on the future of artillery. The recommendations of this board favored mobility over killing power, but the eventual design of American artillery leading into the second World War did not follow suit.¹⁰⁰ Artillery was towed and lacked much of the mobility prescribed by the board for supporting highly mobile mechanized forces.

Fire support doctrine at the beginning of the Second World War did provide for Artillery to conduct operational type missions. Included among the tasks assigned to the Artillery in the 1941 version of FM 100-5 were the requirements to isolate enemy combat formations from the rear and to destroy the enemy command and control (C²) structure.¹⁰¹ Included in the tasks assigned to the artillery were the long range destruction and interdiction of Lines of Communication (LOC) and other sensitive areas.¹⁰² Especially important was the long range attack of the enemy artillery before it completed its deployment and could bring its power to bear.

The artillery available at each level of command had specific responsibilities in accomplishing the tactical and operational fire support requirements. Division artillery supported the close battle. Corps artillery neutralized hostile artillery with long range interdiction fires and reinforced the divisions. Army level artillery conducted distant interdiction and destruction missions and reinforced the corps. The General Headquarters (GHQ)

artillery reserve was allotted to the armies for employment. The stage was set for the Artillery to achieve a truly operational capability.

Two things prevented that: General Leslie McNair and a shortage of ammunition which hampered the artillery for much of the war in Europe. In his drive to make the army efficient, General McNair followed one "sound fundamental."¹⁰³ As with other assets, General McNair pooled artillery assets to allow centralized control of their use in time of need. Expecting that there would be many periods of inactivity, artillery would then support only those sectors currently active. Although General McNair may have been right in his perception, the possibility exists that some periods of inactivity, as well as possible loss of some options, arose out of the deficiency of assets brought about by his adherence to this "sound fundamental".

The additional problem of artillery ammunition shortages in World War II resulted from difficulties in gearing up for production and in getting the stocks off-loaded and brought forward to the firing units. Although General Lawton J. Collins received 21 of the First Army's 47 artillery battalions for Operation COBRA, shortage of ammunition limited the support provided. Collins had to rely primarily on air support for the operation.¹⁰⁴

Improvements in the ammunition situation facilitated extensive employment of massed artillery in the opening preparations of subsequent operations. Field Marshall Montgomery's Operation VERITABLE included a 5 1/2 hour preparation by 1,043 guns, the largest seen on the Western Front up to that time.¹⁰⁵

Montgomery's subsequent crossing of the Rhine River provides an additional example of the growing understanding of the use of artillery to achieve operational effects. General Anderson's XVI (British) Corps, leading Montgomery's crossing of the Rhine, commenced the attack with a 2,070 gun preparation.¹⁰⁶ This one corps opened its attack with fifty four battalions of artillery, all of the artillery of the neighboring XIII Corps, plus the battalions of one division of that corps firing in support. The operational commander planned for the fires to achieve operational effect. The operational fires isolated the battlefield and created an exploitable gap in the enemy's tactical defense. The operation was successful.

Similar episodes occurred until the war's conclusion. But in the years following the war, no foundation of operational theory existed upon which to build artillery doctrine.¹⁰⁷ The American isolationist tendency also provided little impetus for development of offensively oriented doctrine.

As a result of budget cuts and disbanding of force headquarters, the Army contented itself with brigade-level experimentation.¹⁰⁸ The total effect of all this was to obscure the need for large artillery formations and the relegation of artillery to the "back burner".¹⁰⁹ As highlighted earlier, the neglect of artillery development resulted in American artillery being outranged in all classes during the Viet Nam War by the Soviet D-30 120mm howitzer. The American artillery community was no longer thinking operationally.

In contrast to the Soviet predilection for mass, the ability to shift rapidly to concentrate fires and reliance on superior C² has always been a hallmark of American artillery. Only recently has the vast quantitative discrepancy between the Soviet and American artillery assets forced US Army efforts to develop and acquire sufficient capability to decrease the asymmetry in artillery forces. General Otis emphasized, in noting the offensive minded organization of the Soviet armies, "This requires us to modernize our artillery, increase our force structure, and improve our ammunition stocks."

Military writers have addressed the problem of how best to use the available assets to defeat a Soviet attack. Whereas early doctrine dictated destruction of the enemy's leading combat forces, recent thought indicates that it may be more advantageous to delay specific forces to disrupt the tempo of the attack.¹¹⁰ For example, the attack of the engineer unit erecting a bridge may yield more benefit than attacking a second echelon combat unit that has already used the bridge to join the attack.

