THE IMPACT OF ARTILLERY PRECISION MUNITIONS ON ARMY STRATEGIC OBJECTIVES

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MASTER OF MILITARY ART AND SCIENCE
General Studies

by

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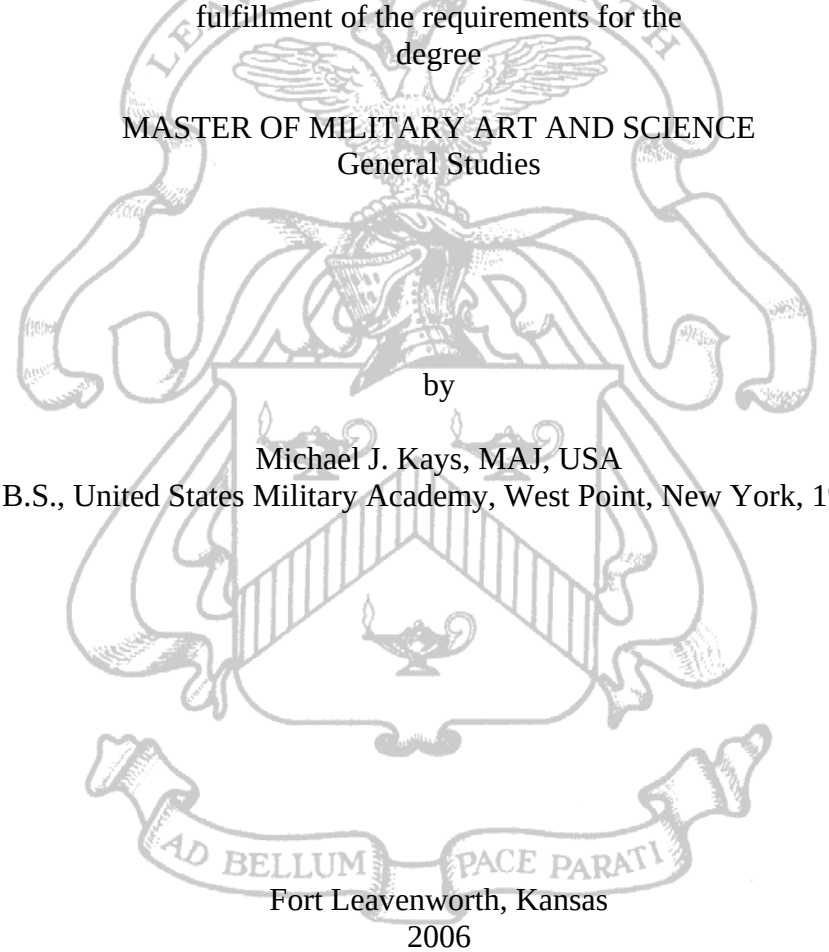

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14. ABSTRACT. The United States Army is changing, and the scope, pace and complexity of that change is unprecedented, given that change is occurring during a war very different from those of the past. The Army Strategic Planning Guidance 2005 describes why and how the Army must change. It outlines the nature of future threats, with particular emphasis on the asymmetrical threats of today. Army Strategic Objectives provide more specific Army-level guidance on what must be done now and in the future. This paper examines the tactical effects and future implications of artillery precision munitions on Army Strategic Objectives. The paper describes these tactical effects and future implications on the key elements of the Army Strategic Objectives – trained and equipped soldiers; developed leaders; a ready, relevant land force for the Joint Team; and dominance of the full spectrum of warfare. The paper concludes that artillery precision munitions will significantly enable the objectives related to equipped soldiers; a ready, relevant force on the Joint Team and dominance of the full warfare spectrum. However, the paper also concludes that there are major challenges in the areas of training and leader development that must be addressed, if the Army is to fulfill these desired objectives.

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

ABSTRACT

THE IMPACT OF ARTILLERY PRECISION MUNITIONS ON ARMY STRATEGIC OBJECTIVES, by MAJ Michael J. Kays, 104 pages.

The United States Army is changing, and the scope, pace and complexity of that change is unprecedented, given that change is occurring during a war very different from those of the past. *The Army Strategic Planning Guidance, 2005*, describes why and how the Army must change. It outlines the nature of future threats, with particular emphasis on the asymmetrical threats of today. *Army Strategic Objectives* provide more specific Army-level guidance on what must be done now and in the future. This paper examines the tactical effects and future implications of artillery precision munitions on *Army Strategic Objectives.* The paper describes these tactical effects and future implications on the key elements of the *Army Strategic Objectives*--trained and equipped Soldiers; developed leaders; a ready, relevant land force for the Joint Team; and dominance of the full-spectrum of warfare. The paper concludes that artillery precision munitions will significantly enable the objectives related to equipped Soldiers; a ready, relevant force on the Joint Team and dominance of the full warfare spectrum. However, the paper also concludes that there are major challenges in the areas of training and leader development that must be addressed, if the Army is to fulfill these desired objectives.

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ACRONYMS

ATACM	Army Tactical Missile
BCT	Brigade Combat Team
BDE	Brigade
BN	Battalion
CENTCOM	Central Command
CFACC	Coalition Forces Air Component Command
CFLCC	Coalition Forces Land Component Command
CLPM	Cannon-launched precision munition
C-RAM	Counterrocket artillery mortar
CSAR	Combat Search and Rescue
DivArty	Division Artillery
DPICM	Dual Purpose Improved Conventional Munitions
DS	Direct Support
ETAC	Enlisted Terminal Attack Controller
FA	Field Artillery
FDC	Fire Direction Center
FM	Field Manual
FO	Forward Observer
GPS	Global Positioning System
GS	General Support
GWOT	Global War on Terrorism
HE	High Explosive
HIMARS	High Mobility Artillery Rocket System

HPT	High-Payoff Target
JMEM	Joint Munition Effectiveness Manual
JTF	Joint Task Force
MEF	Marine Expeditionary Force
MLRS	Multiple-Launch Rocket System
NATO	North Atlantic Treaty Organization
OP	Observation Post
PGK	Precision Guidance Kit
QDR	Quadrennial Defense Review
ROE	Rules of Engagement
SAM	Surface-to-Air Missile
SF	Special Forces
TAC-P	Terminal Attack Control-Party
TF	Task Force
TOC	Tactical Operations Center
TTP	Tactics, Techniques, and Procedures
U.S.	United States

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CHAPTER 1

INTRODUCTION

> In 1983, Congress legislated in Title 10 the creation of the office of Director, Operational Test and Evaluation (DOT&E). Since then, the Cold War ended and a Global War on Terrorism began. These developments have led to far-reaching changes in the way we fight and procure weapons. They have necessitated a rethinking of how we organize and structure our military forces, how we man and train them realistically to face these new threats, and how we equip them in a timely and effective manner with the best systems that rapidly advancing technologies can offer.[1]

Today's Army is changing, and the change is rapid, complex, and in the middle of a war that is very different from the wars for which the Army developed its doctrine, organization, and weapons. National defense strategies are also evolving to keep pace with a dynamic international scene and its inherent challenges to the security of the United States. As it responds to national strategy needs, the Army is transforming to a lighter, more mobile, modular force while simultaneously engaging in combat operations in Iraq and elsewhere.

The important point is that the transformation in the Army is a conscious act, guided by both a vision of the future and current needs on battlefields, such as in Iraq. Also, as the Army changes, the field artillery is changing in response to both the immediate needs and lessons learned from current battlefields, as well as future needs and requirements articulated in future planning documents.

Purpose of the Study

This paper attempts to answer questions about the use and effects of artillery precision weapons at the tactical level in the Global War on Terrorism (GWOT) and beyond.

The general idea for and purpose of this study began between March 2004 and March 2005, the period when the battle space continued to shift to irregular warfighting and also the period when the author deployed to Iraq as a member of a newly formed Brigade Combat Team (BCT). Prior to deployment, the unit originated from the 1st Cavalry Division Artillery (DivArty) and transformed to the 5th BCT during the four-month period, December 2003 through March 2004.

The BCT's area of operation was in South Baghdad, and during this period, the nature of warfighting in Iraq continued its transition from conventional to irregular warfare by insurgent forces that included prominent urban areas, such as the South Baghdad district of Al Rashid. It was a period of rapid change and adjustment for both the 5th BCT Soldiers and leaders. Originally formed and trained to provide fire support to ground combat units in more traditional battle spaces, the units and Soldiers faced roles and missions very different from those upon which they customarily trained.

These new tasks and missions ranged from planning and executing patrols on the streets of Baghdad to an endless variety of tasks in support of security, stabilization, and reconstruction operations. The reduced effectiveness of the artillery in Baghdad played a major role for diverting the artillery from its time-honored fire support roles to these other tasks. Urban areas, such as Baghdad restricted the normal fire support role of the artillery. Often, the trajectories of the munitions were either too low or flat, or there was

the risk of unacceptable collateral damage. For highly trained, dedicated artillery Soldiers and leaders deployed to a combat zone, these were not the best of times.

From that year in Baghdad and having experienced the limited use of field artillery and the diversity of tasks, it seemed clear to the author there existed a need for the artillery to complement its customary cannon and rocket assets with munitions that provided more effective support against insurgents operating in irregular terrain. In the case of Baghdad, which featured small targets and the need to limit collateral damage, it seemed that more accurate, perhaps less destructive, munitions might be part of a solution. Also, improved precision munitions might also provide valuable flexibility to artillery capabilities and relevant contributions in future conflicts.

Late March 2005, when the author redeployed with the 5th BCT, there was no resolution on the reduced effectiveness of the artillery in the Baghdad area or the implementation of precision weapons. With today's Army facing extended engagements as part of the Joint Team in GWOT and beyond, there remains the need to address the general issue of the seemingly reduced effectiveness of the artillery in complex terrain such as Baghdad while engaged in irregular warfare. Also, the question of how improved precision munitions might be part of the solution to this issue remains unanswered.

On the surface, there would seem to be two questions related to the possible use of improved precision munitions:

1. How effective are artillery precision munitions at the tactical level and what are the plans for their use in the future? and,

2. What are the issues related to integrating artillery precision munitions in today's changing Army?

The answers to the first question are important, because they could provide a current picture of "where the artillery is" with regard to the use of precision munitions in actual combat, the status of munitions in development, and hopefully provide insights on their current or projected effectiveness. The answers to the second set of questions are equally important, because they provide a picture of "what needs to be done" to assure the effective use of artillery precision munitions at the tactical level in the future.

Answers to these two questions could provide a basis for determining if the Army might avoid future situations when the artillery delivers less-than-desired effects, as well as reveal some of the implications and challenges related to moving from today's use of artillery precision munitions to their use in the future. Since the second question orients on the future, it generates many other related factors that will inevitably influence and shape the tactical use of artillery precision munitions in future warfare. The background and starting point for pursuing these questions logically begins with recent conflicts in which artillery precision munitions were first used.

Background of the Problem

From Desert Storm to Today in Iraq

> On 24 February 1991, after 39 days of the most lethal and intensive air attack in the history of warfare, the ground offensive campaign was initiated. On 28 February, only 100 hours after the ground campaign began, the NCA and USCINCCENT Operations Desert Storm objectives had been met and ordered a temporary cessation of offensive operations. On 10 March US forces began redeploying, and on 11 April, the UN Security Council agreed that Iraq acceptance of the cease-fire satisfied UN requirements--Operation Desert Storm was over.
>
> US CENTCOM Executive Summary, Operation Desert Shield and Desert Storm

The first combat test for many of the capabilities, munitions, and weapon systems integrated into the Army during the 1980s through the 1990s occurred in the Desert Storm Campaign of 1991. Widely lauded as a classic success, Operation Desert Storm exemplified traditional large-scale warfare--heavy, sustained aerial bombardment followed by division-sized forces executing holding and feint roles, as well as surprise envelopment maneuver. The armed forces developed during the Cold War to discourage war in Europe (win it, if necessary) were at least partially validated by this highly successful, low casualty operation in the desert.

Consistent with warfighting doctrine in 1991, the use of artillery in Desert Storm featured massed fires in support of maneuver operations conducted by forces built around divisional and regimental structure blocks. The howitzers and rocket launchers in direct and general support artillery units generally provided massed fires.

In another first combat test in Desert Storm, the multiple launch rocket system (MLRS) demonstrated its lethality. Developed in the early 1980s, the design of MLRS was to counter the Soviet Union's multiple rocket launchers (MRLs), as well as contribute to counterfire NATO artillery systems. Not belonging solely to the United States, MLRS fired its lethal rockets at the beginning of Operation Desert Storm from both the United States and the British Royal Artillery. LTC Peter Williams, a British artillery battalion commander, stated, "It's the decisive battle winner. We call ourselves the Grid Square Removal System because the rockets from each launcher can take out a square kilometer of the map."[2]

Williams argued that the purpose of MLRS contributed to massed fires by saturating areas of the battlefield and annihilating all targets within designated kilometer

squares, if needed. Surely, MLRS's first test fulfilled the role of massed artillery fires, a traditional artillery mission.

Use of precision artillery munitions occurred in a limited capacity in Desert Storm, in comparison to massed cannon and rocket fires. For example, during the conflict in 1991, the field artillery utilized a precision-guided munition called the M712 Copperhead.[3] Commonly referred to as the artilleryman's sniper round during development, the Copperhead requires the continuous laser designation of a target from an observer. These lasers allow the round to "seek" only its programmed code designation.

While the Copperhead can engage both stationary and moving targets, it may place the observer, or the observation team, at risk of detection. This is especially true if the enemy has the capability to identify laser designations. The Copperhead's ability to function accurately is also subject to the weather. If clouds, fog, or precipitation interfere with the round's ability to locate the laser designation, the round will not guide itself onto the target, but follow its ballistic trajectory as fired from the cannon.[4] With the short duration of Desert Storm, the notoriety of the introduction of the Copperhead round on the battlefield was quite modest.

Operation Desert Storm was the first combat test of artillery precision munitions, but it is clear that the artillery still functioned in a traditional, mass-on-target method. Desert Storm was also a very short campaign in which Coalition and US Forces engaged in conventional warfare on conventional terrain against an enemy conventionally organized in large units and fighting in a conventional manner. In short, the warfighting

doctrine in 1991 aligned well with the conventional battle space and enemy in Desert Storm, and the effectiveness of the artillery in support of ground forces was exemplary.

Operation Iraqi Freedom

As the initial assault phase of Iraqi Freedom concluded and the Iraqi divisions became ineffective, if not nonexistent, the nature of the conflict changed dramatically. More importantly, as the enemy changed to more asymmetric tactics in irregular terrain (e.g., urban environments), conventional Coalition Forces centered on the traditional division became less effective; and the artillery experienced substantially reduced effectiveness in urban area battle spaces in which insurgent forces operated. This situation continues and the Coalition Forces in Iraq today face a very different battle space environment in which an insurgent force does not operate in the conventional manner of Desert Storm.

Significance of this Study

This research is significant, first, because its analysis and conclusions could assist the United States military in understanding the enormous potential of investing in enhanced artillery precision munitions as a vital, extremely flexible capability at the tactical level as the Army transforms and fulfills its commitment to dominating the full-spectrum of combat, to include the GWOT and irregular warfare in complex terrain. Second, the analysis and conclusions could identify challenges associated with integrating enhanced artillery precision munitions at the tactical level, as the Army simultaneously transforms into a modular, expeditionary force by refitting, resetting, and rotating modular brigades while fighting a war. Third, the analysis and conclusions can

prompt a review of doctrine and provide insight into how enhanced munitions and systems mass in battle and how the Army fights at the tactical and operational levels as part of the Joint Team. Last, the discussions of change implementations across the many areas related to enhanced artillery precision munitions could provide important insights related to *Army Strategic Objectives* in training and equipping Soldiers; developing leaders; and providing ready, relevant land forces to the Joint Team.

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[1]Director, Operational Test and Evaluation, *FY2003 Annual Report* [document on-line]; available from http://www.globalsecurity.org/military/library/budget/fy2003 /fy03 _DOTE_Annual_Report.pdf; Internet; accessed 19 April 2006, i.

[2]Peter Williams, "M26 Multiple Launch Rocket System (MLRS)" [document on-line]; available from http://www.globalsecurity.org/military/systems/munitions/m26.htm; Internet; accessed 6 May 2006.

[3]Global Security, M712 Copperhead [document on-line]; available from http://www. globalsecurity.org/ military/systems/munitions/m712.htm; Internet; accessed 24 April 2006.

[4]U.S., Department of the Army, FM 6-30, *Tactics, Techniques, and Procedures for Observed Fire* (Washington, DC: Government Printing Office, July 1991), 6-22.

CHAPTER 2

LITERATURE REVIEW

There is virtually an unlimited amount of research and published scholarly work related to the artillery and its historical use and effectiveness. This includes an equally large amount of the treatment of the evolution of new technologies, the development of improved weapons, and their effects on warfighting and doctrine. None of the areas related to the purpose of this study is lacking in available reference material, although the sources do vary somewhat.

This literature review intends to focus on material that contributes to addressing the two questions related to the possible use of improved precision munitions, postulated in chapter 1:

1. How effective are artillery precision munitions at the tactical level and what are the plans for their use in the future? and,

2. What are the issues related to integrating artillery precision munitions in today's changing Army?

These two questions serve the purposes of, first, providing focus for the literature review and the adequacy of references to answer the questions. Second, as the review progresses, it is likely that the questions postulated in chapter 1 will be reshaped and sharpened to reflect what can be supported by the references and still respond to the fundamental purpose of the study--to answer questions about the use and effects of artillery precision weapons at the tactical level in the GWOT and beyond. It follows that the questions will also likely assist with limiting the amount of material included in the study.

Limitations and Delimitations

The current and future use and effectiveness of artillery precision munitions at the tactical level is the essential concern of this paper. Thus, limits to the scope of this research extend to the use and effects of artillery precision weapons, primarily at the tactical level in recent combat operations in Iraq; and the Army strategic plans for precision munitions in an extended GWOT and beyond.

