

EVOLVING FIELD ARTILLERY STANDARD TACTICAL MISSIONS FOR FORCE XXI

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

MASTER OF MILITARY ART AND SCIENCE

by

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This study examines the need to change the field artillery's four standard tactical missions because of the U.S. Army's evolution to Force XXI operations. Currently the field artillery organizes field artillery for combat and assigns a tactical mission (direct support, reinforcing, general support, or general support reinforcing) to each unit. These four missions may not provide a specific enough purpose for field artillery units providing fires to the future force of the 21st century. The author provides the reader with background definitions, an explanation of the process of organizing field artillery for combat, and a description of the Army concepts for Force XXI. The author analyzes the research question through a study of the Mobile Strike Force (MSF) concept, a study of field artillery employment in Operation Desert Storm, and interviews with senior field artillery leaders. The author concludes that the four standard tactical missions should expand to include a Mission Oriented Task and Purpose (MOTP) statement. The MOTP statement will ensure that supporting field artillery fires are linked to the maneuver task and purpose for each mission. The thesis proposes several categories of MOTP statements for use in the future. The author recommends that the field artillery experiment with the MOTP process to see if it adequately addresses the intent for field artillery fires.

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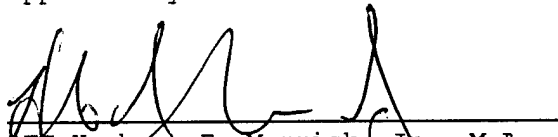
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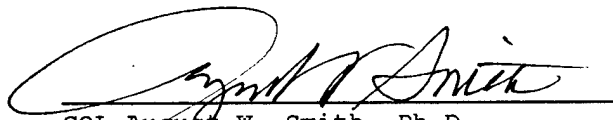
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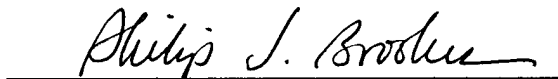
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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff college or any other governmental agency. (References to this study should include the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

## ABSTRACT

EVOLVING FIELD ARTILLERY STANDARD TACTICAL MISSIONS FOR FORCE XXI.  
by MAJ Norman R. Brehm, U.S. Army, 86 pages.

This study examines the need to change the field artillery's four standard tactical missions because of the U.S. Army's evolution to Force XXI operations. Currently the field artillery organizes field artillery for combat and assigns a tactical mission (direct support, reinforcing, general support, or general support reinforcing) to each unit. These four missions may not provide a specific enough purpose for field artillery units providing fires to the future force of the 21st century.

The author provides the reader with background definitions, an explanation of the process of organizing field artillery for combat, and a description of the Army concepts for Force XXI. The author analyzes the research question through a study of the Mobile Strike Force (MSF) concept, a study of field artillery employment in Operation Desert Storm, and interviews with senior field artillery leaders.

The author concludes that the four standard tactical missions should expand to include a Mission Oriented Task and Purpose (MOTP) statement. The MOTP statement will ensure that supporting field artillery fires are linked to the maneuver task and purpose for each mission. The thesis proposes several categories of MOTP statements for use in the future. The author recommends that the field artillery experiment with the MOTP process to see if it adequately addresses the intent for field artillery fires.

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## CHAPTER ONE

### INTRODUCTION

The ability of America's Army to fight and win wars is the foundation of the United States' national military power. The Army must be able to deploy forces anywhere around the world who are properly trained and equipped to fight in a variety of conflicts. Future conflicts in the post Cold War era will range from high-intensity conventional warfare to military operations other than war (OOTW) such as peacekeeping and nation building.

The types of conflicts and operations experienced in the post Cold War period will likely endure into the twenty-first century. The Army will continue to be engaged throughout the world, protecting and promoting the national interests outlined in the U.S. National Security Strategy and National Military Strategy. To meet these challenges in a world of increasing turmoil and strategic unrest will continue to require the Army's presence around the globe.

Today's uncertain world makes it nearly impossible to clearly identify and define a specific threat, let alone project upcoming threats, to U.S. interests. Rather, military planners must often select from an ever-widening spectrum of diverse threat capabilities and intentions. This situation represents a dramatic departure from past scenarios in which fairly well quantified threats could be used to justify doctrine, equipment, organization, and future requirements. The U.S. Army fire support community, led by the U.S. Army Field Artillery School, is demonstrating that it is still possible to provide strategic vision: a balanced focus for the future based on a rational and educated assessment of the potential of future technologies.<sup>1</sup>

Currently the Army is studying the future of warfare in the twenty-first century, known as the Force XXI project. The Army has begun a campaign to conduct experiments that will leverage superior technology to build the Army of the future.