Just as with Soviet artillery, old habits and procedures are hard to change. The US Army continues to push artillery forward to insure the tactical commanders have sufficient force to handle the close battle. Experience indicates that the less we know about the enemy dispositions, the more artillery we need to keep under centralized control to engage unforeseen situations.¹¹¹ At present, the operational commander has no such assets to respond quickly to unforeseen situations.

The concept of operational fires has emerged with the renewed interest in the operational level of war. The artillery's all weather responsiveness makes it ideal for many operational missions. Used to complement the operational fires capabilities of attack aircraft and helicopters, the artillery has great potential as an operational fires asset. This is particularly true as artillery capabilities continue to improve.

If the opinions of Generals von Sandrart and Farnworth are valid, current operational level commanders require their own ground-based delivery systems to insure responsiveness and an ability to control the operational fires while the Corps control and support the tactical battles.¹¹² The Army needs to review this perceived requirement to determine if the need is valid and if its resolution is feasible, and not just a request to develop or create systems and structure for which no real need exists.

Not surprisingly, the ammunition shortages identified in Section IV continue today. Ammunition just isn't available in sufficient quantities to engage the wide assortment of targets that will exist on the future battlefield. As new weapons join the inventory, they bring with them an automatic 30-day shortage of ammunition.

The difficulty of overcoming current ammunition shortages may influence the Army's decision to ever increase artillery force structure to provide a ground-based fire support system to the operational commander. If budget constraints prohibit correction of the ammunition shortfall, increasing the artillery force structure to provide such a system to the operational commander makes no sense. But Army doctrinaires must continue to update doctrine to insure that the US Army takes advantage of each improvement in artillery capabilities and is prepared to change to meet changing situations. An unforeseen breakthrough in technology or insight to the proper application of that technology may bring success on the future battlefield.

The US Army is still in its infancy in developing a capability to wage war at the operational level. As the Army matures in its capability, the role that it perceives for the artillery in the conduct of operational fires may change. We have to be ready to take advantage of every opportunity to improve support to the fighting forces. The use of artillery to conduct operational fires may be one area in which opportunity exists.

VI. Improving US Artillery Capabilities

Major General Raphael J. Hallada, Commandant of the US Field Artillery School, stated in an article in the December 1987 Field Artillery Journal, "...we must provide the fire support necessary to fight and win at the operational and tactical levels of war."¹¹³ The task becomes one of determining how to accomplish both missions with available assets.

That appears to be impossible right now. But there are many innovative technological advancements which hold promise of significantly enhancing our current capability. The Soviets have a great fear described by the term *skachok*. This means a fear that a technological leap on our part would neutralize their massive buildup.¹¹⁴

In actuality, the potential for advancements in firepower far surpasses current expectations of potential improvements for tanks. Unfortunately, we continue to pour billions of dollars into tank research and "throw nickels and dimes at fire support".¹¹⁵ Recent improvement in metallurgy, mechanics, explosives, range, accuracy, lethality, and versatility foreshadow a future rich in potential for artillery fire support.¹¹⁶

Artillery advancements include enhanced target acquisition, improved C², and munitions that promise single round defeat of armored targets. It is not the purpose of this paper to identify each new system and note its capabilities, but the overall effect of the advancements is to provide a quantum leap in our ability to acquire and engage enemy targets.

One of the primary requirements for timely and accurate artillery fire is a good target acquisition capability. Target acquisition advancements include the enhanced Firefinder radar, improved sensors with greater range and effectiveness, Unmanned Aerial Vehicles (UAVs) to recon forward areas searching for targets, and the Joint Surveillance and Target Acquisition Radar System (JSTARS). JSTARS will be able to see 320 kilometers beyond the Forward Line of Own Troops (FLOT) and provide near instantaneous target information to commanders.¹¹⁷ The key will not be to engage every target as quickly as possible just to move faster than the enemy in all areas. Engagement must inflict the greatest damage on the enemy at the right time and place and allow

him the least amount of time to correct the damage. The overall effect is to upset the all-important tempo of the Soviet offensive.