To limit the size of the research and thesis, recent battles in Iraq, particularly the Second Battle of Fallujah and battlefield lessons learned from the Coalition Force ground commander are the primary historical examples. Additional limits include updates on the progress of improved artillery precision munitions, to include their capabilities, and the transition of the artillery to the Army's new modular, expeditionary force according to the accounts from the current Chief of Field Artillery and selections from the open literature that contribute to this paper.

References related to doctrine, tactics, techniques, and procedures are primarily current Army field manuals (FMs), although the use of open literature occurs in discussions of doctrine and the potential impact of improved artillery precision munitions at the tactical level on the operational level of warfighting. Not discussed, nor a major concern, in this paper is warfighting at the operational or strategic levels. All data are unclassified or are from declassified portions of classified references.

Historical cases and summaries describe the style of fighting and the nature of combat situations that are most common for today's Soldier: full-spectrum operations, operations in urban terrain, and very briefly, joint and combined operations. Although the paper is restricted primarily to cases and summaries related to irregular warfare situations

most commonly encountered by today's Army in Iraq, this is not to imply that more conventional warfighting in the future is no longer an important concern.

For a view of the future of artillery precision munitions, this study makes use of two existing documents that describe national and Army strategies for the anticipated future. These documents are the *National Strategy for Victory in Iraq*, which is used for context for the *Army Strategic Planning Guidance, 2005*, the paper's primary reference for the Army's future. This study also applies discussions from the open literature related to artillery precision munitions, the principles of war, and the value of understanding how these principles inherently link to doctrine and the evolution of technologies related to warfighting. The references for historical data are limited to unclassified sources, or the unclassified portions of classified studies.

Additional limits extend to the capabilities studies on weapon systems and their munitions, singling out only open-source documents and commercially available publications. The limitations extend to interviews, as well, and to those most directly related to the research areas in question. These include primarily the current Chief of Field Artillery, Major General Ralston, and the former ground commander of the Second Battle of Fallujah, USMC Lieutenant General Sattler.

Just as limitations "fence out" what will not be researched, "delimitations" focus on, or "fence in," what will be studied. Achieving delimitations in this study occur through focused research in specific areas related to current and future use, and effectiveness of artillery precision munitions at the tactical level. Specifically, with regard to the future implications of these munitions at the tactical level of warfighting, the study will focus only on selected, interrelated areas that can directly affect the use and

effectiveness of these munitions as the Army continues its transformation while sustaining the GWOT. In addition to the continuing evolution of artillery precision munitions, these interrelated areas begin with artillery precision munitions and include: changing battle spaces and organizational structure; warfighting concepts, tactics, techniques, and procedures; doctrine, mass, and tactical versus operational levels of war; and the *Army Strategic Planning Guidance, 2005*. These areas are discussed briefly in the remaining sections in the chapter, with the last area, Army Strategic Planning Guidance, integrated into the first four to avoid repetition.

Artillery Precision Munitions

After action reports from and the open literature describing Operation Desert Storm and the early assault phase of Operation Iraqi Freedom are quite extensive. These sources provide excellent documentation of the first combat trials of artillery precision munitions such as the Copperhead round in Desert Storm and guided multiple rocket launchers in Iraqi Freedom. Beyond the early successes of Iraqi Freedom, the personal experiences of the author and the open literature describe and document the reduced effectiveness of artillery in urban area battle spaces and persistent insurgent forces.

The continued evolution and improvement of artillery precision munitions as Iraqi Freedom continued is extremely well documented in the *Field Artillery Journal* by Major General David Ralston. He describes in detail the current status of improving precision munitions, such as Excalibur, the GMLRS (guided multiple-launch rocket system), as well as C-RAM (Counterrocket, artillery, and mortar) with comments that include the following excerpts:

> The incredible 155-mm Excalibur unitary precision-guided munition . . . testing is on track. . . . [P]rojectile is performing very well. . . . [T]he testing team shot Excalibur with a live warhead at a 20-by-20-meter reinforced structure at a distance of nearly 19 kilometers. . . . [T]he round impacted four meters from the center of the target. . . . [T]he goal of fielding Excalibur [is] in the First Quarter of FY07.
>
> . . . [T]he guided multiple-launch rocket system (GMLRS) unitary rocket's effectiveness in urban operations in Iraq [is] awesome. A total of 30 GMLRS unitary rockets have been fired in OIF on five different targets. Two of the targets were in a dense urban area in a large city. Those two targets were destroyed; killing a number of insurgents with very limited collateral damage to the surrounding structures. Each rocket hit its intended target with less than a four-meter circular error probable (CEP).
>
> The new GMLRS unitary rocket and existing Army tactical missile system (ATACMS) Block 1A quick-reaction unitary (QRU) missile, two surface-to-surface precision-guided munitions, now give the commander options for all-weather first-round effects from 15 to 270 kilometers in ongoing operations.[1]

The *Army Strategic Planning Guidance, 2005,* extends beyond the immediate needs of Iraq and "will guide how the Army organizes, trains, and equips its forces to ensure mastery of the full range of military operations and dominance in armed conflict."[2] The following quotes from the *Army Strategic Planning Guidance, 2005,* are typical and clearly illustrate the priority of supporting the GWOT efforts with promising technologies, to include precision weapons systems:

> The Army is focusing its resources to ensure that the operational force has the requisite capabilities to sustain and win the GWOT. Future force capabilities and resources must be focused on the most promising technologies that can be developed and fielded to the operationally engaged force. However, we must be aware of risk and ensure we strike a balance between winning the current fight and transforming for the next one. To win the extended Global War on Terrorism and honor our global commitments, transformation is imperative. We must not let present capabilities wither nor fail to invest in our future. Providing forces and doctrine to win this war remains the Army's number one priority.
>
> We must develop doctrine and capabilities, such as enhanced target acquisition and more precise weapons systems that reflect the reality of the battle space our Soldiers on the ground face in places like Iraq and Afghanistan. The Army will require tailored, timely, actionable, and focused intelligence, surveillance, and reconnaissance support to improve proficiencies against irregular challenges. [3]

The references available for analyzing current and future artillery precision munitions extend well beyond the purpose of this paper.

Changing Battle Spaces and Organizational Structure

Changing Battle Spaces

The references supporting research of changing battle spaces are also plentiful. The impetus for this paper was the author's personal experience as an artillery officer in Iraq, as the battle space evolved from conventional warfare against an enemy using conventional organizations and tactics to one which the enemy became more unpredictable and irregular. These experiences are leveraged and engrained throughout this paper. However, there are numerous references available in the open literature containing interviews with ground commanders who describe the changing battle space environment in Iraq and its effects. Most of these references are similar in content, but one article is particularly useful in terms of its detail and breadth of coverage. This article is an interview with the coalition ground commander for the Second Battle of Fallujah, and its use is extensive in this paper with full confidence that it is sufficiently representative of the available literature.

The changes in global warfare, the transformation of the Army, as articulated in the *Army Strategic Guidance, 2005, Initiatives and Objectives* clearly reinforce the importance of fully understanding the very different battle space environments in GWOT and the critical need to apply that understanding to transforming the Army, developing new doctrine, leveraging promising technologies into capabilities that assure dominance across the full-spectrum of warfare, and meeting the needs of joint combatant commanders.

A few excerpts from the *Army Strategic Guidance, 2005,* illustrate the strategic view of the importance of battle space environments in general, and the recent change in the Iraqi battle space in particular:

> Iraq in particular has proven to be a non-linear battlefield. Given the security environment, we can expect this to become the norm.
>
> To ensure our Soldiers are fully trained and equipped to meet the challenges they will face, we must ensure that we are executing our mission in a way that accounts for the current environment.
>
> Because it is difficult to predict the exact combination of challenges our forces and leaders will be called upon to defeat, we must field versatile land forces capable of dominance across the spectrum of conflict and adaptive leaders capable of joint force employment under a wide range of conditions.[4]

Another aspect of the nature and impact of changing battle spaces in the pursuit of the GWOT is Information Operations (IO). Indeed, IO can have major impact and consequences from the tactical to strategic level. For example, with regard to the important role of IO in the Second Battle of Fallujah, the ground commander said:

> IO was *huge* in setting the conditions so that the international community, Muslim world and our own US citizens understood why this fight had to be fought.
>
> . . . [W]e shaped the battle space by dropping leaflets inside the city with psychological messages.
>
> . . . [W]e [also] dropped a leaflet that told the civilians who did not leave to stay inside their homes and lay down on the floor with their pamphlets in their hands as we entered the building.
>
> We constantly educated the people so they knew things were happening all over their city.
>
> Our IO campaign worked very well. IO set the conditions for minimal damage and injuries in the battle space.
>
> This is a new kind of war.[5]

With regard to very different battle space environments described in The National Strategy for Victory in Iraq, The *Army Strategic Planning Guidance, 2005,* states, "We remain an Army and a Nation at War. It is a war unlike any our Nation has seen,

prosecuted not by states and Armies, but by extremists employing irregular means to erode our power and our resolve."[6]

In summary, there are more than sufficient references to support research on the effects of changing battle spaces, both recently in Iraq as well as in the future.

Changing Organizational Structure

The references related to the impacts of a changing Army organizational structure are both abundant and excellent. The primary reference describing changing structure in the Army is the *Army Strategic Planning Guidance, 2005*. A few excerpts below illustrate the intent and nature of change at Army level:

> The Army continues to transform its organizations to meet the challenges of the security environment and ensure mastery across the full range of military operations. To ensure that the Army is capable of fielding the relevant and ready forces the Combatant Commander requires, we have undertaken five major transformation initiatives. They are: Implement Modularity.
>
> Implement Modularity: Modularity is the Army's major force transformation initiative which involves the total redesign of the operational Army into a larger, more powerful, flexible and deployable force. This redesign centers on what is called a Brigade Combat Team (Unit of Action) [BCT (UA)]. This unit is a stand-alone and standardized tactical force of between 3,500 to 4,000 Soldiers that is organized the way it fights.
>
> An operational Army organized around Modular Brigade Combat Teams and support forces will better meet the challenges of the 21st century security environment and, specifically, jointly fight and win the Global War on Terrorism.[7]

While continuing to evolve and develop improved precision munitions, the field artillery is also working its way through this difficult period of organizational change in keeping with its proud history. Abbreviated comments providing current updates on this important area from the current Chief of Artillery are typical of what can be found from a broad array of references. "The most sweeping transformation since World War II, the

solutions may be less than optimal at first." "The guidance was to provide organizations at the 80 percent solution level."[8]

Since the Chief of Field Artillery is clearly a credible source of current information related to issues related to the field artillery during the ongoing changes in the Army's organizational structure, his updates are the primary resource supporting research in the area of changing organizational structure related to artillery precision munitions.

Warfighting, Tactics, Techniques, and Procedures

The *Field Artillery Journal* is particularly useful for current feedback by the current Chief of Artillery, providing major updates on the progress of enhanced artillery precision munitions, the challenges associated with transitioning the field artillery to the new modular organization, and the anticipated progress in the artillery's role as warfighting and tactics, techniques, and procedures (TTPs) evolve on the battlefields in Iraq. An interview with LTG Sattler in the *Field Artillery Journal* (March–April 2006) is also an outstanding source for gathering important, very current feedback from Iraq on how ground commanders are creating new TTPs for using artillery in complex terrain (primarily urban areas) against insurgent forces.

In the same interview, LTG Sattler also gives descriptions of how changing battle spaces and enemy forces influenced how he planned his operation and led his joint, coalition force in the highly successful Second Battle of Fallujah. Of particular value were the observations by LTG Sattler about how valuable both current and future enhanced artillery precision munitions are to future warfighting in the GWOT.[9]

There are signs that efforts to enhance artillery precision munitions to improve the utility of artillery in urban environments and the full-spectrum of warfare are making excellent progress. A view of measures to restore artillery effectiveness in irregular terrain comes from DiMascio's article, "Army Artillery Gets a Makeover," *InsideDefense.com NewStand,* 25 April 2006. DiMascio's article describes the following assessment of efforts to restore meaningful roles for the artillery, reduced by asymmetric enemy operations in urban environments in Iraq, and in so doing, provides excellent insights on why the field artillery is anxious to change warfighting, TTPs, and its role in urban environments:

> The combination of newly developed precision munitions and precision targeting software will help Army artillery regain its role on future battlefields, Army artillery, which is embedded in the service's modular brigade combat teams, has been sidelined by Air Force capabilities, the threat of collateral damage and rules of engagement governing today's crowded, urban fighting zones. . . . Artillerymen have been out there walking patrol, doing patrol. . . . That'll continue now, but they'll also have the dual mission of being able to fire artillery, because you can do it precisely. . . . Within the next year, the Army will see a change in the way artillery is used.[10]

With changing warfighting concepts in Iraq, field manuals and seemingly daily developments on how to utilize artillery firepower, the extent of resources, and scholarly work is substantial. The focus of the literature search in the area of TTPs is the field manual, which describes how the United States military approaches battle, primarily with regard to the field artillery and fire support.

FM 3-0, *Operations* (June 2001), provides the basic foundations to warfighting. Moving to the branch of the field artillery, a study into FM 3-09, *Fire Support* (November 2002), gives greater clarity to the general operations conducted by the fire supporters and their integration with the maneuver forces. FM 3-09.21, *Tactics*,

Techniques, and Procedures for the Field Artillery Battalion (March 2001), brings the research closer to the tactical FA unit and explains the how and why to their conduct in training and combat. Finally, FM 3-09.30, *Tactics, Techniques, and Procedures for Observed Fire at the Battalion Task Force and Below* (June 2001), details the methods used by the observers of fire support at a midrange tactical level. This manual offers both an explanation of the observer on the ground (the executor), and the thoughts and focus of the fire support coordinator in a tactical operations center (TOC) (the controllers). To date, these are the most recent FMs available for reference in their title and category.

Over time, manuals depict the shift in concept of the cannon and rocket launchers from a mass formation of artillery units and mass delivery of artillery fires on targets sufficiently large enough to justify massed fires, to smaller firing units, using fewer numbers of rounds, and engaging smaller-sized targets. So great is the change in development and use of the field artillery that interim FMs are now in production, capturing the "currently in the Army" TTPs of the "King of Battle" weapon systems.

As the result of including these documents, the literature search extended to include some recent articles that address developing and integrating new technologies, as well as precision munitions; future doctrine and how to think about it in today's world; and articles that address why and how today's and tomorrow's military must emphasize developing leaders capable of coping with the uncertainties and meeting the challenges inherent in battle spaces of the future. Most of these articles are readily available on the World Wide Web, an invaluable resource for this study.

Doctrine, Mass, and Tactical versus Operational Levels of War

The realm of joint and combined warfare continues to produce a great deal of information, as well as the evolving enhancements to artillery precision munitions. Revisions to joint publications now occur at a much more rapid rate than just a few years ago. In today's Army, interim FMs bridge the gaps between old doctrine and new doctrine¸ the latter still continuing to evolve within the Army, other services, and at the joint level.

Doctrine

The March-April 2006 issue of the *Field Artillery Journal* states that, "Changes in operational and organizational concepts require changes to our doctrine and TTPs."[11] The rewriting of TTPs, according to the *Field Artillery Journal*, is now based on "changes in operational and organizational concepts."[12] It follows directly that as the effectiveness of precision munitions continues to increase, and as new lessons are learned in battle, TTPs must change accordingly.

The need to develop doctrine for asymmetric warfare (a new threat) in complex irregular terrain (new battle space) enabled by precision munitions is a stated requirement to fulfill the *Army Strategic Imperatives* and implied throughout the *Army Strategic Guidance, 2005*: "We must develop doctrine and capabilities, such as enhanced target acquisition and more precise weapons systems that reflect the reality of the battle space our Soldiers on the ground face in places like Iraq and Afghanistan."[13]

The descriptions by the ground commander of the Second Battle of Fallujah indicate that perhaps the TTPs effectively being evolved and implemented in Iraq are ahead of any formal doctrine or top-down guidance for "how to fight" in face of today's

new threats and battle spaces.[14] However, as the "long war" continues, doctrine and TTPs would greatly benefit from an updated "doctrinal umbrella," if there is to be a uniformly effective approach to assuring high quality training and success in future battles.

Mass

Some selected quotes from an article, "Principles of Operations as proposed in Initial Draft, 1998 FM 100-5, *Operations*," *Parameters*, Army War College Quarterly, spring 1998, show that discussions about mass and its link to precision weapons is not new, but still timely in 2006. The article states,

> Precision weapons are potentially a critical component of mass as it is construed today: the concentration of effects to accomplish the mission. If one missile, bomb, or artillery projectile can achieve a desired outcome, it is a supremely effective and efficient application of the principle of mass.[15]

In its simplest terms, "mass" is the concentration of the effects of combat power at the decisive place and time.[16] However, the field artillery extends this definition to include:

> Mass effects at decisive places and times. The intent is to achieve efficient, effective firepower that produces overwhelming effects, as opposed to overwhelming firepower that may waste limited resources. Maximized efficiencies, combined with maximized effectiveness, produce quick victories where possible.[17]

The FA's definition addresses the generic issues of mass, but goes further by explaining how it applies to the artillery branch and artillery fires in support of maneuver forces. Of note is that the definition explicitly mentions, "efficient, effective firepower that produces overwhelming effects, as opposed to overwhelming firepower that may waste limited resources."[18]

This statement, documented in the 2002 FM 3-09 *Fire Support*, has clear implications on the desired effects of the field artillery. Quoting again from FM 3-0, "Massing in time applies the elements of combat power against multiple targets simultaneously."[19] These definitions describe the necessity to minimize expenditure of ammunition, achieve quick results, and maintain sustainable firepower for the duration of extended operations. Precision-guided munitions in the field artillery surely fit the needs implied in the field artillery definition of "mass," because it is able to fire fewer rounds (efficient) to achieve the same results (overwhelming firepower) as traditional massed artillery fires. Artillery doctrine clearly supports the use of precision-guided munitions on the battlefield as a means of creating mass.