We are making the Army of tomorrow a reality today. We are creating a force that meets the needs of the 21st Century by leveraging technology so that America can better accommodate the vastly changing geopolitical landscape. This is a complex and difficult process because we are transforming the Army in its entirety while at the same time retaining our fundamental values, fostering our enduring institutions, and keeping the Army trained and ready for today's crises. . . . Force XXI is the reconceptualization and redesign of the force at all echelons, from the foxhole to the industrial base, to meet the needs of a volatile and ever changing world. It will be force organized around information and information technologies. Its purpose will be to deter those who oppose us, to compel when deterrence fails, and to reassure our friends and allies around the world that they can count on us.<sup>2</sup>

The Force XXI concept will lead to doctrinal changes within all branches of the Army. Doctrine encompasses ideas of how the Army will operate. It is important to remember that doctrine does not attempt to predict the future. It provides fundamentals and principles and outlines the conditions that will produce success in military operations. Today's rapidly changing geostrategic environment, changes in the conduct of warfare, and the rapid pace of technological advances demand that the Army continue to produce relevant doctrine for the next century.

In the past two decades, US Army doctrine has undergone several revisions, beginning with the Active Defense of 1976. In 1982, the Army introduced the concept of AirLand Battle, then further revised in 1986 to emphasize operational art and the deep fight. The June 1993 edition

of FM 100-5 Operations, the Army's doctrinal warfighting manual, highlights operations in a joint environment, and outlines the concept of force projection. This revised FM 100-5 is part of the Army's ongoing attempt at providing doctrine that emphasizes principles to be learned and understood, and relies on the art of battle command to apply the doctrine as the situation demands.

U.S. Army doctrine will continue to develop into the twenty-first century as a result of the Army's evolution to Force XXI. The field artillery force required to support Force XXI must have a revised doctrine that keeps pace with the Army's vision of land warfare in the twenty-first century. This thesis focuses on one doctrinal area that may require change to ensure that the field artillery is a utility player in the future force. Specifically, this thesis examines if there are changes needed in the tactical missions of field artillery units to remain flexible and responsive in the future.

#### Research Questions

The primary research question is: Do the standard field artillery tactical missions need to change because of the U.S. Army's evolution to Force XXI? Supporting questions include:

1. What is the present vision for Force XXI as defined by senior Army leaders?
2. How is the role of the field artillery in Force XXI changing from its present role?

3. What doctrinal considerations affect the present tactical missions of field artillery units?

4. How will future doctrine developed for Force XXI modify the considerations used in assigning tactical missions to field artillery units?

5. Will technological advances provide field artillery units with new capabilities that impact on their employment within a Force XXI context?

#### Purpose of the Study

This thesis proposes a concept for future field artillery operations with a unified force. In order to maintain a trained and ready force today, and transition to the Force XXI vision, the Army focuses on six key areas: quality people, training, force mix, doctrine, modern equipment, and leader development, as shown in Figure 1.<sup>3</sup>

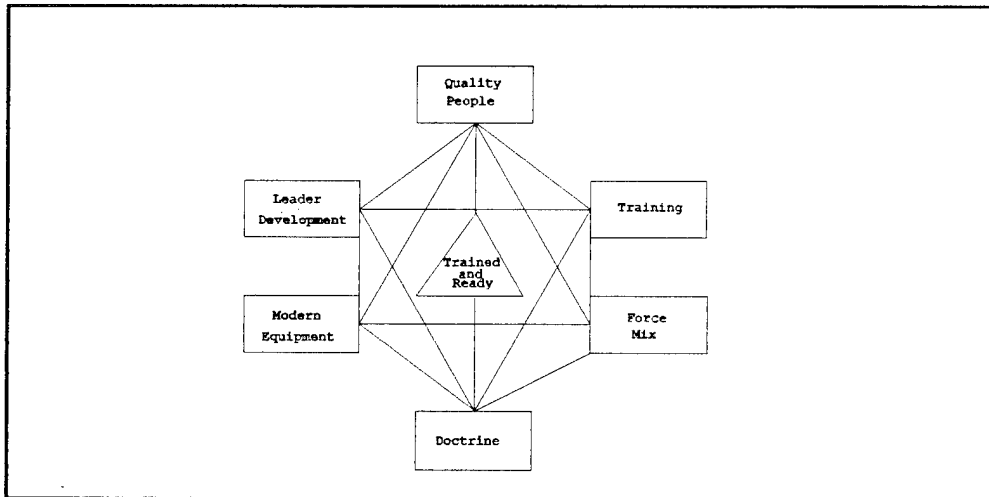


Figure 1. A Changing Institution in a Changing World.