Numerous advancements in target acquisition, fire control, cannons, missiles, and artillery munitions increase the artillery's ability to disrupt the Soviet's offensive tempo. The implications of these advancements are that indirect fire weapons may acquire and attack targets at a level approaching that of direct fire systems.¹¹⁸ Indirect fire weapons can be expected to dominate the battlefield at deeper and wider ranges. The threat of destruction will force maneuver elements to disperse more widely and concentrate more rapidly. Positive benefits for maneuver elements may include relief of maintenance of sensor belts and relief from the burden of effecting penetration of the direct fire zone.¹¹⁹

There must also be a word of caution in getting too caught up in the technology solution. A Soviet idiom states, "Better is the enemy of good enough." In this instance there is a danger that the US Army can get caught up in a war without having procured sufficient quantities of proven equipment.

There are other problems which influence US and NATO decisions to upgrade their conventional forces. These include the costs of replacing current inventories of equipment, to include research and development costs, fielding costs, and the expense of training, maintaining, and providing logistic support for the new system. Commanders must also be concerned with the operational costs: resupply, sustainment, and self-defense.

Europeans, moreover, may question US intentions in pushing such advancements.¹²⁰ Do the advancements signal our intentions to decouple NATO from our nuclear umbrella?

Even though these advancements hold much promise for overcoming current operational deficiencies, there are still many obstacles to overcome before new systems ever find a home in the field. Politicians and soldiers alike may question whether technology holds the answers or just causes more problems. The Army cannot be lax in its consideration of new technologies and their potential impact on the battlefield. Applied incorrectly, new technology gives a false sense of security that breeds the conditions for future failure on the battlefield. Perhaps a more real concern should be whether or not the Soviets

would attack because of their fear of being totally surpassed in technology with no way of correcting the imbalance. The answer to that question may determine how far we move in the direction of attaining operational capability in the Field Artillery.

VII. Conclusions and Implications

Current NATO defense is directed toward stopping, or at least slowing, Soviet maneuver to allow arrival of reinforcements from the US. It seems natural that research and design efforts are geared toward anti-maneuver. When firepower is dominant on the battlefield, maneuver slows to a crawl. Attrition of the enemy force is then high.

Currently, the risk of war generated by the Warsaw Pact seems relatively low. Politicians controlling the purse strings see that as presenting a good opportunity to redirect monies into vote-getting programs. In view of Premier Gorbachev's offer to reduce Soviet forces and equipment in Eastern Europe, the Warsaw Pact Threat seems to be receding to even lower levels. General Galvin, current SACEUR, noted recently that the greatest risk was "that a few relatively minor gestures by the other side could change our whole view of requirements for defense and security".¹²¹ Risk, it appears, is relative. It is also liable to rapid change.

The armed forces have the mission of responding to any threat which results in war. Being prepared for that contingency is not simple. Enmeshed in the process is the requirement for development of doctrine. FM 100-5 contains the US Army's current doctrine for defeating the nation's wartime enemies. According to FM 100-5, fire support will play a vital part in that effort.¹²² But neither Army nor current artillery doctrine adequately describes how to make best use of available assets to accomplish all the tasks that are assigned to the fire support community. In particular, FM 100-5 and other Army doctrinal publications fail to take into account recent advancements in technology which portend a much greater capability for the field artillery in an operational role.

Incorporation of artillery into the operational fire plan provides additional benefits. Careful consideration of assigned missions results in mutual survivability benefits for all concerned participants.

The Army expects the synergism achieved by using artillery in conjunction with air strikes to improve the effects of a Suppression of Enemy Air Defense (SEAD) campaign. Artillery strikes against enemy air defense units near the front aid the fixed and rotary winged attack units. The combined effects of the air and artillery attack in turn aids the front line forces by allowing larger air packets to be inserted instead of dribbles. Consequently, the enhanced effects of air attacks can be expected to improve the survivability of maneuver and fire support units. Everyone benefits.

The multitude of assigned fire support tasks necessitates the prioritization of fire support requirements. The US Air Force recognizes its own need to concentrate early in a war against the Soviets on counterair missions to secure its own survivability. We have heard frequently that CAS will be limited until the counterair war is won.

Artillery, however, cannot divorce itself so easily from the requirement to support the maneuver forces. Operational commanders have identified a need for a ground-based fire support system at the operational level by which the commander can control execution of the operational fire plan or support the tactical battle. The need becomes more apparent when considering the many times in Europe when aircraft are unable to fly due to weather or other reasons. If, in turn, the aircraft cannot fly and the artillery assets at the tactical level are all heavily engaged supporting the tactical battle, the operational commander currently has no other means to execute operational fires or to influence the battle. The potential for disaster in such a scenario is great.