Operational and Tactical Levels of Warfare

The military distinguishes between the tactical, operational, and strategic levels in fairly precise terms while focusing on more conventional forms of warfare as doctrine evolves. These distinctions and their definitions are very useful for many reasons that include describing warfighting at different levels of organization, clarifying roles and responsibilities, coordination among services, to name but a few: focusing training and education.

As doctrine evolves to adjust to the different warfare of GWOT and influences the capabilities and potential roles of precision weapons, it is arguable that traditional distinctions between traditional tactical and operational levels can become blurred. Blurring of formerly reasonably distinct boundaries between these two levels, or changes in doctrine created by improved precision munitions, would have major implications on the development of new tactics, procedures, and training, as well as increase the

importance of good judgment and savvy on the part of field artillery commanders and leaders.

Recent open literature describes some implications of improved artillery precision munitions and the potential for changing roles between the tactical and operational levels. For example, in "Army Artillery Gets a Makeover," with regard to artillery precision munitions, "Now we've got everything for precision fires . . . the smallest thing [the Air Force has] is a 500-pound bomb. Now, with a 50-pound warhead on an Excalibur, we can give [the ground commander] . . . precision targeting, the same accuracy."[20]

This article and Major General Ralston's summation of progress to enhance artillery precision munitions in accuracy, range, size of munitions, and rapid responsiveness to ground forces, have far reaching implications. Clearly, tactical-level artillery is becoming a much greater part of the operational level of warfare, fully capable of providing either precision or massed fires at short or long ranges. These new capabilities in the artillery will also add to the flexibility of choices for firepower to both tactical and operational commanders. With these enhanced operational capabilities now in the hands of tactical ground commanders, it makes sense at some point to reconsider current understanding of roles and responsibilities at the tactical and operational levels of warfare.

This limited review of how one small aspect of field artillery may alter the understanding of the operational and tactical levels of warfare is important for the insights it provides to the challenges related to transforming the Army at a rapid pace to a very different modular structure, while in an asymmetrical war that creates high rates of

deployments. It also reveals how improvements to just one capability, artillery precision munitions, could, at some point, prompt a reconsideration of how the Army fights.

These higher level ideas are critically important, since integrating enhanced capabilities into the Army can ultimately lead to adjustments to doctrine and provide the basis for more fundamental changes in areas that include TTPs; training; service schools; leader development; and many others.

Summary

Collectively, the *Army Strategic Planning Guidance, 2005,* with its descriptions of *Army Strategic Goals, Objectives,* and *Imperatives*; the updates from the Chief of Field Artillery; the feedback from battle field commanders in Iraq; and the articles related to the capabilities and implications of evolving enhanced artillery munitions into the new modular Army provided excellent material and inputs for addressing the research question,

What are the tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*?

These references also enabled the study to remain focused and within its limitations and in accord with its delimitations.

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[1]MG David C. Ralston, "Modularity Update: Transforming the FA," *Field Artillery Journal* (March-April 2006): 1-3.

[2]*US Army Strategic Imperatives* [document on-line]; available from http://www.ausa.org/ WEBINT/ DeptILW.nsf/ byid/CCRN-6CCRLT; Internet; Accessed 6 May 2006.

[3]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide .com/content/army_board_study_guide_topics/the_army_plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

[4]Ibid.

[5]John F. Sattler, "Second Battle of Fallujah:Urban Operations in a New Kind of War," *Field Artillery Journal* (March-April 2006): 4-9.

[6]Ibid.

[7]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide .com/content/army_board_study_guide_topics/the_army_plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

[8]MG David C. Ralston, "Modularity Update: Transforming the FA," *Field Artillery Journal* (March-April 2006): 1-3.

[9]Ibid.

[10]Jen DiMascio, *Army Artillery Gets a Makeover* [document on-line]; available from http://www.insidedefense.com; Internet; accessed 25 April 2006.

[11]MG David C. Ralston, "Modularity Update: Transforming the FA," *Field Artillery Journal* (March-April 2006): 1-3.

[12]Ibid.

[13]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide .com/content/army_board_study_guide_topics/the_army_plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

[14]John F. Sattler, "Second Battle of Fallujah:Urban Operations in a New Kind of War," *Field Artillery Journal* (March-April 2006): 4-9.

[15]Russell Glenn, "Principles of Operations as proposed in Initial Draft, 1998 FM 100-5, Operations," *Parameters* (Army War College Quarterly), 28, no 1, (spring 1998): 48-66.

[16]US, Department of the Army, FM 3-0, *Operations* (Washington, DC: Government Printing Office, June 2001), 4-13.

[17]US, Department of the Army, FM 3-09, *Fire Support* (Washington, DC: Government Printing Office, November 2002), 3-6.

[18]Ibid.

[19]Ibid.

[20]Jen DiMascio, *Army Artillery Gets a Makeover* [document on-line]; available from http://www.insidedefense.com; Internet; accessed 25 April 2006.

CHAPTER 3

RESEARCH METHODOLOGY

As stated at the close of chapter 2, "Literature Review," the research question addressed in this paper is, What are the tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*? These two objectives are: (1) trained and equipped Soldiers and developed leaders and (2) relevant, ready land forces for the joint team. The higher-level goal, to be served by these two objectives is domination of the full-spectrum of land warfare, both now in the GWOT and in future battle space environments. This higher level goal will be included in discussions of the second objective, "relevant, ready land forces" since that is clearly the intent of the *Army Strategic Planning Guidance, 2005*.

The literature review shows a wide variety of references that relate to the first part of the research question: The tactical effects and future implications of artillery precision munitions. These highly interrelated areas include artillery precision munitions; changing battle spaces and organizational structure; warfighting, TTPs; doctrine and mass; the tactical and operational levels of warfare; and the *Army Strategic Planning Guidance, 2005*.

The basic research design for this paper is to use the cited references to analyze each of these areas (later in chapter 4) by identifying the positive and negative effects at the tactical level, to include any current or known future changes, as well as the future implications of effects and changes on other related areas. The analysis of the area, "Artillery Precision Munitions," identifies the tactical effects and future implications on the two *Army Strategic Objectives*. The analyses of the remaining three areas identify

how each area influences the tactical effects and future implications identified in the first area, “Artillery Precision Munitions.”

This basic research model of linking the area analyses to *Army Strategic Objectives* is depicted in table 1 and provides the framework for the analysis. It is important to note that completion of the first row addresses the research question; however, completion of the remaining three rows enables a full discussion of the research question and the development of meaningful conclusions and recommendations. The completed table will be included at the end of chapter 4 “Analysis.”

Since the research design for analyzing each area is essentially the same, the following sections describe only the references used in each area. The research design described above explains the use of the references and how their analysis to each area identifies positive and negative effects at the tactical level, known changes for the future, and the impacts on other related areas. The effects and future implications from each area on the *Army Strategic Objectives* are also part of the analysis of each area.

Table 1. Tactical Effects and Future Implications of Artillery Precision Munitions on the *Army Strategic Objectives, 2005*

Areas Related to Artillery Precision Munitions and Army Strategic Objectives	**Trained Soldiers**	**Equipped Soldiers**	**Leader Development**	**Relevant, Ready Land Force**	**Full Spectrum of Conflict**
Artillery Precision Munitions (APM)	FI1-Training of Soldiers aligned to and enable new TE1, TE2 and TE3 capabilities; affected by BS, OS, WF, DM	TE1-Enhanced range, accuracy, relevance, flexibility enhances equipped Soldiers	FI2-Leader development aligned to TE1 capabilities, BS, OS, WF, DM	TE2-Enhanced range, accuracy, relevance, flexibility enables relevant, ready land force; enhanced by FI1, FI2, TE1; enhances TE3	TE3-Enhanced range, accuracy, relevance, flexibility enhances capabilities to dominate full spectrum of conflict; enhanced by TE2
Changing Battle Spaces (BS) and Organizational Structure (OS)	FI1: shaped by BS and quality influenced by OS	TE1: effects and quality influenced by BS and OS	FI2: effects and quality influenced by BS and OS	TE2: effects and quality influenced by ES and OS	TE3: effects and quality influenced by BS and OS
Warfighting TTPs (WF)	FI1: effects and quality influenced by WF	TE1: effects and quality influenced by WF	FI2: effects and quality influenced by WF	TE2: effects and quality influenced by WF	TE3: effects and quality influenced by WF
Doctrine, Mass, Tactical and Operational Levels of Warfare (DM)	FI1: effects and quality influenced by DM	TE1: effects and quality influenced by DM	FI2: effects and quality influenced by DM	TE2: effects and quality influenced by DM	TE3: effects and quality influenced by DM

Artillery Precision Munitions

The basis of analysis related to the effects at the tactical level of currently fielded artillery precision munitions comes from feedback from actual battlefields--after-action reports, accounts and open literature. These references describe Desert Storm, the early assault phase of Operation Iraqi Freedom, and combat in Iraq during the transition of the

battle space to insurgent forces operating in complex urban environments. Interviews with the current Army Chief of Artillery supplement battlefield descriptions provide excellent updates on both the emerging enhancements to the current arsenal of artillery precision munitions, but also new technologies that will enhance their effectiveness.

In these interviews, the Chief of Artillery also addresses areas related to the tactical effects and future implications of artillery precision munitions that will begin to emerge in the near time frame. These areas include changing battle spaces and organizational structure; warfighting TTPs; and doctrine, mass, and the tactical and operational levels of war. Present and future influences on each of these areas create the effects and future implications of artillery precision munitions.

Changing Battle Spaces and Organizational Structure

Battle Spaces

The focus of the research on the effects of changing battles spaces intends to describe the impacts of the changing battle space in Iraq following the initial assault phase of Operation Iraqi Freedom and also to examine the battle spaces envisioned for the future as the Army continues its transition to a modular, expeditionary force. Descriptions of battle spaces in Iraq come from many of the same sources: the feedback from actual battlefields--after-action reports, accounts, and open literature describing the early assault phase of Operation Iraqi Freedom and follow-on combat in Iraq during the transition of the battle space to insurgent forces operating in complex urban environments.

Personal experiences by the author in Baghdad from March 2004 until March 2005 are also invaluable in the research effort. These battlefield descriptions also

supplement interviews, primarily with the senior ground commander for Coalition Forces in the Second Battle of Fallujah, but also as part of the interview with the Chief of Field Artillery as he describes future artillery precision munitions. Both interviews are from the *Field Artillery Journal*, an excellent source of highly credible, current updates on the issues addressed in this paper.

The Army Strategic Planning Guide, 2005, describes the future battle spaces in which the Army must prepare to fight in and win. Extensive use of this guide helps to describe these future battle spaces, as well as the spectrum of land warfare that the Army expects to dominate. Both the accounts from battles in Iraq and the discussions in *The Army Strategic Planning Guide, 2005,* relate to and surely impact other research areas that include artillery precision munitions, warfighting, and doctrine. These references also are excellent in relating the research areas to the *Army Strategic Objectives*.

Changing Organizational Structure

Descriptions and the basis for research for the changing organizational structure in the Army is *The Army Strategic Planning Guide, 2005,* which outlines the extent of and rationale for the transformation of a division-based structure to a modular, expeditionary force. Interim field manuals, interviews with the Chief of Field Artillery, and articles from the open literature provide the basis of research. The available resources and references for describing the effects and impacts of changing organizational structure in the Army are prevalent.

Warfighting, Tactics, Techniques, and Procedures

The references for the area of warfighting and TTPs include after-action reports and accounts from battlefields in Iraq, as well as numerous field manuals and interim field manuals focused on keeping pace with changing battle spaces and organizational structure, as well as evolving artillery precision munitions. Accounts from the ground commander of the coalition forces describing warfighting concepts and TTPs created in response to the very different battles space and enemy are particularly useful for the analysis of this area.[1]

An interview with the ground commander, LTG Sattler (USMC), of the Second Battle of Fallujah is particularly relevant to this area, as well as the first area of artillery precision munitions. The commander describes not only what he did and why he did it; he also shares how he made adjustments to TTPs to fit the Fallujah environment and offers insights related to the value of future artillery precision munitions in environments similar to Fallujah. His descriptions of TTPs to employ joint fire support in an urban area are also extremely useful for understanding the future implications for improved artillery precision munitions and achieving relevant, ready land forces for the joint team in future conflicts.

Doctrine, Mass, Tactical and Operational Levels of Warfare

Doctrine

Using standard, widely accepted definitions in this paper are critical for the discussions of doctrine, mass, and the tactical and operational levels of war. The open literature and professional publications that include *Parameters*, US Army War College Quarterly, provide excellent background, insights, and rationale underlying the principles

of war, mass and economy of force, in the evolving concept of net-centric warfare. The Army strategic imperatives explicitly require, *The Army Strategic Guidance, 2005,* implies, the need to develop doctrine for asymmetric warfare (a new threat) in complex irregular terrain (new battle space). These documents are also extremely useful for linking "the tactical effects and future implications of artillery precision munitions" to doctrine for new threats of asymmetric warfare in new battle spaces such as irregular terrain, as well as related areas that include warfighting and strategic objectives focused on both leader development and relevant, ready land forces for the joint team.

Mass

Many of the references related to doctrine also apply to the area of mass. For example, the article from *Parameters,* US Army War College Quarterly, spring 1998, cited in chapter 2, "Literature Review," also stated, "The principle of mass no longer means what the concept seemed to mean in Napoleonic times: to bring together in time and space Soldiers or supporting weapons. Such practices now and in the future could create conditions more likely to lead to disaster than to success by creating lucrative targets for an adversary's air and surface fire capabilities. Nor is mass only the concentration of all fires in time and space."[2] This quote is typical of many excellent references that include current and evolving field manuals, especially FM 3-09, *Fire Support*. These references and many others are rapidly adjusting to changes in areas that include munitions, battle spaces, organizational structures, and experiences from current battlefields.

Tactical and Operational Levels of Warfare

The linkages between doctrine, the use of mass to achieve success in the application of doctrine in battle, and the growing capabilities of enhanced artillery precision munitions at the tactical level to contribute to the operational application of mass receive adequate research and discussion in detail. There are ample sources in the open literature that analyze and discuss these linkages. These include, "Army Artillery Gets a Makeover," briefly described in the previous chapter. This article raises legitimate questions related to future roles and responsibilities for providing supporting fires for tactical ground commanders, as well as the coordination and control of tactical artillery fires that clearly have significantly enhanced, flexible, and relevant operational capabilities that ground commanders will likely prefer in the future, depending on the situation and the nature of the battle space.

Highly reliable, unclassified references and articles from the open literature support the research and analysis in this area well. The research model assures that the future implications of the development of enhanced artillery precision munitions on the *Army Strategic Objectives* are part of the analysis.

In summary, the areas and related references identified in the literature search are the basis of the research question and also the focal points of the analysis (chapter 4). The research design assures that each area receives analysis so as to identify the positive and negative effects at the tactical level, to include any current or known future changes, as well as the future implications of effects and changes on other related areas. The references also identify the effects and implications, by area, on the two *Army Strategic*

Objectives. The area analyses also formulate conclusions and recommendations (chapter 5) related to both the areas as well as the *Army Strategic Objectives*.

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[1]John F. Sattler, "Second Battle of Fallujah:Urban Operations in a New Kind of War," *Field Artillery Journal* (March-April 2006): 4-9.

[2]Russell Glenn, "Principles of Operations as Proposed in Initial Draft, 1998 FM 100-5, Operations," *Parameters* 28, no 1 (spring 1998): 48-66.

CHAPTER 4

ANALYSIS

Important Notes

This chapter explores the tactical effects and future implications of artillery precision munitions and the selected interrelated areas, on the strategic effects described in Army strategic objectives in *The Army Strategic Guidance, 2005*. Using the framework presented in chapter 3, this analysis will focus on, What are the tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*?

This chapter primarily addresses the use of artillery and the increased capabilities of artillery precision munitions following the debut of artillery precision munitions in Operations Desert Storm through Iraqi Freedom at the end of 2005. Since the introduction of precision munitions in Desert Storm, enhanced artillery precision munitions have been used in Iraq, some with significant improvements in precision and related technologies. Accounts of US forces' Iraqi battlefield experiences using precision munitions offer insights and suggest future challenges related to how precision artillery munitions will likely continue to influence the evolution of warfighting.

Insights from these battlefield experiences and challenges are invaluable for understanding the tactical effects and future implications of enhanced artillery precision munitions in the pursuit of the two *Army Strategic Objectives*: (1) trained and equipped Soldiers and developed leaders, and (2) relevant and ready land power for the combatant commander as part of the joint team. Achieving these two strategic objectives enables the fulfillment of the *Army Strategic Goal*, "to remain relevant and ready by providing the

Joint Force with essential capabilities to dominate across the full range of military operations."[1]

The extent to which enhanced capabilities from improved artillery munitions ultimately translate into the *effects* described in and implied by *Army Strategic Objectives* and the *Army Strategic Goal* will ultimately be determined by the cumulative impacts of several interrelated areas that include: artillery precision munitions; changing battle spaces and organizational structure; warfighting and TTPs; doctrine, mass, tactical, and operational levels of warfare; and *The Army Strategic Planning Guidance, 2005,* itself. The effectiveness with which the Army is able to synchronize these interrelated, changing "moving parts" will ultimately determine the, "tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*." The completed table will show the tactical effects and future implications of artillery precision munitions (first row), but also show the effects of the other related areas (last three rows) to provide a more comprehensive answer to the research question.

In summary, this chapter intends to illuminate the emerging tactical effects of artillery precision munitions, as well as future implications related to the pursuit of the two *Army Strategic Objectives*. Describing the increasing capabilities of artillery precision munitions achieves this research question; explaining the interrelationships between these munitions and areas that affect the translation of these enhanced capabilities into strategic effects (e.g., relevant and ready land power); and then synthesizing the results of each area analysis into conclusions (chapter 5). The analysis will align and be consistent with previous chapters describing the purpose of the study, the supporting literature and research questions, and the research methodology in order to

describing the tactical effects and future implications effects of artillery precision munitions on the Army's ability to comprehend its very ambitious strategic vision.