This thesis will focus on three of the six areas: the doctrine, modern equipment, and force mix needed for potential changes in the four standard field artillery tactical missions. These three areas are objective factors whose impact can be varied and measured for the purpose of this study. The other three areas are assumed to be constant for the purposes of this thesis.

#### Significance of the Study

This research will help solve a fundamental problem facing the entire field artillery community. Profound recent changes in the world's geopolitical order require changes in future military operations. In the past, the Army focused on a well-defined Soviet threat. Today there are multiple, ill-defined, and diverse threats, with varied forms of military power associated with each. These various threats derive their power from many different sources, including basic resources, economy, science and technology, universal culture, and national cohesion.<sup>4</sup>

In the past, field artillery doctrine and tactics, techniques, and procedures (TTP) were developed after careful analysis of one principal threat. In today's post-Cold War era, there is no predominant, clearly defined threat. Multiple changing threats cannot limit how field artillery units will fight in the future. Now is the time to study and show how emerging technologies are redefining traditional battlefields, and how the field artillery can best be employed in a unified force.

How the Army envisions combat power in the next century, and plans the warfighting strategy to support this vision, is critical. Field artillery will continue to be a key player in the unified force of Force XXI. The key is to focus on the future, but to not allow the future to come "at the expense of mortgaging the present."<sup>5</sup>

#### Definition of Terms

There are several basic definitions used throughout this thesis.

Battle Command. The art of battle decision making, leading, and motivating soldiers and their organizations into action to accomplish missions. It includes assigning missions, prioritizing and allocating resources, selecting the critical time and place to act, and knowing how and when to make adjustments during the fight.<sup>6</sup> Battle command is one of the five battle dynamics that define major areas of change from current operations to Force XXI operations.

Battlespace. Battlespace is a concept that facilitates the type of innovative approach required for military leaders. It is a mental construct that assists the commander in achieving an unconstrained vision of the area in which he will operate. In the physical sense battlespace is that volume determined by the capabilities of a unit to acquire and engage the enemy.

Close Support Fires. Fires used to engage enemy troops, weapons, or positions that are threatening or can threaten the force in either the attack or the defense. Close support fires allow the

maneuver commander to rapidly multiply the effects of combat power and to shift fires rapidly throughout the battlefield.<sup>7</sup>

Command and Control of Field Artillery. Measures taken to ensure that the field artillery contributes to the overall fire support system in a responsive manner that is adequate in support of maneuver forces.<sup>8</sup> Command and control relationships are established through field artillery organization for combat.

Counterfires. Fires used to attack enemy indirect fire systems including mortar, artillery, air defense, missile, and rocket systems. Counterfire allows freedom of action to supported maneuver forces.<sup>9</sup>

Digitization. The application of information technologies to acquire, exchange, and employ timely digital information throughout the battlespace, tailored to the needs of each decider (commander), shooter, and supporter, allowing each to maintain a clear and accurate vision of the Battlespace necessary to support planning and execution.<sup>10</sup>

Field Artillery Mission. The mission of the field artillery is to destroy, neutralize, or suppress the enemy by cannon, rocket, and missile fires, and to integrate all supporting fires into combined arms operations.<sup>11</sup>

Field Artillery Roles. The field artillery system provides close support to maneuver forces, counterfire, and interdiction as required.

Fire Support. Fire support is the collective and coordinated employment of the fires of armed aircraft, land and sea based indirect

fire systems, and electronic warfare systems against ground targets to support land combat operations at both the operational and tactical levels.<sup>12</sup> The principal fire support element in synchronizing maneuver and fires is the field artillery.

Force XXI. According to General Gordon R. Sullivan, Chief of Staff of the Army, Force XXI will be the synthesis of emerging technologies, new doctrine and organization, and the use of quality, well-trained personnel. Force XXI will prepare the Army for future battlefields in the twenty-first century.

Fundamentals of Organization for Combat. Field artillery is organized for combat to provide responsive and effective field artillery fires and to coordinate all fire support. The objective of field artillery organization for combat is to ensure that each field artillery unit is in a tactical organization and is assigned a tactical mission.<sup>13</sup> The five fundamentals of organization for combat are discussed in greater detail in Chapter Two.

Horizontal Technology Insertion (HTI). The application of common technologies across multiple systems to improve the warfighting capability of the force.<sup>14</sup> HTI is one of the key concepts that will lead to shared information on the Force XXI battlefield.

Interdiction Fires. Fires used to disrupt, delay, and destroy enemy forces that, because of range limitations or intervening terrain, cannot fire their primary weapon systems on friendly forces.