Fighting outnumbered requires NATO to attack the Soviets in depth before they can develop their full combat potential.¹²³ NATO's strategy of forward defense requires early detection, massing of fires, and interdiction of large formations to neutralize them and begin the process of destroying the Soviet ability and will to fight.¹²⁴ Denying the enemy the ability to command and control his forces through attack of his C² centers and attacking his operational forces deep initiates the process. Providing a ground-based fire support system to the operational commander would facilitate early disruption of the tempo of the Soviet offensive.

What remains unknown is how the next war in Europe will unfold. A no-notice or little-notice attack might change everything. Many gaps would exist in NATO's defense in such a situation. Currently, all artillery assets are assigned or attached to tactical units. Artillery units would either be moving to their own General Defense Plan (GDP) positions or would necessarily be engaged in firing in support of any maneuver units heading toward GDP positions. The duration of the war would determine if the operational commander ever reached the point of being able to consider using artillery to execute operational fires. But the non-availability of other operational fire assets due to weather or successful enemy attack might force the requirement on him. Degradation of fire support to the front line units would result.

Finally, the difficulty of conducting operational fires within NATO is going to be every bit as difficult as the Soviets' massing of fires after decentralization of command. Each NATO corps operates according to its own criteria and timesheet. The prospect of unravelling the mystery of planning and conducting operational fires within NATO may put it automatically in the "Too hard to even consider" box. In that case, the US Army may be unable to consider operational missions for artillery.

The first step to solving the basic problem, however, is to improve US Army doctrine concerning operational fires. The doctrine writers for the Field Artillery must accept a fair share of the blame for this predicament. However, the historical lack of a true operational capability, resulting from lack of assets as well as range, provide some degree of justification for inaction.

The lack of artillery force structure is the most significant problem. Even with a clear delineation of operational and tactical fire support requirements, Field Artillery would be hard-pressed to accomplish each task assigned it with current equipment and ammunition stocks. A simple increase in quantity is not the sole solution. Weapons acquired must have adequate range, accuracy, and lethality, and must be acquired in sufficient quantity to attain maximum benefit from their use.

Technology holds the promise for meeting increased mobility, range,

accuracy, and lethality requirements. But if the US insists on relying on this technological edge, it must insure that it maintains a true edge. US superiority in the laboratory does not automatically translate to battlefield capability.¹²⁵

Maintaining the technological edge is, of course, a matter of finances. Are we willing to make the commitment in order to have a force capable of defeating an enemy who currently portrays himself as no enemy? If so, can we convince our Allies that such a system is financially achievable and politically acceptable? If not, then we must prioritize our needs and plan realistic phasing to overcome the deficiencies.¹²⁶ The major menace facing us is that, as described by General Rogers, "the current imbalance will continue to grow until the military situation, even for a defense, will be beyond restoration."¹²⁷

Artillery cannot be a war winner by itself. But it is available to the commander who recognizes its potentials and limitations.¹²⁸ Is the US Army keying too much on the artillery's limitations, and not adequately concerning itself with its potential? Modern firepower is increasingly capable of inflicting vastly greater damage at greater ranges and over much shorter time periods. Improvements in artillery technology may so shift the favor to indirect fire systems as to warrant change in organization and equipment.¹²⁹ NATO's current restriction on forces operating beyond the Intra-German Border (IGB) doesn't apply to the impact of artillery munitions, be they cannon projectiles or missiles. Providing an indirect fire system to the operational level commander gives him the means to shape the presentation of enemy forces at the IGB by slowing their momentum, disorganizing their march, suppressing their fire support weapons, and disrupting the closure of their echelons.

Obviously, it is no reason to say the US Army must follow suit just because the Soviets provide artillery to the operational level commander. On the other hand, saying this is the way the Army's done it for forty years isn't a suitable reason for not considering a change. The benefits may be well worth the effort. Even if advanced technology does support changing how the Army conducts fire support, the Army must realize that technological superiority can only

complement; it cannot replace sound doctrine, good training, and sustained support. Opportunity lies ahead. We must grasp it and move forward.