Analysis

The analysis is very straightforward and builds on the very brief overview in chapter 1 of the use of artillery precision munitions first in Desert Storm in 1991 and the assault phase of Iraqi Freedom in 2003. The analysis logically begins with the area, artillery precision munitions, and examines the increasing capabilities that enable tactical effects of artillery precision munitions (first part of the research question) on *Army Strategic Objectives* (second part of the research question). The intent of this paper is to examine the impacts of these improved munitions as the Army transforms and prepares for the future. Since it is very difficult to completely isolate the use of precision munitions from the context and conditions that ultimately translate capabilities into effects (the *Army Strategic Objectives*), the analysis then turns to an examination of other areas related to the effective integration on enhanced artillery precision munitions into Army units and warfighting. Each of these area analyses will focus on the effects and influences of the area on the first part of the research question, "the tactical effects and future implications of artillery precision munitions," using the *Army Strategic Objectives* as a basis for that determination. A summary of the effects and implications will close each discussion and be added to the table.

Artillery Precision Munitions

Success followed the Desert Storm actions in 1991 years later by the "shock and awe" assault phase of Operation Iraqi Freedom in 2003, where the traditional use of

division formations supported by massed artillery fires was again highly successful. By 2003, the MLRS' capabilities of Desert Storm evolved into a leaner, more lethal system whose talents exceeded those from twelve years earlier. For example, later in Operation Iraqi Freedom, MLRS fired precision-guided rocket munitions in excess of 50 kilometers, destroying two insurgent strongholds and at least 48 insurgents in Tal Afar on 9 and 10 September 2005.[2]

As this new kind of warfare began to establish itself in Baghdad, efforts to improve and develop new precision munitions continued. Some of these munitions and their supporting systems deployed and are effective in Iraq. Other new advanced precision munitions are in the final stages of approval for deployment, while more advanced systems are making excellent progress. Feedback from Iraq indicates that commanders on the ground are learning to take advantage of and use precision munitions more effectively to improve the use of artillery in urban environments. The remainder of this section first addresses many of the precision munitions in development, and then describes the very different nature and the impacts of the use of these new advances in a changing battle space. Indeed, making meaningful insight changes in precision weapons and their value to warfighting surely requires a battle space context.

MLRS improved between Operations Desert Storm and Iraqi Freedom. The Guided Multiple Launch Rocket System (GMLRS) Advanced Technology Demonstration (ATD 95-98) demonstrated a significant improvement in the range and accuracy of the MLRS artillery rocket. Improved accuracy results in a significant reduction in the number of rockets required to defeat the target (as much as six fold at extended ranges). Other benefits include an associated reduction in the logistics burden

(transportation of rockets), reduced chances of collateral damage and fratricide, reduced mission times (resulting in increased system survivability), and increased effective range for the MLRS rocket.[3]

The Excalibur, combat tested in neither Desert Storm nor Iraqi Freedom, has test fired successfully since Iraqi Freedom shifted into a more asymmetric environment. The Excalibur, a 155-millimeter Precision Guided Extended Range Artillery Projectile, also known as the M982 ER DPICM (extended range dual-purpose improved conventional munitions) Projectile, is the Army's fire and forget, smart munition. It provides the capability to attack all three key target sets: soft and armored vehicles, and reinforced bunkers, out to ranges exceeding current 155-millimeter family of artillery munitions.

In short, the Excalibur is a GPS guided munition that requires no observer with special capabilities. Although the artillery prefers that an observer to control fire missions on a target, in the case of the Excalibur, the observer does not need special codes to program into a laser designator. The Excalibur is an all-weather capable round, since the basis of its guidance system is the target's location and does not require a designation or "painting" by a laser. The observer must, however, identify the target's location with extreme accuracy, maintain visual contact, and notify the firing field artillery unit if the target's location changes.

These examples make it very clear that during the 1990s, and continuing today, the development and use of precision munitions progressed at much greater rates than before Desert Storm. As testing continues on the Excalibur, GMLRS, and advanced Army tactical missiles (ATACMS), the field artillery is even attempting to convert already existing "dumb" munitions into smarter rounds. Currently, the U.S. Field

Artillery is experimenting with precision-guidance kits (PGK) that enable a cannoneer to turn a standard HE round into a smart round that will guide itself to a known point on the ground, or a target.[4]

More recently, in the March-April 2006 issue of the *Field Artillery Journal*, Major General Ralston commented on the current status of improving precision munitions such as Excalibur, the GMLRS, as well as C-RAM. Major General Ralston explained that the 155-millimeter Excalibur unitary precision-guided munition is on track, that in recent testing it hit a 20-by-20-meter reinforced structure four meters from the center of the target at a distance of nearly 19 kilometers, and that the goal of fielding Excalibur is in the First Quarter of FY 07.

In the same article, Major General Ralston also discussed the performance of the guided multiple-launch rocket system (GMLRS) unitary rocket in urban operations in Iraq, stating that 30 GMLRS unitary rockets have been fired in OIF on five different targets; destroying two targets in a dense urban area in a large city and killing a number of insurgents with very limited collateral damage to the surrounding structures. Each rocket hit its intended target with less than a four-meter circular error probable (CEP). In Major General Ralston's words,

> The new GMLRS unitary rocket and existing Army tactical missile system (ATACMS) Block 1A quick-reaction unitary (QRU) missile, two surface-to-surface precision-guided munitions, now give the commander options for all-weather first-round effects from 15 to 270 kilometers in ongoing operations.[5]

Major General Ralston also described progress in another important area related to artillery precision munitions: vulnerability and survivability. He explained the fielding of the new Counter Rocket, Artillery, and Mortar (C-RAM) "sense and warn" capabilities in several FOBs within the CENTCOM area of responsibility (AOR). C-RAM provides

early warning of indirect fire attacks on friendly forces and involves the integration of Army, Air Force, and Marine Corps' sensors and fusing their data into a common operational picture (COP). C-RAM allows commanders to clear fires quickly to respond to enemy indirect fire attacks.

To summarize, impressive advances have and continue to progress with artillery precision munitions compared to the days of Desert Storm. Commanders will soon have, "options for all-weather first-round effects from 15 to 270 kilometers in ongoing operations . . . with a four-meter circular error probable (CEP)."[6]

The views of battle commanders on the ground provide additional insights into the importance of continuing to improve and deploy artillery precision munitions to combat zones. In the interview in the March-April issue of the *Field Artillery Journal*, cited earlier, the interviewer asked LTG Sattler about his thoughts on improved precision munitions. LTG Sattler commented on the anticipated fielding of the lightweight 155-millimeter M777 howitzer in combination with the Excalibur unitary round that, "it will provide unbelievable first-round precision fires, day or night, seven days a week. The same is true of HIMARS (high-mobility artillery rocket system) firing GMLRS unitary, giving us even greater range."

In the same March-April issue of *Field Artillery Journal*, LTG Sattler was also asked, "How will fielding the lightweight 155-millimeter M777 howitzer enhance the fires capabilities of the Marine air ground task force (MAGTF)? The high-mobility artillery rocket system (HIMARS)? The expeditionary fire support system (EFSS)?" EFSS is a towed, rifled 120-mm mortar and is scheduled to begin fielding in the 10th Marines in late 2006 or early 2007."

LTG Sattler responded,

> With GMLRS hitting rounds in the water and Excalibur hitting rounds in testing, both within four meters or less of their targets--absolutely I could have used them. They will be extremely useful in future conflicts. They give us all-weather, 24-hour, seven-day-a-week precision-guided capabilities. The sooner we can get them, the better.
>
> Now, having said that, these incredible munitions will add to our capabilities, not replace any. They will not replace aviation with air-breathing pilots, not only dropping precision-guided munitions, but also providing situational awareness so the guys on the ground can prosecute the battle better.
>
> And, our "dumb" artillery rounds in the battle of Fallujah were pretty damn "smart," so *we don't want to get rid of them. It isn't an either-or* [emphasis mine].
>
> The ground warrior doesn't care if his fires come from tubes, rockets or aircraft, just as long as he gets what he needs and when he needs it. These two new munitions now mean he can have precision-guided fires any time.
>
> The fires triad coming into the force--the M777, HIMARS and EFSS will complement our other mortars and aviation and give us seamless and continuous fires to prosecute battle 24/7 anywhere in the world.[7]

The capabilities of artillery precision munitions have increased dramatically since their debut in Desert Storm in 1991. By 2007, the capabilities and tactical effects of artillery precision munitions will have improved in range, accuracy, relevance and flexibility (choice of warhead and delivery system), and responsiveness (faster response time, all weather), to name most of the important areas in which technical improvements have been or will be made.

These increased capabilities mark substantial improvements over the artillery in Iraq just over a year ago. For example, based on personal experience of the author, in the Baghdad area, March 2004 to March 2005, artillery seldom fired in urban terrain due to a concern about potential collateral damage. Mortars fired more often than artillery because of their higher angle of trajectory and smaller burst radius, despite the fact that they lacked the range of a howitzer.[8] Many of the situations in which mortars fired in lieu of

howitzers were those in need of indirect fires capable of more precise targeting and engagement.

The howitzer was also less effective in urban environments because it was often prohibited from engaging targets due to the commander's engagement criteria or rules of engagement (ROE). For example, in these very different environments with insurgent forces using asymmetric tactics, groups of up to three insurgents hiding in a mosque normally did not qualify as a target for artillery fires. Moreover, the difficulties of urban terrain and the interference of buildings on the relatively flat flight path of an artillery round further limited the utility of the artillery.

Furthermore, C-RAM is a major addition that will partner with artillery precision munitions to greatly enhance the counterfires capabilities of the field artillery. The impact of this kind of flexible, reliable, long-range firepower at the immediate call of a tactical ground commander is not completely clear at this point, but in the future, it could likely lead to a reevaluation of how the Army will fight in future battles spaces as a member of the Joint Team.

Summary. Tactical capabilities of artillery precision munitions have been or will enhance significantly in range, accuracy, relevance and flexibility, and responsiveness. These enhanced capabilities have the potential to contribute directly to and significantly enhance the strategic effects in the *Army Strategic Objectives* related to "equipped Soldiers," and "relevant and ready land power for the combatant commander as part of the joint team" by "providing the joint force with essential capabilities to dominate across the full range of military operations."[9] The improvements in range, accuracy, relevance and flexibility, and responsiveness better equip Soldiers and units that in turn contribute

immeasurably to a relevant and ready land power, while also assuring essential capabilities to dominate across the full range of military operations.

If successfully integrated into Army units, these enhanced *capabilities* will also have important future implications for the strategic *effects* in the *Army Strategic Objectives*, related to "trained Soldiers" and, "developed leaders." Indeed, *The Army Strategic Planning Guidance, 2005,* emphasizes the following:

> Trained and Equipped Soldiers and Developed Leaders. Our first Strategic Objective is trained and equipped Soldiers and developed leaders. As people are the Army's most valuable resource, assuring Army Soldiers and leaders are adequately prepared to meet the substantial demands of our current, complex security environment is vital.
>
> The complexity of the operational environment affects all levels of leadership. . . . To succeed, leaders at all levels must have situational understanding that extends beyond the tactical level. This requires a robust leader development system that grows leaders who are prepared, versatile and adaptive.
>
> We are enhancing the capabilities required to increase speed, reach and precision and our ability to engage routinely in joint operations at significantly lower operational and tactical levels than today.
>
> To succeed, the Army must develop a more sophisticated understanding of the implications of the new environment at the operational and strategic levels.[10]

As enhanced artillery munitions integrate into the Army, the actual achievement of the *Army Strategic Objectives* will ultimately depend on people--trained Soldiers and developed leaders. These are the most important of the "future implications," since they will ultimately determine the success of the integration of enhanced artillery munitions to contribute to the Army's future.

In addition to "trained Soldiers" and "developed leaders," the fulfillment of the potential of enhanced tactical capabilities of artillery precision munitions on the strategic effects articulated in the *Army Strategic Objectives* and *Strategic Goal* ("equipped Soldiers," and "relevant and ready land power for the combatant commander as part of the joint team," by "with essential capabilities to dominate across the full range of

military operations") will also depend in large part on the impacts of other areas closely related to the successful integration of these munitions into Army units. These related areas, as well as parts of *The Army Strategic Planning Guidance, 2005*, link to the second part of the research question, *Army Strategic Objectives* through their influence on the successful integration of enhanced artillery precision munitions into Army units. The first of these areas is changing battle spaces and organizational structure.

Changing Battle Spaces and Organizational Structure

Changing Battle Spaces

After the initial assault phase of Iraqi Freedom in 2003, the battle space and opposing enemy in Iraq began to change dramatically. The main Iraqi Army divisions withered under the overwhelming assault and eventual destruction, capture, or fading into the population occurred. A more insurgent force operating as to avoid confronting large scale, traditional use of Army divisions, increasingly replaced these conventional forces. In many areas, battle space environments shifted from relatively open terrain typical of the early assaults (better suited for tanks, infantry fighting vehicles, and tracked howitzers) to a much more irregular, more complex terrain, to include highly populated urban environments. These very different environments often challenged and limited the traditional strengths of the US military while enhancing the opposing insurgent forces. Asymmetric warfare began in earnest.

In this new battle space, tanks and armored infantry vehicles retained some of their relevance and utility, primarily because of their ability to survive and respond to attacks by insurgent forces. Indeed, tanks and armored vehicles proved quite effective in the urban environments as well as open areas in which engagements with insurgents

occurred. However, as heavy combat began to subside after the early assault phase of Operation Iraqi Freedom, the use of field artillery units changed dramatically as the utility of low-angle artillery fires in urban areas diminished.

The change to urban environments and asymmetric warfare, and the resulting reduced effectiveness of the field artillery, quickly identified a "gap" in capability that needed filling, if the artillery wanted to retain a meaningful role in asymmetric warfare in urban environments. Even the Copperhead did not fill the "gap" because of its requirements for laser designations, the time required to lase the target (minimum of 13 seconds for acquisition), and the flight path of the round being too shallow for urban use. The artillery clearly needed different types of munitions because adequate preparation for the irregular, asymmetric battle space environments in Iraq did not occur.

As already discussed, efforts to enhance artillery precision munitions, as well as to improve the utility of artillery in urban environments, are making excellent progress. Another example of this progress is documented in the same interview of the *Field Artillery Journal* with LTG Sattler. This interview is an excellent example of how artillery effects depend on the battle space, other related technologies, and assets from other branches, services, and relevant TTPs. When LTG Sattler was asked, "What did you learn about Artillery in urban operations?" he responded with:

> If you have shared imagery and preplan as much as possible by knowing the coordinates of potential targets on that imagery, then the FOs and FDCs can hit the target, adjusting if they have to, to take out a target very rapidly. We learned that UAVs can provide the coordinates required for Artillery as well as aviation fires. If an Artillery round was the choice for the desired effects, an aviation crew flying in the area can use its Litening pod to provide the exact coordinates for the target. [The new Litening pod in many aircraft can display detailed imagery of the ground from, say, 26,000 feet in the air.] The crew also could see, for example, if another friendly unit was coming into the backside of

> that target, something an FO might not be able to see. Every part of the joint team played some unique role that made the whole more effective.
>
> Another thing we learned was that on the front side of the attack, VT [variable time] fuzes were most effective because many of the enemy were outside on rooftops. But once we moved down into south Fallujah where we backed the thugs into a wall (2nd BCT had sealed the south) and the thugs became very determined, PT [point detonating] fuzes were more effective.[11]

First, and to be fair, it should be noted that the Second Battle of Fallujah was a major battle where field artillery effectively influenced the fight with TTPs that the battle space greatly shaped, but it should not be assumed that the manner of artillery use in this situation implies that all future situations will have the same, overwhelming effect, or even that the TTPs used in Fallujah would apply in other environments. Every situation is different, requiring different techniques to achieve success. In some situations, more common than not, the enemy attacks in smaller, unplanned, spontaneous confrontations with smaller irregular forces in urban battle spaces in which artillery might be far less effective.

Second, accounts from the battlefield such as those from LTG Sattler on Fallujah, indicate that the artillery's use of precision weapons can be effective in urban battle spaces, depending on the situation, and with continued improvement (Major General Ralston's comments) will become a contributor for closing the capability gap of artillery in urban environments.

Finally, LTG Sattler's comments surely reveal the importance of technologies that enable capabilities such as shared imagery; the learning that takes place in battle ("we learned that UAVs can provide the coordinates required for Artillery as well as aviation fires."[12]) and the on-the-ground development of TTPs to cope with an urban battle space

such as Fallujah. “Lessons learned” from battlefields must integrate into the validation of future planning, and be reused and leveraged for the joint teams of the future.

Another view of measures to restore artillery effectiveness in irregular terrain comes from the article, “Army Artillery Gets a Makeover.” This article describes the following assessment of efforts to restore meaningful roles for the artillery, recently reduced by asymmetric enemy operations in urban environments in Iraq:

> The combination of newly developed precision munitions and precision targeting software will help Army artillery regain its role on future battlefields, the commander of the Artillery School said last week.
>
> Army artillery, which is embedded in the service’s modular brigade combat teams, has been sidelined by Air Force capabilities, the threat of collateral damage and rules of engagement governing today’s crowded, urban fighting zones, Maj. Gen. David Ralston told *Inside the Army* after speaking at an April 19 conference sponsored by the Precision Strike Association.
>
> Artillerymen have “been out there walking patrol, doing patrol,” Ralston said. “That’ll continue now, but they’ll also have the dual mission of being able to fire artillery, because you can do it precisely.
>
> Within the next year, the Army will see a change in the way artillery is used.”[13]

These two examples (LTG Sattler and the article above) are among the many available that describe significant improvement in artillery precision munitions in response to the very different urban battle spaces in Iraq and the potential for their expanded use in the GWOT and other future battle space environments.

Another aspect of the nature and impact of changing battle spaces in the pursuit of the Global War on Terror is IO. Indeed, IO can have major force and consequences from the tactical to strategic level. Most importantly, ideally suited are the enhanced capabilities of artillery precision munitions to assure that a prepared field artillery contributes to the success of IO, regardless of the conditions and needs of the battle space. The special contributions of artillery precision munitions to the successful pursuit

of IO in GWOT come to further discussion in a later section, “Warfighting, Tactics, Techniques, and Procedures.”

Summary. After the initial assault phase of Operation Iraqi Freedom, the changing battle space in Iraq from a conventional battle space and enemy to a battle space of complex urban terrain, and an insurgent force using asymmetrical tactics demonstrated the enormous shock that battle spaces can have on the effects of artillery at the tactical level, as well as warfighting in general. The Iraq experience reinforces the needs described in *The Army Strategic Planning Guidance, 2005,* to win the GWOT and to prepare for future battle space environments and the full-spectrum of land warfare. Both the ongoing improvements in artillery precision munitions and continuing battlefield experiences in the irregular battle space environments in Iraq carry tremendous importance as the Army transitions and pursues its vision of a relevant, ready land power that is dominant over the full-spectrum of warfare.

The innovative, highly competent leadership by the ground commander at Fallujah dramatically reinforces the importance of “developed leaders” capable of adapting to and succeeding in battle spaces that may not have encountered and for which their units may not have been fully prepared. Information Operations and its importance in current and future battle spaces is an example of an area that clearly must receive additional input towards Soldier training and leader development.

Perhaps most importantly, future “battle spaces” remains uncertain with regard to a future enemy, the environment, and the use of artillery fires and their desired effects. Our Army must prepare to fight in any battle space across the full-spectrum of conflict.

This simple but profound observation reinforces the flexibility and added value that artillery precision munitions will bring to the joint team in any future battle space.

Changing Organizational Structure

The *Army Strategic Planning Guidance, 2005,* is very clear and direct with regard to how and why the Army organizational is changing and will continue to change:

> Army continues to transform its organizations to meet the challenges of the security environment and ensure mastery across the full range of military operations. To ensure that the Army is capable of fielding the relevant and ready forces the Combatant Commander requires, we have undertaken five major transformation initiatives. They are: Implement Modularity.
>
> Implement Modularity: Modularity is the Army's major force transformation initiative . . . involves the total redesign of the operational Army into a larger, more powerful, flexible and deployable force . . . redesign centers on what is called a Brigade Combat Team (Unit of Action) [BCT (UA)] . . . a stand-alone and standardized tactical force of between 3,500 to 4,000 Soldiers that is organized the way it fights.
>
> Modularity has several major advantages . . . at least a 30 percent increase in the combat power of the active component of the force . . . an increase in the rotational pool of ready units by at least 50 percent . . . creation of a deployable joint-capable headquarters . . . a more predictable deployment cycle: One year deployed and two years at home station for the active component. . . . One year deployed and four years at home station for the Reserve force. . . . One year deployed and five years at home station for the National Guard force. . . . Reduced mobilization times for the reserve component as a whole.
>
> An operational Army organized around Modular Brigade Combat Teams and support forces will better meet the challenges of the 21st century security environment and, specifically, jointly fight and win the Global War on Terrorism.[14]

The transformation to modularity poses special challenges to both the Army and the Field Artillery. For example, the tasks associated with forming new Brigade Combat Teams (BCT)--completing the personnel replacements, reequipping, and training a brigade-sized unit--and then deploying to fight in a war where weapon systems are introduced and TTPs are improvised on the ground are staggering by any measure.

While continuing to evolve and develop improved precision munitions, the field artillery is working its way through this difficult period of organizational change in keeping with its proud history. According to Major General Ralston, "The artillery branch is making good progress." He notes the involvement of the Army in "The most sweeping transformation since World War II" and that "conversions will not be without significant resourcing challenges" and that "the solutions may be less than optimal at first." He adds that guidance "Was to provide organizations at the 80 percent solution level that could be adjusted and required little or no growth in personnel."

With regard to field artillery, he states that the focus is on "transferring those functions the division artillery (DivArty) performed to the new fire support cells (FSCs) in the BCT and maneuver battalion headquarters." FSC is the doctrinal term replacing the "fires and effects cell" or FEC" and "adding a fire support coordinator (FSCOORD) lieutenant colonel to the BCT and consolidating the fire support teams (FISTs) into a platoon in the maneuver battalion." He explains that the "changes allow the FSCOORD to oversee the training and certification of fire supporters who are so critical to the BCT's operations."[15]

These statements from Major General Ralston reveal the enormity of the challenge to the field artillery of transitioning to a modular, expeditionary structure while integrating new weapons (precision munitions is the example in this paper), and evolving warfighting concepts and TTPs on the battlefield. It is understandable that guidance to design teams was "to provide organizations at the 80 percent solution level that could be adjusted and required little or no growth in personnel."[16] However, even with the assumption that the impacts of an 80 percent solution on unit effectiveness and

warfighting capabilities have been considered and factored into this guidance, there remains a very obvious, long term need for well equipped and well trained Soldiers, as well as extremely well developed, dedicated, savvy leaders. If initial reorganization targets are set at 80 percent, then Soldiers and leaders will surely have to make the difference in the challenging years ahead as these units engage in the GWOT.

The summary account from the Field Artillery Chief is extremely useful, but it is also important to examine in greater detail how the field artillery "fits" into the new modular organizations. For example, a fires brigade (formerly DivArty command) plays an extremely important role in the evolving field artillery role in the new modular Army. First, the fires brigade enables an artillery unit to mass on a target with fewer rounds fired per howitzer. Additionally, with the fires brigade's involvement, effects on multiple targets can be made available with additional fires from reinforcing artillery units outside the firing unit or the fires brigade. Lastly, with his own artillery assets (a DS battalion) within the BCT, the tactical commander now directly controls an expanded ability to engage the enemy deeper on the battlefield and pressures an enemy combatant to make tactical decisions at a time or place not of his choice.

Another advantage of the fires brigade now belonging directly to the tactical commander (division) is that it is another asset he can employ in the fight. Similar to the DS battalion, the fires brigade possesses similar or greater firepower, all of which is all-weather capable. Under the new modular concept, the Air Force or attack aviation provides reinforcing fires for the fires brigade (and hence, the BCT).

It is very clear from the account from Major General Ralston, and the more detailed overview of the new control and coordination of artillery fires owned by the

BCT commander, that there are a plethora of new challenges in areas that include TTPs, as well as warfighting concepts and training.

Summary. After decades of organization, training, deployments, and fighting with a focus on a traditional structure where the major combat force was the division, the United States Army is adapting to a new modular organization. Under the old structure, maneuver units received fire support from their direct support (DS) artillery, with additional massing of fires planned and coordinated by a higher artillery headquarters (DivArty, CorpsArty, etc.). Under DivArty control, all DS battalions could receive orders from DivArty to fire at Division targets, or reinforce one particular DS battalion. Under the new concept of modularity, DivArty does not exist, and thus this possibility of reinforcement from another BCT's DS battalion becomes more remote.

With the change to modularity, the need to coordinate and mass fires remains an imperative for the field artillery at all levels. However, the Army's Field Artillery will now place direct support battalions under the command of BCT commanders and have a fires brigade at the division level. However, the challenge will be greater since DS battalions in a BCT no longer have a DivArty immediately available to provide reinforcing fires from other resources. The important point is that if and when enhanced artillery precision munitions become part of the BCT, there will be very different, more flexible, and highly capable firepower immediately available to the tactical ground commander

Changing organizational structure has had, and will continue to have, major impacts on the use and effectiveness of the artillery, especially the tactical effects of artillery precision munitions and the Army's ability to fulfill its strategic vision. In the

not too distant future, the BCT commander at the tactical level will command and control artillery firepower that include artillery munitions of unprecedented capabilities.

Using the words in the earlier section, "Artillery Precision Munitions," these capabilities may contribute significantly to the parts of the *Army Strategic Objectives* related to "equipped Soldiers," and "relevant and ready land power for the combatant commander as part of the joint team"; and the somewhat redundant *Army Strategic Goal*, "to remain relevant and ready by providing the joint force with essential capabilities to dominate across the full range of military operations." Indeed, the improvements in the tactical capabilities of artillery precision munitions in range, accuracy, relevance and flexibility, and responsiveness may enhance the desired strategic effects described above. These improvements may better equip Soldiers and units, may contribute immeasurably to a relevant and ready land power, and may assure essential capabilities to dominate across the full range of military operations.

The word "may" illustrates how closely related organizational structure is to the successful use of enhanced artillery precision and the importance of a successful transition of the Army to a modular structure. There are many "moving parts"--changing technologies, enhanced munitions, battle spaces, and now, organizational structure (not forgetting the enemy always has a vote in how battle ensues)--and the Army needs to synchronize the evolution of these "moving parts" if the transition and a successful conclusion of hostilities are to be realized downstream.

As important, the transition to a modular structure continues while focusing on an 80 percent level of fill and rotating BCTs to and from a hostile region. Equally important,

as enhanced artillery precision munitions integrate into BCTs; these unprecedented capabilities may dramatically affect the tactical levels of combat.

Warfighting, Tactics, Techniques, and Procedures

Warfighting

Earlier, the traditional, more conventional nature of warfighting in both Desert Storm in 1991 and the initial assault phase of Iraqi Freedom in 2003 was briefly described. Although weapons improved between 1991 and 2003, in both cases, use of division-based formations and massed field artillery fires were essential according to developed doctrine for more-traditional warfare on the central plains of Europe. That is, division deployments and maneuvers were in accordance with air-land battle doctrine; and the field artillery focused on its traditional role of massing fires in support of large formations of divisions.

Warfighting in GWOT is now adjusting in response to the interrelated changing battle spaces and enemy also summarized in earlier sections. Briefly discussed are these changes relevant to the artillery and precision munitions, again in subsequent paragraphs only for purposes of context.

The Second Battle of Fallujah again offers excellent examples of a number of very important dynamics that illuminate the nature of warfighting in urban areas in Iraq, and more importantly, what might occur in future similar conflicts. Understanding these dynamics, to include what was done and why, is essential if one is to draw inferences about the changing nature of warfare in the GWOT, possible reexaminations of doctrine, how TTPs might require modification, related adjustments to training, if leader

development might require review, and a multitude of other issues as our nation enters what is now referred to as the "long war."

From the same interview in the March-April 2006 *Field Artillery Journal*, LTG Sattler commented on the important role of IO in the Second Battle of Fallujah:

> IO was *huge* in setting the conditions so that the international community, Muslim world and our own US citizens understood why this fight had to be fought, understood that the Prime Minister had asked us to go in and clean out Fallujah.
>
> Weeks ahead of the fight, we shaped the battle space by dropping leaflets inside the city with psychological messages and messages from the Prime Minister to the people of Fallujah. It was clear that if the intimidators were not turned in or if they did not leave the city of their own volition, the Prime Minister would not tolerate the situation in Fallujah.
>
> The leaflets also told the people what was being "stolen" from them by the intimidators--projects to improve the city's sewage, water and schools that could not be initiated as long as thugs dominated the city, such as [Abu Musab] Al-Zarkawi. We even told them when the attack was coming, so they could leave the city, which really helped us avoid noncombatant injuries, keeping them down to almost zero.
>
> The last thing we did before the attack was drop a leaflet that told the civilians who did not leave to stay inside their homes and lay down on the floor with their pamphlets in their hands as we entered the building. We took them north to holding places, in most cases, mosques. We brought buses and vehicles along behind the attack to escort them north.
>
> Although we worked hard to avoid damaging the city or causing noncombatant injuries during the battle, we still had to fight the fight; some damage was inevitable. So our IO campaign told the people about the reconstruction of Fallujah--that power grids and water purification were coming back online, schools were being remodeled, streets were being repaired and rubble was being taken out of the city. We constantly educated the people so they knew things were happening all over their city.
>
> Our IO campaign worked very well. It was time-consuming, and there was still some citizen angst about not being able to return to their homes except by designated districts.
>
> IO set the conditions for minimal damage and injuries in the battle space, allowed us to fight in Fallujah with the world understanding why it was necessary and helped decrease the citizens' anxiety during the city's attack, clean up and repopulation.
>
> This is a new kind of war. [17]

The importance placed on IO in the Second Battle of Fallujah, is typical of the dramatically different battle spaces characteristic of the GWOT. The extreme precautions taken in Fallujah surely lead to the obvious conclusion that if artillery has a major contribution in irregular warfare in complex, populated terrain, it is absolutely essential that artillery fire avoid collateral damage whenever possible. In previous conflicts, a small, local battle might be won (by conventional warfare standards) by using conventional "massed fires" artillery support that incurs collateral damage. However, in today's "new kind of war," a battle concluded with collateral damage could easily translate into higher order, often worldwide, effects that derive from IO. Of all the reasons to continue the improvement and use of artillery precision munitions in the effort to win the GWOT, there are surely a few more important than the ability to hit targets quickly, precisely, and successfully at both short and long ranges without inflicting collateral damage.

To summarize, evolution occurred in the nature of warfighting in Iraq in response to changing battle space environments and the immergence of irregular warfare by insurgents who consciously avoid major confrontations with Coalition Forces. Initially, limitations to the field artillery's role in urban terrain contributed to the extent artillery Soldiers received relegated tasks and missions very different from the core tasks for which they trained. However, the continuing evolution of artillery precision munitions, the full commitment and creativity by leaders such as Major General Ralston, and innovative, adaptive combatant commanders, such as LTG Sattler, are restoring meaningful, effective roles for the field artillery in this very different "new kind of war." These leaders and the experiences on actual battle fields in Iraq surely confirm that

critically important to the field artillery meeting current and future challenges across the full-spectrum of land warfare is the continued enhancement and effective integration of precision munitions in the new modular, expeditionary Army.

Tactics, Techniques, and Procedures

Earlier discussions of artillery precision munitions, changing battle spaces, organizational structure, and warfighting included both explicit discussions and inferences about TTPs. This section supplements earlier discussions and provides updates.

For example, the March-April 2006 issue of the *Field Artillery Journal* provides an update on how artillery doctrine and TTPs are rapidly evolving in response to lessons from the battlefield and organizational change to modularity:

> Significant changes in operational and organizational concepts require changes to our doctrine and tactics, techniques and procedures (TTPs). Currently, FM 3-09.41 *TTP for Fires and Effects for SBCT Operations* and FMI 3-09.42 *TTP for the Modular Fires Battalion* have been approved. We are working on FM 3-09.23 *TTP for the Modular Fires Battalion* and FM 3-09.42 *TTP for Fire Support for the BCT*. Readers can find links to these manuals on the Fires Knowledge Network (FKN) home page, part of Army Knowledge Online (AKO). We soon will begin work on FM 3-09.24 *TTP for the Fires Brigade*."[18]

To summarize, the *Field Artillery Journal* states that "changes in operational and organizational concepts require changes to our doctrine and tactics, techniques and procedures (TTPs)." The *Journal* states that TTPs are being rewritten now based on, "changes in operational and organizational concepts. It follows directly that as the effectiveness of precision munitions continues to increase, both doctrine and TTPs will change accordingly."

In his interview in the March-April 2006 issue of the *Field Artillery Journal*, LTG Sattler was also asked, "What unique TTP did you use to employ joint fires?" He responded,

> We employed what we called "keyhole CAS." Working with the CENTCOM [Central Command] CFACC [Coalition Force Air Component Commander], Lieutenant General Buchanan [Walter E., III], and the CENTCOM Commander, General John [P.] Abizaid, we built a stack of CAS. With rotary-wing aircraft operating at 5,000 feet and below and fixed-wing at 9,000 feet, we established four holding points for Air Force, Navy or Marine fixed-wing and Army or Marine helicopters. We had Cobra and Apache attack helicopters plus Blackhawks and CH-46s that flew MEDEVACs or resupply.
>
> We built shared, detailed imagery of Fallujah; mensurated coordinates for certain key buildings on the imagery; and worked closely with CENTCOM's CAOC [Coalition Air Operations Center] in Qatar. So all joint pilots had the same keyhole CAS stack briefing and used the same reference points on their kneeboards. The ground warriors understood the keyhole CAS stack along with the ANGLICOs [air naval gunfire liaison companies], FACs [forward air controllers] and JTACs [joint terminal attack controllers], and they all had the same imagery.
>
> So when a building was mentioned as a target, everyone knew exactly which building it was, regardless of the uniform he wore or his role in the fight. If a Marine pilot in the stack said he did not have the right ordnance on board for a particular target, then an Air Force pilot could say he did and come out of the stack to take out the target.
>
> Fallujah II was fought in a city five miles by five miles with 15,000 to 20,000 buildings that had about 10,000 Soldiers, Marines and Iraqis attacking north to south, some swinging east to west and some attacking back from south to north. Aviation, Artillery, mortars plus UAVs had to be deconflicted with their effects orchestrated to prevent fratricide, be most effective and limit collateral damage or injuries to noncombatants. All that had to happen in a fog of intense house-to-house combat for 10-plus days in a constrained urban environment.
>
> We were about as joint as you can get.

LTG Sattler was also asked, "Please describe your targeting process, both deliberate and reactive." And he responded,

> When we positively identified a target as valid, in deliberate targeting we estimated the collateral damage potential of executing that target. A weaponeer worked a detailed equation, taking into account the type and size of the target, size and effects of the weapon, etc., to come up with the estimated collateral damage. We then figured out how we could get that collateral damage down to zero--change the heading of the aircraft, size of the bomb, delay of the fuze, etc.