ENDNOTES

1. Department of the Army, FM 100-5, Operations, Washington, DC (May, 1986), p. 27.
2. Department of the Army, FM 100-6, Large Unit Operations (Coordinating Draft), Fort Leavenworth, KS (30 September 1987), pgs. 3-7.
3. Ibid.
4. Ibid. p 3-14.
5. Department of the Army, FM 6-20, Fire Support in the AirLand Battle (Final Draft) (Washington, DC, 1988), p. 1-6.
6. General Sir Martin Farndale, "Follow on Forces Attack," NATO's Sixteen Nations (April/May 1988), p. 45.
7. Ibid. p. 3-15.
8. FM 100-6, p. 3-14.
9. Russell F. Weigley, Eisenhower's Lieutenant's, (Bloomington, IN, 1981), p. 151.
10. FM 100-6, p. 3-15.
11. Ibid. p. 3-14.
12. FM 6-20, Fire Support in the AirLand Battle (Final Draft), Washington, DC (April 1988), p. 2-2.
13. This list summarizes just a few of the artillery missions listed in US Army doctrinal publications such as FM 100-5 and FM 100-6.
14. FM 100-5, pgs. 43-44.
15. Ibid. p. 13.
16. Ibid. p. 43.
17. Ibid. p. 20.
18. FM 6-20, p. 4-19.
19. Department of the Army, FM 6-20-30, Fire Support at Corps and Division (Coordinating Draft), Fort Sill, OK (Mar 1988), p. C-4-6.
20. Department of the Army, FM 100-15, Corps Operations (Approved Final Draft), Washington, DC (15 November 1988), p. 6-24.
21. Ibid. p. 3-7.
22. John G. Hines and Phillip A. Petersen, "Is NATO Thinking Too Small?" International Defense Review (No. 5/1986), p. 565.
23. Farndale, p. 48.

24. General Hans Henning von Sandrart, "Considerations of the Battle in Depth" Military Review (October 1987), p. 12.
25. Ibid.
26. MG Raphael J. Hallada, "Chief of Field Artillery's Message to the Field," Field Artillery Journal (December 1987), p. 6.
27. David C. Isby, Weapons and Tactics of the Soviet Army. (London, 1988), p. 223
28. "Field Artillery Training and Development Challenges," Field Artillery Journal (December, 1988), p. 6.
29. GEN Glenn K. Otis (Ret), "Future Concepts and Capabilities in NATO's Central Region," Royal United Services Institute (RUSI) Journal (Winter, 1988), p. 18.
30. Roland A. Tiede, On the Analysis of Ground Combat (Manhattan, KS, 1979), p. 114.
31. Included in a non-attributed lecture to the School of Advanced Military Studies, Academic Year 1988-89.
32. COL John T. Burke, "The Firepower Revolution," Army (November 1988), p. 57.
33. Weigley, p. 28.
34. COL Harry G. Summers (Ret), "Clear Values in the Field Artillery," Kansas City Star, March 12, 1989, Section G, p. 5.
35. Shelf Bidwell, "Artillery as a War-winner" in Old Battles and New Defenses, (London, 1986), p. 7.
36. Summers, Section G, p. 5.
37. Ibid.
38. Fred C. Ikle, "NATO Strategy: Competition vs Stability," Defense 1986, (May-June 1986), p. 3.
39. Ibid.
40. "Exploit Technology to Defend NATO—an Interview with GEN Jack Merritt," Field Artillery Journal, p. 15.
41. Ibid.
42. Henry Trehwitt with Jeff Trimble et al. "A Different Call to Arms," US News and World Report, p. 25.
43. Ibid, p. 24.
44. CPT John Gordon IV, "The Evolution of Soviet Fire Support," Field Artillery Journal, p. 21.

45. Ibid.
46. Isby, p. 254.
47. Gordon, p. 21.
48. Donnelly, C.N., "The Wind of Change in Soviet Artillery," International Defense Review (No. 6/1982), p. 743.
49. Otis, p. 18.
50. Donnelly, p. 741.
51. The Factors of Combat, a report prepared for the Defense Nuclear Agency, (November 1980), p. 11.
52. FM 100-5, p. 186.
53. Hines and Petersen, p. 565.
54. Ibid, p. 567.
55. Quote attributed to Yogi Berra and repeated during the School for Advanced Military Studies trip to the National Training Center, September 1988.
56. LTC Eric C. Deets, "The Counterfire Battle--the Missing Element in Today's Training," Field Artillery Journal (April 1988, p. 43.
57. Trehwitt, p. 25.
58. GEN Bernard W. Rogers, "NATO Strategy: Time for a Change?" The Alliance Papers (No. 9, October 1985), p. 6.
59. Ibid.
60. Trehwitt, p. 26.
61. Bellamy. In Red God of War Bellamy provides an in depth look at the development of Russian artillery. Chapter 1, A Tradition of Excellence, traces the history of the development and the Russian fascination with the artillery weapon.
62. Ibid.
63. V. V. Triandafillov, Nature of the Operations of Modern Armies, (Moscow-Leningrad, 1929), p. 64.
64. Y. Ye. Savkin, The Basic Principles of Operational Art and Tactics (Translated under the auspices of the US Air Force, Washington, DC, 1974), p. 211.
65. Ibid.
66. Bellamy, p. 39.
67. Ibid.