> If the collateral damage was still high, then an authority in the chain of command had to determine if the target was important enough to risk the collateral damage.
>
> The next step in the deliberate targeting process was to deconflict the target with friendly forces. We're never going to accept a friendly casualty on a deliberate target. We ensured the commander who owned the target's battle space had cleared the target.
>
> The last thing we did in counterinsurgency ops was to ask a series of questions. What are the unintended consequences of executing this target? Will we hand the enemy an IO opportunity or can he generate a false IO campaign because of it? (In one IO campaign, the enemy used old footage to show elderly men, women and children in the hospital, claiming they were injured by our forces in Fallujah II.)
>
> Two months before the fight, we took down deliberate targets on a nightly basis: training camps, command and control nodes, meeting places for some of the high-value targets, etc. It took weeks to build some of those target folders before we actually decided we were going to take those targets down.
>
> Now, in reactive targeting--when troops were in contact or if there was hostile intent--the junior commander on the ground could clear and execute the target. An example of "hostile intent" is when the enemy was setting up a mortar tube; the commander didn't have to wait until the enemy fired the tube to take it out.
>
> If troops were in contact, the junior commander on the ground had the authority to engage a target to protect his forces. He positively identified the target and cleared it. Collateral damage was his call.
>
> Now, the commander had to consider proportionality. In other words, he couldn't throw a 2,000-pound bomb that could cause collateral damage on an enemy walking across a street with a rifle.
>
> For either type of targeting, based on the fire support control measures that we employed and our keyhole stacked CAS, when a valid target appeared, we wanted to engage it in seconds or, worst case, in minutes.[19]

These last two interviews by LTG Sattler offer clear evidence of how savvy commanders are developing and using highly effective TTPs on the ground in situations they have not previously encountered. They also demonstrate how an experienced, creative leader can adapt to new situations with innovative, highly effective solutions that result in success. Again, as the Army looks to the future, strategic planning must leverage the invaluable counsel of combat leaders who have faced these situations and prevailed.

As described earlier in the context of "changing organizational structure," under the new modular concept, the Air Force or attack aviation provide the reinforcing fires for the fires brigade (and hence, the BCT). However, it should be understood that due to a lag in time from target identification to target engagement, these air support assets might not serve time sensitive needs of the tactical commander.[20] For these very important reasons, it would appear that the DS battalion, a tactical asset, needs either a greater capability to precisely engage targets or access to more responsive reinforcing fires.

As tactical commanders begin addressing this apparent shortcoming, similar changes may occur at the operational level, as well. With the tactical commanders becoming more reliant on their internal assets to deliver precision munitions, the need for air delivered precision munitions may decrease for the tactical battlefield. With this, the deep strike capabilities (those munitions that deliver precision munitions beyond the range of the DS howitzers) may focus their efforts and effects on shaping the battlefield prior to the tactical unit's (BCT) arrival. Operational commanders may increase the allocation of fixed wing aircraft to the deep fight, or air interdiction (AI); and decrease the sorties allocated to the close air support (CAS) role. These decisions would do much to reduce the likelihood of fratricide incidents.

With the range and accuracies of the MLRS increasing, the requirement of self-suppression of air defense (SEAD) may decrease and possibly shift to MLRS ATACMS units. This rocket/missile SEAD support assumes the air defense artillery (ADA) is of a conventional method such as missile launchers with radar, as opposed to massed small arms fired from dispersed insurgents in a city. An example of the latter occurred in the initial assault into Iraq during the first deep strike operation with Apache helicopters, and

the ground threat from dispersed insurgent could not be foreseen or targeted. The field artillery is not effective in these situations, since the targets are individuals with rifles. This is especially true when they are in the open streets, not grouped together, and fire individually at their airborne targets. Avoiding flight paths over these types of areas or controlling the areas with infantry are possible solutions to this problem.

In summary, the March-April 2006 issue of the *Field Artillery* journal states that "changes in operational and organizational concepts require changes to our doctrine and TTPs." The journal states that TTPs are being rewritten now based on "changes in operational and organizational concepts."[21] It follows directly that as the effectiveness of precision munitions continues to increase, and as new lessons-learned gather from battle experiences, TTPs must change accordingly. It is also plausible that at some point in the future, doctrine may also evolve to address today's "new kind of war."

Some of the comments here relate to earlier discussions in the sections "Artillery Precision Munitions" and "Changing Battle Spaces and Organizational Structure." Historically, enhanced munitions and changing battle spaces often have major effects on the evolution of warfighting concepts and TTPs. The discussions in this section show that warfighting concepts and TTPs evolved in Iraq as Coalition Forces adjusted to the changes to asymmetric warfare by irregular forces who took great advantage of irregular terrain such as urban environments.

Recent successes in Iraq, such as the Second Battle of Fallujah, are in part due to improved munitions, but are primarily due to the innovative leadership of the ground commander USMC LTG Sattler. His detailed planning, insightful development of warfighting concepts and TTPs aligned to the situation in Fallujah and meticulous

execution of the IO campaign were the major reasons for the success at Fallujah. The fact that ground commanders can create warfighting concepts and TTPs without over arching doctrine addressing the new battle space environments in GWOT now and possibly others in the future, does not negate the need to eventually begin shaping new doctrine as required by *The Army Strategic Planning Guidance, 2005*.

As important, however, are LTG Sattler's responses to questions about the how relevant and effective enhanced artillery precision munitions (due for fielding in the next year or so) would have been in Fallujah. His emphatic responses underscored the relevance artillery precision munitions carry on the battlefield and how they could have significantly increased his capabilities and ability to fight. He was outspoken with his support for the near future when ground commanders will have command and control of such dramatically improved munitions.

LTG Sattler's descriptions of the intricate planning, effective execution, and important positive results of the IO campaign in Fallujah speak volumes about the importance of avoiding collateral damage in this "new kind of war." The improved flexibility and responsiveness of future artillery precision munitions (enabled by greater accuracies and ranges, smaller warheads, all weather capability, etc.) will enhance the ability of ground commanders to avoid collateral damage. That enhancement promotes a major contribution to winning the GWOT, the Army's top priority.

Doctrine, Mass, Tactical and Operational Levels of Warfare

Doctrine

Doctrine describes how an army fights. It follows that much of the previous section, "Warfighting, TTPs," applies to and carries over to the discussions in this

section. An understanding and consideration of time proven principles of war, such as "mass" (and almost by implication, its opposite cousin, "economy of force"), contribute to the formulation of doctrine just as the effective use of principles, such as "mass" on battlefields contributes to the successful execution of doctrine. Doctrine and principles of war are inseparable. Also, history clearly shows that doctrine tends to evolve with enhanced warfighting capabilities, as well as the changing nature of threats and battles spaces, since these areas closely relate. This is surely the case in the ongoing GWOT.

There are explicit requirements to develop doctrine for asymmetric warfare (a new threat) in complex irregular terrain (new battle space) to fulfill the strategic imperatives, as well as implied responsibilities throughout the *Army Strategic Planning Guidance, 2005*. The descriptions of the Second Battle of Fallujah by LTG Sattler indicate that perhaps the evolved and implemented TTPs in Iraq are ahead of any formal doctrine or top-down guidance for "how to fight" in face of today's new threats and battle spaces. However, as the "long war" continues, doctrine and TTPs consolidated as much as possible under a "doctrinal umbrella," would be very helpful to creating an effective approach for assuring high quality training for Soldiers, informed leader development and success in future battles--areas strongly supported in the *Army Strategic Planning Guidance, 2005*.

The limited focus of this paper does not permit a full discussion of what doctrine for "asymmetric warfare in complex irregular terrain" should be or even if there is an overall doctrine that might capture the full-spectrum of warfare, both required by the *Army Strategic Planning Guidance, 2005*. However, as precision munitions and their enhanced warfighting capabilities continue to evolve, and assuming that asymmetric

warfare will be part of the foreseeable future, there are some insights related to how precision weapons create mass on the battlefield. Hence, any meaningful discussion of the ties between mass and artillery precision munitions that may ultimately influence the evolution of warfighting and new doctrine are worthy of discussion and consideration.

Mass

History shows that periodically over time, as weapons and battle spaces evolve, military doctrine and organizations also adjust. For example, artillery fires combined and coordinated with large, overwhelming assaults by infantry foot Soldiers achieved mass in the trenches of World War I. Armor and air power had not developed sufficiently at that point in history to warrant a doctrine based on other than predominantly ground forces.

In contrast and after years of technological progress, mass was achieved in many notable cases (for example, Patton's Third Army relief of Bastogne) in World War II with maneuver of large tank formations supported by and coordinated with air and artillery firepower. With the development of both tracked vehicles (primarily the tank) and airpower, doctrine changed from a focus on ground Soldiers in World War I to a more combined use of both ground Soldiers and armored units supported by both artillery and air in World War II. Inherent in the change in doctrine between World Wars I and II was how to achieve mass in each of the wars and how changes in the capabilities of weapons systems (tanks and planes) prompted and enabled the change in doctrine.

For similar reasons, any pursuit of doctrine to address new threats of asymmetric warfare in new battle spaces, such as irregular terrain (from the *Army Strategic Planning Guidance, 2005*), should include a consideration of changes in weapons systems and how those changes might alter warfighting. In this paper, this logic applies to the continued

enhancement of precision munitions and whether or not they may alter how to achieve mass differently in future battle spaces and against new threats. Simply stated, will enhanced precision munitions alter how to achieve mass and if so, how might that alteration impact future warfighting and doctrine?

Some selected quotes cited earlier from an article, "Principles of Operations as Proposed in Initial Draft, 1998 FM 100-5, *Operations*," *Parameters,* Army War College Quarterly, spring 1998, are paraphrased here to show that the discussion about mass and precision weapons is hardly new, but surely timely in 2006. The article stated, in effect, that "precision weapons are potentially a critical component of mass and that if an artillery projectile can achieve a desired outcome, it is a supremely effective and efficient application of the principle of mass."[22]

In its simplest terms, mass is the concentration of the effects of combat power at the decisive place and time.[23] However, the field artillery extends this definition to include:

> Mass effects at decisive places and times. The intent is to achieve efficient, effective firepower that produces overwhelming effects, as opposed to overwhelming firepower that may waste limited resources. Maximized efficiencies, combined with maximized effectiveness, produce quick victories where possible, and support maintenance of battle tempo, initiative, and sustainable firepower for the duration of extended operations. Massed effects, at decisive places and times, can produce critical, immediate results, and shape conditions for future operations.[24]

The field artillery's definition addresses the generic issues of mass, but goes further by explaining how it applies to the artillery branch and artillery fires in support of maneuver forces. Of note is that the definition explicitly mentions, "efficient, effective firepower that produces overwhelming effects, as opposed to overwhelming firepower that may waste limited resources."[25] This statement, documented in the 2002 FM for fire

support (FM 3-09), has clear implications on the desired effects of the field artillery. It describes the necessity to minimize expenditure of ammunition, achieve quick results, and maintain sustainable firepower for the duration of extended operations. Precision-guided munitions in the field artillery surely fit the needs implied in the field artillery definition of mass because these munitions create the capability to fire fewer rounds (efficient) to achieve the same results (overwhelming firepower) as conventional massed artillery fires.

Quoting again from FM 3-0, "Massing in time applies the elements of combat power against multiple targets simultaneously."[26] Again, current definition of doctrine clearly supports the use of precision-guided munitions on the battlefield. More specifically, without precision munitions, the field artillery would need to fire a battalion of artillery in order to destroy one enemy platoon of tanks. Such a target would likely require a standard fire order of a "battalion 3," or each howitzer in the battalion firing three rounds in rapid succession. Indeed, this fire order follows the guidance in the Joint Munitions Effect Matrix (JMEM), and is commonly used at the Combat Training Centers. Without precision munitions, the artillery is likely incapable of fighting in accordance of its own doctrine.

Applying the example above with artillery precision munitions and the capability that enables each howitzer to orient on an individual tank, a fewer number of rounds is required to destroy the same target. This example illustrates, "efficient, effective firepower." Without precision weapons, when a battalion of field artillery engages multiple targets, the targets not engaged initially continue to maneuver against friendly forces. With precision munitions, a battery of six howitzers can engage and destroy more

of the same number of targets with fewer rounds. In short, precision munitions enhance the capability of the field artillery to achieve both mass and economy of force, and they also are fully aligned with the artillery's definition of mass and the future Army described in *The Army Strategic Planning Guidance, 2005*.

Tactical and Operational Levels of Warfare

In recent years, the military has distinguished between the tactical, operational, and strategic levels in fairly precise terms while focusing on more conventional forms of warfare as doctrine evolves. These distinctions and their definitions are very useful for many reasons that include describing warfighting at different levels of organization, clarifying roles and responsibilities, coordinating among services, focusing training and education, to name but a few.

This section suggests that as the evolution of doctrine continues to adjust to the different warfare of GWOT and the enhanced capabilities and potential roles of artillery precision munitions influence its terminology, it is arguable that traditional distinctions and between traditional tactical and operational levels can become blurred. Blurring of formerly well-understood boundaries between these two levels, or changes in doctrine created by improved precision munitions, would eventually have future implications on the development of new tactics and procedures and training, as well as increase the importance of good judgment and savvy on the part of Army leaders.

Recent open literature describes some implications of improved artillery precision munitions. In "Army Artillery Gets a Makeover," cited in part in earlier sections, but is fully stated here:

> Now we've got everything for precision fires. . . . [T]he smallest thing [the Air Force has] is a 500-pound bomb. Now, with a 50-pound warhead on an Excalibur, we can give [the ground commander]. . . . [P]recision targeting, the same accuracy.
>
> A key component of this new capability is the Army's Employment of a new program--the Precision Strike Suite for Special Operations Forces (PSS-SOF). The software program may be fielded to Soldiers in Iraq within the next three months. . . . [E]nables Soldiers at the tactical level to precisely locate a time-sensitive target for fires within about five minutes.
>
> Previously, confirming a target took more time than the Army wanted.
>
> Even in 2004 and 2005, 'mensuration' was performed at the theater level. . . . That is where we come up with a set of grid coordinates, the Air Force takes it, they go through some very long and painful verification and truly turn it into a very precise grid that they can attack with certainty. It was done only in theater and it took hours to do, and that's the best case. . . . [W]e said that doesn't allow you to attack time-sensitive targets, and it doesn't necessarily help the tactical guy in the field when he needs it.
>
> It's a great system that is actually very easy to use. . . . [T]his is not mensurated targeting, it is near-mensurated. But it is close enough that it will get you "precise targeting," defined as targeting the right spot within 10 meters. . . . [I]t is best used to attack buildings where insurgents may be meeting during a specific time.
>
> PSS-SOF is becoming a program of record for all the services and is being incorporated into the Army's existing Forward Observer Software.
>
> The need for such a targeting system was uncovered as Fort Sill studied what the service needed to use in Iraq. . . . Combining PSS-SOF with precision munitions the service is fielding or is on the verge of fielding brings precision fires to the "pointy end of the spear."
>
> In addition to the munitions piece, the Artillery School at Fort Sill also started an operational warfare class and a course to train joint fire observers.
>
> It also plans to use precision munitions--the unitary portion of the Guided Multiple Launch Rocket System (GMLRS) and the Excalibur munition. . . . The recently fielded GMLRS provides greater precision with a smaller bang than Air Force firepower, because it fires a 200-pound warhead as opposed to dropping a 500-pound bomb. . . . Excalibur, an even smaller munition at 50 pounds, is even better for urban fighting, because it drops nearly vertically over its target."[27]

This article, and Major General Ralston's summation of progress to enhance artillery precision munitions in accuracy, range, size of munitions, and rapid responsiveness to ground forces, have far-reaching implications. Clearly, tactical level artillery is becoming a much greater part of the operational level of warfare (note Major General Ralston's reference that Fort Sill also started an operational warfare class and

coordinated a course to train joint fire observers), fully capable of providing either precision or massed fires at short or long ranges. These new capabilities in the artillery will also add to the flexibility of choices for firepower to both tactical and operational commanders now and in the future.

There are other examples of how progress in the enhancement of precision artillery munitions will inevitably make it a factor at both the tactical and operational levels. ATACM usually requires the authority from an operational commander (contradicting the word “tactical” in its acronym). The range of the missile, extending beyond 150 kilometers (exact range is classified), categorizes this weapon as a deep strike capability. Additionally, there is a finite number of ATACMs available to a theater at one time, creating a stringent requirement for stationary targets that the operational commander identifies for destruction. Targets can include buildings, bunkers, or a formation of reserves. The ATACM can engage with multiple capabilities, depending on the version of the missile. At the operational level, use of ATACM requires that modifications be made to planning allocations for aircraft, target selection, and engagement criteria; and positioning of Special Forces and deep observers, and the schematics of the battlefield all get modified through the field artillery’s long range, precision capabilities.

During planning for operations, aircraft allocation plays an influential role in shaping the theater attack. With limited aircraft, operational commanders and their staff must allocate portions of the total sorties to air interdiction (the deep fight) and close air support (the close fight at the tactical level). With the increased range and precision of MLRS and its munitions--both the guided MLRS rockets (GMLRS) and the ATACMS--

the artillery will be capable of engaging more targets in any weather and within virtually any time constraints.

Compared to an aircraft, there is also a lowered risk associated with artillery firing deep strikes, because search and rescue operations are negligible. If an aircraft is shot down, a search and rescue team inserts into the last reported area of the aircraft. This rescue operation can require many assets, which sometimes limits the aircraft available to engage other targets. Also, in some instances, the lack of a search and rescue team may cancel the operations-level planners from engaging targets with aircraft. An example occurred during the initial phases of Operation Enduring Freedom, where over flight permissions were difficult to obtain, and a CSAR (combat search and rescue) team could not get to a portion of a theater because of distances that were out of range.

To summarize briefly, there is little doubt that enhanced artillery precision weapons at tactical levels of organization are significantly increasing their relevance and contributions to operational warfare. Indeed, depending on the battle space situation--urgency, weather, available sources of fire, potential of collateral damage, etc.--they may be the preferred option for striking targets that heretofore would normally have been the responsibility of another source of fire support, to include another service. These likely scenarios imply major challenges to avoid “blurring” between the tactical and operational levels that would, for example, cause confusion, interfere with target planning, or the effective execution of fire support to maneuver units. Having operational capabilities at the tactical level is not completely new, but the extent of improvement in the near future in the range and accuracy envisioned for artillery precision munitions under BCT control is an issue that might require careful addressing in TTPs and training.

Summary. This section relates to extended discussions in earlier sections describing artillery precision munitions; changing battle spaces and organizational structure; and warfighting and TTPs. Closely related are doctrine, changing technology and weapons, battle space environments and organizational structure, and warfighting and TTPs as they interrelate and evolve in myriad ways in response to a wide variety of stimuli.

The evolution of warfighting concepts in Iraq in response to a changing battle space environment; and enhanced artillery munitions are developing at least partly in response to the decline of artillery effectiveness in Iraqi urban areas. A pursuance exists to changing organizational structure to a modular, expeditionary force and the desire for new doctrine to address threats in a very different world by *Army Strategic Planning Guidance, 2005*. Warfighting concepts and TTPs are evolving today in both Iraq and in our military schoolhouses. In the last century these interrelated, dynamic areas of doctrine, war-fighting concepts, enhanced weapons systems, mass, and TTPs evolved in different ways as the Army responded to stimuli of the time. Today, the Army faces a different set of these same interrelated areas. The time may be nearing to respond to the *Army Strategic Planning Guidance, 2005,* by beginning to develop new doctrine for the very different stimuli in the foreseeable future.

Because doctrine describes how armies fight, and historically, armies have fought by applying time proven principles of war, changes to the achievement of these principles in battle raise questions about doctrine. In this section, it is clear that improved artillery precision munitions that achieve, “efficient, effective firepower that produces overwhelming effects, as opposed to overwhelming firepower that may waste limited

resources" enhance the how of achieving mass in the field artillery significantly. Also, because artillery precision munitions appear to be ideally suited for contributing to the strategic objective, "relevant and ready land power for the joint team," with "essential capabilities to dominate across the full range of military operations," this also suggests that, at some point, it may be time to review Army doctrine for the future.

For the reasons that relate to doctrine, as well as the fact that enhanced precision munitions place significant operational capabilities at the tactical level in the hands of BCT commanders, there may also be a need in the future to assure that there is no "blurring" or ambiguity between the tactical and operational levels of warfare.

The *Army Strategic Planning Guidance, 2005*

Major General Robert Scales, US Army (Ret.), commenting on military strategy and planning:

> If you are boring into the practical present, if your job is to be the can-do guy, the guy who is expected to be the operator, then ideas aren't all that important because you're the fixer.
>
> But as you cast yourself out further in time, if you go out a generation or two and look at the course of war, it's all driven by ideas and by vision. It's sort of like shooting ducks--if you shoot at the duck your rounds are going to go behind him; you have to lead the duck. And you lead with ideas and vision. You form an image of what the future is going to look like based on what occurs in the past. From that, you come up with concepts that you think are about right in future gazing. Michael Howard once said the object of writing about warfare and future gazing is not to get it right, but to avoid getting it terribly wrong.
>
> What we try to do as futurists is to use the tools we have at hand to look to the future and to anticipate what's going to happen, because everything else that follows behind it--building weapons, training Soldiers, creating institutions to educate Soldiers--are things that travel along the time sequence. They have to meet up somewhere, and they meet up where ideas and vision intersect with the practical day-to-day bits of the military.[28]

The *Army Strategic Planning Guidance* is the Army's documentation of its vision.

> The Army Strategic Planning Guidance (ASPG), Section I of the Army Plan (TAP), is the Army's institutional strategy and serves as its principal long-range planning document. The ASPG expresses the Senior Leadership's intent for how the Army will fulfill its Title 10 obligations to the Joint Force and the Nation in support of Defense and National Strategies. The ASPG provides a long-term perspective (10 to 20 years) for planning at all levels and a common understanding of the Army's contribution to National Security and the Joint Team. Last year's ASPG provided a new vision and direction for the Army in the context of a security environment fundamentally changed by the Global War on Terrorism (GWOT). This year's document will not alter that direction significantly, but will identify areas where additional emphasis is needed to maintain momentum for transformation and change.[29]

This paper attempts to answer the research question, What are the tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*? This section concludes this chapter by presenting in a single section excerpts from the *Army Strategic Planning Guidance, 2005*, related to the purpose of this study. This section contrasts with earlier sections in this chapter that focused primarily on analyses of areas to determine the answer to this question and referred often to the *Army Strategic Objectives*, and somewhat redundantly to the *Army Strategic Goal* (which is linked to the second strategic objective for this paper). This short section intends to provide sufficient context to the *Army Strategic Objectives*, the second part of the research question. This added context, linked to the earlier analyses of areas related to artillery precision munitions, enables the development of meaningful conclusions and recommendations (in the next chapter).

Transformation to a modular force is not the only change in the Army's future. Indeed, the *Army Strategic Planning Guidance, 2005*, describes an ambitious undertaking that includes, but also looks beyond, the immediate challenges associated with a specific combat zone in the GWOT. The need to continue efforts to improve the Army's field artillery's evolving precision munitions are described and implied in many sections of the

Army Strategic Planning Guidance, 2005, as well as the *Army Strategic Objectives* and *Imperatives*.

Quite different from changes made on the ground and in response to conditions in a different, "kind of war," this guidance describes the Army's future in general terms and how the Army will pursue that future. Clearly, changes driven by both results from battlefield experiences and strategic planning are important for understanding the full import of the continuing enhancement and roles of artillery precision munitions on the Army's ability to fulfill its strategic plans.

As articulated in the *Army Strategic Planning Guidance, 2005*, the *Army Strategic Objectives*, what the Army seeks, are simply stated: first, trained and equipped Soldiers and developed leaders; and second, relevant and ready land power for the combatant commander as part of the joint team.[30] *Army Strategic Imperatives* guide how the Army organizes, trains, and equips its forces to assure mastery of the full range of military operations in armed conflict, and to provide focus, include at least four that relate to artillery precision munitions: implement transformation initiatives, improve proficiencies against irregular challenges, achieve Army force capabilities to dominate in complex terrain and improve capabilities for joint fires capability. The imperatives are intended to, "clarify how the Army will accomplish its mission to meet the challenges of the current and projected security environment. Unlike our statutory requirements, strategic imperatives change with time, the strategic environment and joint force requirements."[31]

As discussed earlier, the *Army Strategic Planning Guidance, 2005*, describes the *Army Strategic Objectives*, what the Army seeks: (1) trained and equipped soldiers and

developed leaders and (2) relevant and ready land power for the combatant commander as part of the joint team.[32]

These imperatives are intended to "clarify how the Army will accomplish its mission to meet the challenges of the current and projected security environment. Unlike our statutory requirements, strategic imperatives change with time, the strategic environment and joint force requirements."[33]

There is little doubt from the *Army Strategic Planning Guidance, 2005*, that artillery precision munitions are a vital part of the Army's future, to include the continuing efforts in GWOT and beyond. The *Army Strategic Planning Guidance, 2005,* also leaves little doubt about the enormous challenges facing the Army and the United States. The paragraphs below place quoted excerpts from this guidance into the context of this paper and role of precision artillery munitions in the Army's future.

The *Army Strategic Planning Guidance, 2005,* states, "Providing forces and doctrine to win" the GWOT "remains the Army's number one priority." The guidance also states explicitly that resources are being focused to ensure that the "operational force has the requisite capabilities" and that "future force capabilities and resources must be focused on the most promising technologies that can be developed and fielded to the operationally engaged force."[34] Clearly, given the dramatic improvements being made to artillery precision munitions that will be available in the near term and the successful use of munitions already deployed in Iraq, these statements imply that as the "long war" ensues, leaders of units in hostile zones may be learning, adjusting and developing new TTPs as they engage in battle.

The *Army Strategic Planning Guidance, 2005*, also describes an equally onerous challenge of winning the GWOT, but also evolving the Army so as to provide "the Joint Force with essential capabilities to dominate across the full range of military operations. Our Army must simultaneously prepare for future challenges and meet the combatant commander's immediate needs for relevant and ready land power." The implications here are that precision artillery munitions must not only enhance force capabilities to win the GWOT, but they also have to contribute to dominating "across the full range of military operations." If the future Army is to meet this over arching mandate, areas such as doctrine, TTPs, leader development, and individual and unit training related to precision artillery munitions will be part of an array of areas that must be evolved as well. Indeed, the guidance states flatly that the, "Army's Strategic Goal is to remain relevant and ready by providing the Joint Force with essential capabilities to dominate across the full range of military operations."[35]

Soldiers are a central part of the guidance for tomorrow's Army, which states "the need for Soldiers who are not only well trained and equipped, but who are also adaptable and capable of responding to rapidly changing situations and are attuned to cultural conditions. Soldiers also require training in how to adapt to quickly evolving situations, not just how to react to changes, but also how to shape the environment to create the best possible outcomes."[36]

Surely, in the words of LTG Sattler, this "new kind of war," the Army is going to need Soldiers trained to new levels and likely with new approaches to training. The careful, judicious use of enhanced artillery precision munitions will require Soldiers

trained and leaders developed to use these new technologies in a manner that optimizes success in this "new kind of war."[37]

Indeed the guidance related to the "new kind of war" continues by saying that "Iraq in particular has proven to be a non-linear battlefield. Given the security environment, we can expect this to become the norm" that "the distinctions between combatant and noncombatant have blurred, as have the distinctions between combat operations and stability operations" and that "simultaneous operations across the range of military operations, rather than sequential operations will likely be the rule."[38]

With regard to leader development, the guidance first states that "The complexity of the operational environment affects all levels of leadership. To succeed, leaders at all levels must have situational understanding that extends beyond the tactical level." and that "This requires a robust leader development system that grows leaders who are prepared, versatile, and adaptive."

The guidance cites the need to draw upon and institutionalize the experience of seasoned combat leaders and that the "complexity, demands, and expectations of our leaders can only be met through a cohesive and continuous approach to learning." It also states that "we are enhancing the capabilities required to increase speed, reach, precision, and our ability to engage routinely in joint operations at significantly lower operational and tactical levels than today." and that "Because it is difficult to predict the exact combination of challenges our forces and leaders will be called upon to defeat, we must field versatile land forces capable of dominance across the spectrum of conflict and adaptive leaders capable of joint force employment under a wide range of conditions."[39]

Summary. Each facet of the guidance above surely applies to both Soldiers and leaders who own and fight with the devastating "speed, reach, and precision" of current and future artillery munitions in a "new kind of war."[40] The effective, but wise, use of these potent capabilities requires extraordinary good judgment and adaptability while in extremely stressful situations where errors at the tactical level can be magnified to the operational and strategic levels as part of the information war inherent in GWOT. The leader development system must produce these leaders, if these munitions are to have their intended effects.

The guidance addresses the development of doctrine and capabilities with quotes that include, "Concept Development and Experimentation (CD&E) are key components of how we determine, validate, and refine capabilities. The overarching priorities of winning the current war and transforming the force now will drive our CD&E activities. CD&E plans will support capability generation in the near, mid, and long term." and "To succeed, the Army must develop a more sophisticated understanding of the implications of the new environment at the operational and strategic levels."[41]

The guidance also addresses doctrine as it relates to capabilities by stating

> We must develop doctrine and capabilities, such as enhanced target acquisition and more precise weapons systems that reflect the reality of the battle space our Soldiers on the ground face in places like Iraq and Afghanistan, which the Army will require tailored, timely, actionable, and focused intelligence, surveillance and reconnaissance support to improve proficiencies against irregular challenges.
>
> Effectively combating irregular challenges requires an intellectual and cultural commitment to constantly reexamine our assumptions and methods at the tactical through strategic level. The kinds of operations that Army forces will be called upon to execute are more likely than ever to be conducted in complex terrain. While the need to be capable of conducting open maneuver warfare remains, the likelihood of long duration, high intensity open warfare is lower.

> Combatants and non-combatants will seek the protection of complex terrain, including urban areas, jungles and remote mountainous areas.[42]

These last statements from the *Army Strategic Planning Guidance, 2005,* coupled with the earlier recent feedback from the battlefields in Iraq, leave no doubt that precision artillery munitions will continue to fill vital roles to meet future irregular challenges in complex terrain, as well as across the full-spectrum of future land warfare.

Table 2: Tactical Effects (TE) and Future Implications (FI) of Artillery Precision Munitions on the *Army Strategic Objectives, 2005,* summarizes in necessarily abbreviated form the primary results of the area analyses in this chapter. Down the left column are listed Areas Related to Artillery Precision Munitions and *Army Strategic Objectives*. These areas are the same areas analyzed in this chapter. Across the top row of table 1 are listed the *Army Strategic Objectives*, to include the objective, "full-spectrum of conflict," implied as part of the actual objective, "relevant, ready land forces." Abbreviations of the areas in the left column, shown in capital letters, are used to conserve space in the table. For example, artillery precision munitions is abbreviated, "APM."

The research question of this paper is, "What are the tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*?" In the row and to the right of "Artillery Precision Munitions (APM) are listed tactical effects (TE) and future implications (FI) under the strategic objective to which they apply. The three tactical effects of artillery precision munitions on *Army Strategic Objectives* are described under the objectives--equipped Soldiers; relevant, ready land force; and full-spectrum of conflict--and are labeled TE1, TE2 and TE3, respectively. The descriptions are brief, but connote the nature of the tactical effects on each objective.

Similarly, the two future implications of artillery precision munitions on *Army Strategic Objectives* are described under the objectives--trained Soldiers and leader development--and labeled FI1 and FI2, respectively. The implications relate to analyses that described what must be done over time (in the future) to fulfill the tactical effects (TE1, TE2 and TE3). As shown on the table, FI1 relates to "trained Soldiers" and is not a tactical effect, per se. However, trained Soldiers is an example of a future implication of the tactical effects (TE1, TE2 and TE3) and over time must be accomplished in a quality, relevant manner for the tactical to be realized as envisioned. In short, the future implications (FI) of artillery precision munitions are the means by which the enhanced *capabilities* of precision munitions (extended range, improved accuracies, etc.) translate into desired *effects* such as "relevant, ready land force."

The rows to the right of the other areas describe how that area affects the tactical effect or future implication of artillery precision munitions. This simple table does not begin to capture the multiple interrelationships between the areas, areas and objectives, and even the objectives themselves. However, the table does provide a visual aid that displays the research design, the research model, and the answer to the research question.

Table 2. Tactical Effects and Future Implications of Artillery Precision Munitions on the *Army Strategic Objectives, 2005*

Areas Related to Artillery Precision Munitions and Army Strategic Objectives	**Trained Soldiers**	**Equipped Soldiers**	**Leader Development**	**Relevant, Ready Land Force**	**Full Spectrum of Conflict**
Artillery Precision Munitions (APM)	**FI1 -Training of Soldiers aligned to and enable new TE1, TE2 and TE3 capabilities; affected by BS, OS, WF, DM**	**TE1-Enhanced range, accuracy, relevance, flexibility enhances equipped Soldiers**	**FI2-Leader development aligned to TE1 capabilities, BS, OS, WF, DM**	**TE2-Enhanced range, accuracy, relevance, flexibility enables relevant, ready land force; enhanced by FI1, FI2, TE1; enhances TE3**	**TE3-Enhanced range, accuracy, relevance, flexibility enhances capabilities to dominate full spectrum of conflict; enhanced by TE2**
Changing Battle Spaces (BS) and Organizational Structure (OS)	**FI1: shaped by BS and quality influenced by OS**	**TE1: effects and quality influenced by BS and OS**	**FI2: effects and quality influenced by BS and OS**	**TE2: effects and quality influenced by BS and OS**	**TE3: effects and quality influenced by BS and OS**
Warfighting TTPs (WF)	**FI1: effects and quality influenced by WF**	**TE1: effects and quality influenced by WF**	**FI2: effects and quality influenced by WF**	**TE2: effects and quality influenced by WF**	**TE3: effects and quality influenced by WF**
Doctrine, Mass, Tactical and Operational Levels of Warfare (DM)	**FI1: effects and quality influenced by DM**	**TE1: effects and quality influenced by DM**	**FI2: effects and quality influenced by DM**	**TE2: effects and quality influenced by DM**	**TE3: effects and quality influenced by DM**

[1]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide .com/content/army_board_study_guide_topics/the_army_plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

[2]Michael Carden, New precision MLRS helps in battle for Tal Afar [document on-line]; available from http://www4.army.mil/ocpa/read.php?story_id_key=7963; Internet, accessed 23 September 2005.

[3]Global Security, M30 Guided Multiple Launch Rocket System (MLRS) [document on-line]; available from http://www.globalsecurity.org/military/systems/munitions/mlrs-g.htm; Internet; Accessed 19 April 2006.

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[5]MG David C. Ralston, "Modularity Update: Transforming the FA," *Field Artillery Journal* (March-April 2006): 1-3.

[6]Ibid.

[7]John F. Sattler, "Second Battle of Fallujah:Urban Operations in a New Kind of War," *Field Artillery Journal* (March-April 2006): 4-9.

[8]Personal experience during deployment in OIF II, 5th BCT, 1CD, Al Rashid District, Baghdad, March 2004 through March 2005.

[9]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide .com/content/army_board_study_guide_topics/the_army_plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

[10]Ibid.

[11]John F. Sattler, "Second Battle of Fallujah:Urban Operations in a New Kind of War," *Field Artillery Journal* (March-April 2006): 4-9.

[12]Ibid.

[13]Jen DiMascio, *Army Artillery Gets a Makeover* [document on-line]; available from http://www.insidedefense.com; Internet; accessed 25 April 2006.

[14]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide .com/content/army_board_study_guide_topics/the_army_plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

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[16]Ibid.

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[24]US, Department of the Army, FM 3-09, *Fire Support* (Washington, DC: Government Printing Office, November 2002), 3-6.

[25]Ibid.

[26]Ibid.