68. Ibid, p. 46.
69. Triandafillov, p. 62.
70. Ibid, p. 63.
71. Gordon IV, p. 19.
72. Ibid.
73. Ibid.
74. Savkin. p 220.
75. Ibid.
76. MAJ Mark P. Gay, "Soviet and US Army Operational Styles of War," Military Review (September 1985), p. 48.
77. FM 100-6, p. 3-15.
78. Ibid.
79. Bellamy, p. 64.
80. Gordon IV, p. 19.
81. Bellamy, p. 75.
82. Gay, p. 51.
83. Otis, p.17.
84. Savkin, p. 98.
85. Department of Defense, DDB-1130-8-82, Soviet Front Fire Support (Washington, DC, September 1982), p. ix.
86. Ibid. p. 1.
87. Isby, p. 223 and Gordon IV, p. 21.
88. Gordon IV, p. 20.
89. GEN Bernard W. Rogers, "Follow on Forces Attack: Myths and Realities," NATO REVIEW (December 1984), p. 4.
90. P. H. Vigor, Soviet Blitzkrieg (New York, 1983), p. 106.
91. DDB-1130-8-82, p. 8.
92. Ibid, p. 33.
93. Donnelly, p. 737.
94. Ibid.

95. Department of the Army, FM 6-20-30, Fire Support at Corps and Division (Coordinating Draft) (Fort Sill, OK, Mar 1988), p. C-4-1.
96. Ibid.
97. Isby, p. 246.
98. Nathan Leites, Soviet Style in War, (New York, 1982), p. 349. The Soviets continue to control unobserved fire support through established norms. Norms represent the number of rounds to be fired and units required to fire at an unobserved target to obtain the required degree of destruction or neutralization. Observation simply allows fewer rounds to be fired to bring the maximum effect on target. Target effects result from the artillery rounds' impact pattern. Based on the type target, the weapon used to engage the target, the range, and whether or not the target is observed, the Soviets expect to demolish enemy fire support assets to preserve the tempo of the attack and to preserve Soviet forces. But the norms also reflect an upgrade of the unit to fire to a battalion. It is easier and faster to achieve the required density of rounds to neutralize a target by firing a battalion at a target instead of a battery. This, in turn, allows engagement of more targets, and the attack continues to move rapidly. (DDB-1130-8-82, p. 77)
99. COL Thomas E. White Jr., "Disrupting the Tempo of Soviet Operations," Military Review (November 1987), p. 5.
100. Weigley, p. 9.
101. FM 100-5, p. 120.
102. Ibid, pages 8-9.
103. Weigley, p. 23.
104. Ibid, p. 151.
105. Ibid, p. 606.
106. Ibid, p. 644.
107. Gay, p. 49.
108. Ibid.
109. Ibid.
110. White, p. 5.
111. FM 6-20-30, p. C-2-7.
112. Sandrart, p. 14, and Farndale, p. 48.
113. Hallada, "Chief of Field Artillery's Message to the Field," p. 6.
114. Trewhitt, p. 25.
115. Caleb Baker, "Artillery Master Plan—Upgrade would offset 7-to-1 Soviet advantage," Army Times (April 3, 1989), p. 23.

- 116. Burke, p. 51.
- 117. "Exploit Technology to Defend NATO," p. 16.
- 118. Tiede, p. 114.
- 119. Ibid.
- 120. Trehwitt, p. 26.
- 121. Ibid.
- 122. FM 100-5, p. 43.
- 123. FM 6-20-30, p. C-4-6.
- 124. FM 100-5, p. 3.
- 125. Phillip A. Karber, "The Strategy: In Defense of Forward Defense," Armed Forces Journal International (May 1984), p. 34.
- 126. Ibid, p. 35.
- 127. Rogers, "NATO Strategy," p. 4.
- 128. Bidwell, p. 138.
- 129. Burke, p. 57.