[27]Jen DiMascio, *Army Artillery Gets a Makeover* [document on-line]; available from http://www.insidedefense.com; Internet; Accessed 25 April 2006.

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[30]Ibid.

[31]Ibid.

[32]Ibid.

[33]Ibid.

[34]Ibid.

[35]Ibid.

[36]Ibid.

[37]John F. Sattler, “Second Battle of Fallujah:Urban Operations in a New Kind of War,” *Field Artillery Journal* (March-April 2006): 4-9.

[38]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide .com/content/army_board_study_guide_topics/the_army_ plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

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[41]Ibid.

[42]John F. Sattler, “Second Battle of Fallujah:Urban Operations in a New Kind of War,” *Field Artillery Journal* (March-April 2006): 4-9.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

In the previous chapter, the paper has analyzed the literature reviewed in chapter 2. In the following paragraphs, the paper will discuss conclusions, recommendations, and possible areas of further research this paper does not address.

As table 1 indicates, the first conclusion is that enhanced capabilities of current and future artillery munitions enable significant tactical effects that contribute directly to the *Army Strategic Objectives* of equipped Soldiers; a ready, relevant land force; and dominance of the full range of military operations. The tactical effects enabled by enhanced capabilities of artillery precision munitions--substantial improvements in range, accuracy, variety of warheads, and all weather capability--equip the Soldiers and units that provide the lethality, flexibility, responsiveness and relevance required by a relevant, ready land power, as part of a Joint Team, to dominate across the full range of military operations.

As suggested in the analysis, BCT commanders will soon have, or have immediate access to, an artillery arsenal that includes precision munitions such as the ATACMS Block1A quick-reaction unitary (QRU) missile and the new GMLRS unitary rocket, two sources of all-weather first-round effects from 15-270 kilometers with accuracies less than a four-meter circular error probable (CEP). The GMLRS unitary rocket is already deployed in urban operations and has been used effectively against insurgent forces with minimal collateral damage. GMLRS also provides greater precision in far less time in any weather with a 200-pound warhead than Air Force firepower,

where the 500-pound bomb is the smallest used by the Air Force and the response time is far greater than the GMLRS.

The 155-millimeter Excalibur unitary precision munition provides all-weather first round effects out to 19 kilometers and has the capability to attack all three key targets sets--soft and armored vehicles, and reinforced bunkers. The Excalibur is also capable of an almost vertical descent with accuracies with less than a four-meter CEP with a warhead as small as 50 pounds. This descent capability, improved accuracies and smaller warhead close the "gap" in artillery effectiveness in urban Iraq terrain and provide flexibility in similar situations in future battle spaces. The HIMARS also brings improved mobility and faster response times for calls for fire; and the introduction of the PSS-SOF program links precision targeting in the hands of Soldiers to precision munitions, and without TTPs restriction, places an operational level capability at the "point of the spear" at the tactical level.

The findings further suggest the collective contribution of these enhanced tactical effects align with and fully support the full-spectrum of land warfare from insurgent forces operating in complex terrain to larger, conventional forces operating in more conventional battle spaces. Soldiers and units will be better equipped with these enhanced munitions, which in turn will contribute substantially to a ready, relevant land force that contributes as part of the Joint Team to dominate the full range of military operations. The improvements in range, accuracy, choice in warheads, all weather capability, and ability to hit targets from the vertical (Excalibur) not only fill the "gaps" in today's Iraq, but also provide extraordinary flexibility and relevance to ground commanders in future warfare where the nature of the battle space environment is currently unknown.

Recommendations

Given the extraordinary ranges, improved accuracies, choice of warheads, and means of delivery, all of which create flexibility and likely relevance in virtually any future battle space, the first recommendation is that the Army should "stay the course" by providing adequate resources to support its vision for the future of artillery precision munitions.

A second recommendation is that the Army should also sustain conventional artillery firepower and retain a breadth and balance in its arsenal. A balanced combination of conventional and precision munitions should be developed with the needs of GWOT as the initial first priority. However, as GWOT is replaced by a "new" threat and the next "new" battle space, the priorities and artillery arsenal must have retained sufficient balance to meet the worst-case scenario of any future threat and battle space. For the foreseeable future, a worst-case scenario will likely require conventional munitions. In short, facing uncertainty and change in the future mandates balance and wisdom in investments in the tools of warfare.

A second conclusion drawn from table 2 is a realization of the tactical effects of precision artillery munitions that contribute to *Army Strategic Objectives* related to equipped Soldiers; a relevant, ready land force; and dominance of the full range of military operations will require effective responses to future implications related to the *Army Strategic Objectives* of trained Soldiers (and units) and developed leaders.

The training of Soldiers, unit training and the development of leaders are the enablers of the tactical effects of artillery precision munitions--substantial improvements in range, accuracy, variety of warheads, and all-weather capability. Without well trained

Soldiers and units and high quality leaders, the tactical effects of artillery precision munitions will not be translated into realizing the full potential of equipped Soldiers; a relevant, ready land force; and dominance of the full-spectrum of warfare.

A third conclusion drawn from table 2 is that effectively equipping Soldiers and units requires careful consideration of the interrelated areas of changing battle spaces and organizational structure; warfighting and TTPs; and doctrine and mass. Equipping and developing leaders, while considering these areas of influence, while also rotating BCTs to and from a battle space; resetting (equipping, manning and training) BCTs; and evolving warfighting concepts and TTPs; and in time, developing doctrine aligned to the future are challenges of the highest order.

The effects and quality of equipping Soldiers and units are significantly affected by the battle space to which a BCT will be deployed. Organizational changes affect the types and quantities of equipment for Soldiers and units. With current Army guidance to transition to BCTs at the 80 percent solution level, the effects of organizational change on equipping Soldiers raises concerns about both manning and equipping BCTs and the need to “get it right,” if that 80 percent is to translate into meaningful combat effectiveness.

One could argue that warfighting, TTPs, and doctrine also have to be consistent and aligned with organizational structure, equipment, and battle spaces. The reduction of the effectiveness of artillery in urban areas in Iraq while engaged with an insurgent force using asymmetric tactics is sufficient to make the point that equipping Soldiers and units in a manner consistent with the battle space environment is extremely important. The battle space to which a BCT will be deployed should be an integral part of training a BCT, before it deploys.

Similarly, the on-the-ground development of warfighting concepts and TTPs, while effectively accomplished by some innovative leaders in Iraq, is not the long-term solution for training, which needs to be of consistently high quality for both Soldiers and units. A second recommendation is that, at some point, the need for comprehensive doctrine addressing future warfare focusing on dominance of the full-spectrum of warfare with a modular, expeditionary force must be addressed. An over arching doctrine would do much to provide rationale and structure to training and developing leaders for the next "new kind of war."

A fourth conclusion is the challenge to training a BCT as a team as opposed to training an artillery battalion, a division artillery, an infantry battalion or a brigade. For example, the artillery is making major changes in the organization and responsibilities related to the planning, coordinating, and execution of firepower in support of the BCT ground forces. These changes, and many others like it, must be integrated into a new BCT organizational structure and a totally different culture than the single branch units in the old division structure. The BCT must train with the purpose of developing unit cohesion and teamwork (among former members of separate branch related units such artillery battalions) essential for success in battle. In short, training is a critical future implication that must be addressed in order for the Army to experience the full potential of the tactical effect of artillery precision munitions.

A third recommendation is that the Army should consider developing more detailed, comprehensive guidance for training both Soldiers and units that accounts for critical interrelated factors, any one of which could seriously degrade training quality. The plan should also account for, resource, and synchronize the integration of artillery

precision munitions into the new modular structure to assure that manning, equipping, and training deployable BCTs are the Army's highest priority. Warfighting concepts, TTPs, and doctrine should also evolve as the plan is implemented and feed the training process across the Army. The plan should be linked to the battle field experiences of combat leaders who should lead the execution of the plan and be directly involved with both Soldier and unit training. The plan should be comprehensive to account for challenges that would result from any change in structure, but it should also account for the interrelated factors identified in this paper that make today's situation even more challenging.

As indicated in the findings, a fifth conclusion is that leader development is another critical future implication of realizing the tactical effects of artillery precision munitions and also requires careful consideration of the interrelated areas of changing battle spaces and organizational structure; warfighting and TTPs; and doctrine and mass. The savvy, innovative leadership of LTG Sattler prior to and during the Second Battle of Fallujah is an excellent example how leadership can make the difference in making the best use of trained Soldiers, and in this case, Marines. His comprehensive, insightful understanding of the battle space of Fallujah, as well as the second and third order effects of how the battle should be pursued, followed by detailed preparation and superb execution clearly made a significant difference in the successful outcome of the battle.

LTG Sattler also developed TTPs to assure not only success in the conventional sense, but to also address the need to minimize noncombatant casualties and collateral damage to avoid negative reaction from within Iraq and around the world. His development and execution of his Information Operations (IO) plan was masterful and a

critically important element of not only winning at the tactical level, but at the operational and strategic levels as well. In his words, this really is a "different kind of war."

According to the *Army Strategic Planning Guidance, 2005*, this "different kind of war" and future "different wars" will require a "different kind of leader":

> The complexity of the operational environment affects all levels of leadership. . . . To succeed, leaders at all levels must have situational understanding that extends beyond the tactical level.

The *Army Strategic Planning Guidance, 2005*, also states that growing a different kind of leader will require "a robust leader development system that grows leaders who are prepared, versatile, and adaptive, and who have a broad understanding of the political and military objectives of the campaign, as well as the potential implications of their actions upon those objectives" that the Army must leverage the current "cohort of leaders with diverse and extensive operational experience . . . and ensure that lessons learned are captured and institutionalized where appropriate, rather than forcing new leaders to relearn the same lessons again and again," and that "the stated complexity, demands, and expectations of our leaders can only be met through a cohesive and continuous approach to learning."[1]

The challenges to respond to this guidance are extensive and unprecedented. A fourth recommendation is that developing leaders requires a leader development strategy and systems to nurture leaders who anticipate and respond to changing battles spaces; are able to lead and train Soldiers and units for future, unknown battle spaces; adjust to and leverage the advantages of the new modular structure; understand and leverage the rapidly changing capabilities of enhanced artillery precision munitions; synthesize new

structure, weapons, and battle spaces into warfighting concepts; understand and are able to apply the changing dynamics at different levels of warfare, to include areas that include still fairly new dynamics of information, stability, security, reconstruction, interagency, coalition, and joint operations; all of this and more. And, leader development must be accomplished while immersed in the many interrelated areas already discussed and shown on table 2.

Given the complexities and challenges related to leader development, very similar to the future implications related to training, and the very ambitious mandates in the *Army Strategic Planning Guidance, 2005,* related to leader development, the Army should follow up its strategic planning with more specific guidance and resources for leader development. Given the pace maintained by today's leadership, additional structure and assignment of responsibilities are needed, if these long-range goals are to be pursued effectively. The plan should be executable in today's rapid paced environment while engaged in GWOT. Developing leaders as described in the *Army Strategic Planning Guidance, 2005,* will be enormously difficult with an effective plan, but it will be impossible without a plan to fund and implement the guidance.

The answer to the research question, What are the tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*? is shown in table 2, which indicates three tactical effects and two future implications of artillery munitions on the *Army Strategic Objectives*.

Directions for Future Study

The conclusions and recommendations reveal several directions for future study. The directions consist of more thorough examinations of areas discussed in this paper and

related to the *Army Strategic Planning Guidance, 2005*. These general, interrelated directions include, but are not limited to, more detailed studies of future leader development; future individual and unit training; doctrine, mass, and the tactical and operational levels of warfare; the evolution of warfighting and TTPs; the impact of warfighting concepts at the Joint Team level on BCT ground component; the evolving roles and responsibilities for close air support and SEAD as enhanced artillery munitions integrate more fully into the BCT structure; the evolution of BCTs; the mix, or balance, of artillery munitions required to address the full-spectrum of armed conflict as doctrine and TTPs evolve; the logistical challenges posed by different combinations of BCT force packages in which BCTs may or may not be equipped with the same weapons systems or trained the same way; and the impacts on BCTs as a result of being diverted away from more conventional warfighting tasks to unconventional missions and tasks related to security, stabilization, and reconstruction. An additional future study may include the non-kinetic effects of precision munitions, as this thesis' focus was kinetic. Discussions of each of these future directions will be brief in the subsequent paragraphs.

As described earlier, the *Army Strategic Planning Guidance, 2005,* discusses the need for a "different kind of leader" for the "different kind of wars" our Army will likely face for the foreseeable future. This guidance also states that growing a different kind of leader will require "A robust leader development system that grows leaders who are prepared, versatile, and adaptive, and who have a broad understanding of the political and military objectives of the campaign, as well as the potential implications of their actions upon those objectives." The guidance concludes by stating that, "The stated complexity,

demands, and expectations of our leaders can only be met through a cohesive and continuous approach to learning."[2]

This guidance offers the opportunity for a number of directions for future study that answer questions, such as: What are the attributes of this different kind of leader and how are they different from those currently inculcated by Army leader development systems and processes? How does the Army best develop these different leader attributes for future, different wars? What changes are required in current Army leader development systems and processes? How does the Army create, implement and sustain "a cohesive and continuous approach to learning" to respond to the "complexity, demands, and expectations of our future leaders?" Similar questions and directions for future study also apply to the area of individual Soldier training, as well as training BCTs to fulfill their roles on the Joint Team across the full-spectrum of armed conflict.

The *Army Strategic Planning Guidance, 2005,* states "The need for Soldiers who are not only well trained and equipped, but who are also adaptable and capable of responding to rapidly changing situations and are attuned to cultural conditions. Soldiers also require training in how to adapt to quickly evolving situations, not just how to react to changes, but also how to shape the environment to create the best possible outcomes."[3]

These words of guidance describing the need for Soldiers perhaps trained differently than in the past suggest a number of directions for future study that answer questions such as, How well does current Soldier training fulfill this future need? Should current training be revised to address this need for a different kind of soldier? If current training requires revision, how should it be revised to fill the need for soldiers who are "adaptable and capable of responding to rapidly changing situations . . . attuned to

cultural conditions" and are able not only to "react to changes," but also know how to, "shape the environment to create the best possible outcomes?"[4] These desired attributes for future Soldiers extend well beyond the focus of Soldier training which has not been aligned to the different kinds of war envisioned for the future. These desired attributes present major challenges for well established training methods, systems, and processes; and for these reasons, the area of soldier training in the future offers several timely directions for future study.

Unit training also provides ample directions for future study that answer questions that include: What are the impacts of manning and equipping BCTs at the 80 percent levels on unit training? On combat effectiveness? Should the 80 percent levels of manning and equipping BCTs be focused on designated spaces and equipment to assure the ability to train as a unit and achieve some minimal level of combat effectiveness? If so, what is the optimal combination of spaces and equipment at the 80 percent level? What are the logistics challenges of supporting deployed BCTs, if 80 percent manning and equipping of BCTs are not standardized? Does the addition of enhanced artillery precision munitions at BCT levels require adjustments to TTPs and unit training? Should seasoned combat commanders be used to oversee training of BCTs designated for deployment? If so, how might that be done most effectively? Unit training is also closely related to and highly dependent on doctrine, warfighting, and TTPs.

The areas of doctrine, warfighting, TTPs, and the blurring boundary between the operational and tactical levels of warfare offer a large number of opportunities for future study that answer questions such as the following: How well does current doctrine apply to strategic guidance that includes the need to win the GWOT, but also to be capable of

domination the full-spectrum of armed conflict? How should doctrine be articulated to address both GWOT and the full-spectrum of armed conflict? Should there be a single overarching doctrine that is then decomposed into descriptions of subordinate doctrine that address different phases of the full-spectrum of armed conflict? Or, should there be a separate doctrine for each phase of the spectrum of armed conflict, but without an overarching doctrine?

The questions about future doctrine and TTPs lead to other questions that include the following: What are the challenges associated with evolving new doctrine and TTPs on leader development, as well as soldier and unit training, while simultaneously engaged in GWOT? Is unit training different under the modular BCT force structure, and if so, how? What is the right balance of weapons systems and technologies to support new doctrine, TTPs and the modular BCT force structure? What are the impacts of enhanced artillery precision munitions on doctrine, TTPs, and unit training in the new modular BCT force structure?

As artillery precision munitions alter how both the tactical and operational levels might achieve mass, directions of future study include addressing the following questions: What are the impacts of all-weather first-round artillery effects from 15-270 kilometers with accuracies less than a four-meter circular error probable (CEP) at the call of tactical ground commanders on the Joint Team and Joint warfighting? On the USAF roles and responsibilities for close air support?

This paper focused on answering the research question, What are the tactical effects and future implications of artillery precision munitions on the *Army Strategic Objectives*? The pursuit of the answer to this question revealed a large number of

additional questions worthy of pursuit as the Army continues to not only introduce enhanced artillery precision munitions, but also to evolve in accordance with the *Army Strategic Planning Guidance*. There are important tactical effects and future implications of enhanced artillery precision munitions on the *Army Strategic Objectives.* However, as discussed briefly in this section, there are a host of other issues and questions related to the research question that are beyond the scope and intent of this paper.

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[1]*Army Strategic Planning Guidance, 2005* [document on-line]; available from http://www.armystudyguide.com/content/army_board_study_guide_topics/the_army_plan/army-strategic-planning-g.shtml; Internet; accessed 6 May 2006.

[2]Ibid.

[3]Ibid.

[4]Ibid.

ILLUSTRATIONS

Figure 1. Excalibur (Projectile Designator XM982), the Replacement to the Copperhead Projectile for the United States Field Artillery
Source: Global Security, XM982 Excalibur, Precision Guided Extended Range Artillery Projectile; available from http://www.globalsecurity.org/military/systems /munitions/m982-155.htm; Internet.

Figure 2. The Copperhead Round (Projectile Designator M712) Was the Artillery's First Precision-Guided Munition
Source: Global Security, M712 Copperhead, online at http://www.globalsecurity.org/ military/systems/ munitions/m712.htm.

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