BIBLIOGRAPHY

Books

Barnett, Cornelli et al, Old Battles and New Defenses—Can We Learn from Military History?. London: Brassey's Defense Publishers Ltd, 1986.

Baxter, William, Soviet Airland Battle Tactics. Novato, CA: Presidio Press, 1986.

Bellamy, Chris, Res God of War—Soviet Artillery and Rocket Forces. London: Brassey's Defense Publishers, 1986.

Isby, David C., Weapons and Tactics of the Soviet Army. London: Jane's Publishing Co. Ltd, 1988.

Leites, Nathan, Soviet Style in War. New York: Crane, Russak & Company, Ltd., 1982.

Savkin, V. Ye., The Basic Principles of Operational Art and Tactics (A Soviet View). Washington, D.C.: U.S. Government Printing Office, 1974 (Translated and Published under the Auspices of the U.S. Air Force).

Scott, Harriet Fast and William F., editors, The Soviet Art of War—Doctrine, Strategy, and Tactics. Boulder, CO: Westview Press, 1982.

Sidorenko, A. A., The Offensive (A Soviet View). Washington, D.C.: Government Printing Office, 1970 (Translated and Published under the Auspices of the U.S. Air Force).

Triandafillov, V. K., Nature of the Operations of Modern Armies. Moscow-Leningrad: State Publishing House, 1929 (Translated by William A. Burhans).

Vigor, P. H., Soviet Blitzkrieg Theory. New York: St. Martin's Press, 1983.

Weigley, Russell F., Eisenhower's Lieutenants. Bloomington, IN: Indiana University Press, 1981.

Manuals

Field Manual 6-20, Fire Support in the AirLand Battle (Final Draft). Washington, D.C., 1988

Field Manual 6-20-30, Fire Support at Corps and Division (Coordinating Draft). Fort Sill, OK, Mar 1988.

Field Manual 100-2-1, The Soviet Army—Operations and Tactics. Washington, D.C., 1984.

Field Manual 100-2-2, The Soviet Army—Specialized Warfare and Rear Area Support. Washington, D.C., 1984.

Field Manual 100-2-3, The Soviet Army—Troops, Organization, and Equipment. Washington, D.C., 1984.

Field Manual 100-5, Operations. Washington, D.C., 1941 and 1986 editions.

Field Manual 100-6, Large Unit Operations (Coordinating Draft). Fort Leavenworth, KS, 30 September 1987.

Field Manual 100-15, Corps Operations (Approved Final Draft). Washington, D.C., 15 November 1988.

Periodicals and Articles

Baker, Caleb, "Artillery Master Plan-Upgrade would offset 7-to-1 Soviet advantage." The Army Times, April 3, 1989, page 23.

Bailey, CWO (Retired) Dale C., "Fire Support's Future in Emerging Technology." Field Artillery Journal, December 1988, pages 30-32.

Barry, John, "Fighting Smart, Not Rich." Newsweek, November 14, 1988, pages 24-25.

Bracken, Paul, "The NATO Defense Problem." ORBIS: A Journal of World Affairs, Spring 1983, pages 83-105.

Brown, Charles E., "Smart Munitions for the Modern Battlefield." Journal of Electronic Defense, September 1988, pages 51-56.

Burke, COL John T., "The Firepower Revolution." ARMY, November 1988, pages 50-60.

Deets, LTC Eric C., "The Counterfire Battle-the Missing Element in Today's Training." Field Artillery Journal, April 1988, pages 41-43.

Donnelly, C. N., "The Wind of Change in Soviet Artillery." International Defense Review, No.6/1982, pages 737-744.

Farndale, General Sir Martin, "Follow On Forces Attack." NATO's Sixteen Nations, April/May 1988, pages 42-49.

Gay, MAJ Mark P., "Soviet and U.S. Army Operational Styles of War." Military Review, Volume LXV, September 1985, pages 48-53.

Goodman, Glenn W. Jr., "Antiarmor Warhead for NATO's MLRS Moves Toward Full-Scale Development." Armed Forces Journal International, September 1988, page 24.

Gordon, CPT John IV, "The Evolution of Soviet Fire Support, 1940-1988." Field Artillery Journal, June 1988, pages 18-21.

Hallada, MG Raphael J., "Chief of Field Artillery's Message to the Field." Field Artillery Journal, December 1987, pages 5-7.

Hallada, MG Raphael J., "The Field Artillery State of the Branch Address." Field Artillery Journal, December 1988, pages 2-3.

Hallada, MG Raphael J., "On the Move." Field Artillery Journal, June 1988, page 1.

Hines, John G. and Phillip A. Petersen, "Is NATO Thinking Too Small? A Comparison of Command Structure." International Defense Review, No. 5, 1986, pages 563-572.

Ikle, Fred C., "NATO Strategy: Competition vs Stability." Defense 86, May-June 1986, pages 2-6.

Karber, Phillip A., "The Strategy: In Defense of Forward Defense." Armed Forces Journal International, May 1984, pages 27-50.

Komer, Robert W., "A Credible Conventional Option: Can NATO Afford It?" STRATEGIC REVIEW, Spring 1984, pages 33-38.

Kromer, Dr. Robert A., "Field Artillery Ammunition Resupply Solutions." Field Artillery Journal, October 1988, pages 17-21.

Mack, General Hans-Joachim, "Conventional Defense Improvements." NATO'S SIXTEEN NATIONS, Vol. 30, No. 6, October 1985, pages 16-27.

Maze, Rick, "Battle begins anew over bringing troops back from Europe." Army Times, March 13, 1989, page 8.

Meacham, James, "NATO's Central Front." The Economist, August 30, 1986, pages 3-22.

Otis, General Glenn K. (Retired), "Future Concepts and Capabilities in NATO's Central Region." RUSI Journal, Winter 1988, pages 17-19.

Reed, Fred, "An anti-tank missile a soldier could love." Army Times, March 13, 1989, page 70.

Rogers, General Bernard W., "Follow-on Forces Attack (FOFA): Myths and Realities." NATO REVIEW, December 1984, pages 1-9.

Rogers, General Bernard W., "NATO Strategy: Time to Change?" THE ALLIANCE PAPERS, No. 9, October 1985.

Saint, LTG Crosbie E., COL Tommy R. Franks, and MAJ Alan B. Moon, "Fire Support in Mobile Armored Warfare." Field Artillery Journal, June 1988, pages 10-14.

Sandrart, General Hans-Henning von, "Considerations of the Battle in Depth." Military Review, October 1987, pages 8-15.

Schill, Charles, "Galvin: Don't abandon the short-range nuclear upgrade." Army Times, March 6, 1989, page 6.

Summers, COL Harry G. (Retired), "Clear Values in the Field Artillery." Kansas City Star, March 12, 1989, page 5G.

Tice, Jim, "Army will protect personnel at the expense of modernization." Army Times, March 13, 1989, page 4.

Timmons, Richard F., "Lessons from the Past for NATO." PARAMETERS-Journal of the US Army War College, Vol XIV, No. 3, Autumn 1984, pages 3-11.

Trewhitt, Henry with Jeff Trimble et al, "A Different Call to Arms." U.S. News and World Report, March 13, 1989, 18-26.

White, COL Thomas E. Jr., "Disrupting the Tempo of Soviet Operations." Military Review, November 1987, pages 2-11.

"Exploit Technology to Defend NATO, an Interview with General Jack N. Merritt, US Representative to the NATO Military Committee." Field Artillery Journal, February 1988, pages 14-18.

"Field Artillery Training and Development Challenges, an Interview with GEN Maxwell R. Thurman." Field Artillery Journal December 1988, pages 4-6.

"The Key to Field Artillery-Focusing Combat Power, An Interview with General Crosbie E. Saint, CINCUSAREUR." Field Artillery Journal, October 1988, pages 10-12.

"Lance to MLRS: Short-range weapon may avoid controls." Army Times, March 13, 1989, page 26.

"Soviets Revive Heavy Artillery Formations." Field Artillery Journal, August 1988, page 44-45.

Government Documents

Department of Defense, Soviet Military Power 1988. Washington, D.C.: U.S. Government Office, March 1988.

Department of Defense, DDB-1130-8-82, Soviet Front Fire Support. Washington, D.C.: U.S. Government Printing Office, September 1982.

The Factors of Combat. A Report Prepared for the Defense Nuclear Agency under Contract Number DNA 001-79-C-0378-P000001, November 1980.

Search for Historical Records of High-Rate Artillery Fire in Combat Situations (Phase Two). A Report Prepared for the U.S. Human Engineering Laboratory under Work Order Number 4, Contract Number DAAD05-77-C-0723, March 1978.

Manuscripts

Tiede, Roland A., On the Analysis of Ground Combat. Manhattan, KS: Department of Military Affairs/Aerospace Engineering, 1978.