Interdiction fires create "windows of opportunity" for friendly unit offensive movement.<sup>15</sup>

METT-T. The factors of METT-T are useful when considering how to organize field artillery units for combat operations. The acronym stands for Mission, Enemy forces, Troops available, Terrain and weather conditions, and Time available.

Nonstandard Tactical Missions. Assigned when the commander's intent cannot be met by the four standard tactical missions. These missions can change, limit, or amplify one or more of the seven inherent responsibilities.<sup>16</sup>

Operations Other Than War (OOTW). Military activities during peacetime and conflict that do not necessarily involve armed clashes between two organized forces.<sup>17</sup> Operations other than war include, but are not limited to, humanitarian assistance and disaster relief, nation assistance, support to counterdrug operations, peacekeeping operations, and combating terrorism.

Seven Inherent Responsibilities. When a field artillery unit is assigned a tactical mission, there are seven inherent responsibilities that define how the maneuver commander receives his support. The seven inherent responsibilities are: answers calls for fire in priority from; has as its zone of fire; furnishes fire support team; furnishes liaison officer; establishes communications with; is positioned by; and has its fires planned by. Table 1 provides a summary of the seven inherent responsibilities associated with each standard

tactical mission. Chapter Two will address the relationship between these responsibilities and the standard tactical missions in more detail.

Standard Tactical Missions. Each field artillery unit is assigned a standard tactical mission based on the five fundamentals of organization for combat. The four standard tactical missions are direct support (DS), reinforcing (R), general support (GS), or general support reinforcing (GSR). Each standard tactical mission has seven inherent responsibilities associated with it. Table 1 shows the relationship between the standard tactical missions and the seven inherent responsibilities.

#### Scope and Limitations

This thesis assumes that current concepts being studied at the US Army Training and Doctrine Command (TRADOC) do, in fact, reflect the primary doctrinal revisions that will affect the force structure of Force XXI. The study is limited to available information about current field artillery systems and ammunition under development that should be available and operational in Force XXI units. New weapon systems and ammunition will define the environment of the Force XXI battlefield as it relates to the field artillery.

This thesis is limited to examining standard tactical missions that are used in a combat environment. There are many ways that a field artillery organization could be used in an OOTW environment that would

TABLE 1

## INHERENT RESPONSIBILITIES OF FIELD ARTILLERY MISSIONS

AN FA UNIT WITH A MISSION OF:	DIRECT SUPPORT	REINFORCING	GENERAL SUPPORT REINFORCING	GENERAL SUPPORT
1. Answers calls for fire in priority from:	1. Supported unit 2. Own observers <sup>1</sup> 3. Force FA HQ	1. Reinforced FA 2. Own observers <sup>1</sup> 3. Force FA HQ	1. Force FA HQ 2. Reinforced FA 3. Own observers <sup>1</sup>	1. Force FA HQ 2. Own observers <sup>1</sup>
2. Has as its zone of fire:	Zone of action of supported unit	Zone of fire of reinforced FA	Zone of action of supported unit to include zone of fire of reinforced FA unit	Zone of action of supported unit
3. Furnishes fire support team: (FIST/FSS) <sup>2</sup>	Provides temporary replacements for casualty losses as required	No requirement	No requirement	No requirement
4. Furnishes liaison officer:	No requirement	To reinforced FA unit HQ	To reinforced FA unit HQ	No requirement
5. Establishes communications with:	Company FSOs, FSOs, and supported maneuver unit HQ	Reinforced FA unit HQ	Reinforced FA unit HQ	No requirement
6. Is positioned by:	DS FA unit commander or as ordered by force FA HQ	Reinforce FA unit or as ordered by force FA HQ	Force FA HQ or reinforced FA unit if approved by force FA HQ	Force FA HQ
7. Has its fires planned by:	Develops own fire plan	Reinforced FA unit HQ	Force FA HQ	Force FA HQ

<sup>1</sup>Includes all target acquisition means not deployed with supported unit (radar, aerial observers, survey parties, etc.)

<sup>2</sup>A fire support section (FSS) for each maneuver brigade/ battalion/cavalry squadron and one FIST with each maneuver company/ground cavalry troop are trained and deployed by the FA unit authorized these assets by TOE. After deployment, FISTs and FSSs remain with the supported maneuver unit throughout the conflict.

not involve actual combat operations. This thesis will not explore the missions that could be given to field artillery units involved in these situations, because the standard tactical missions apply to combat operations only.

The primary limitation of this study is the lack of published available doctrinal information about the employment of forces in Force XXI. Present available information on Force XXI from Army and other published sources are presented in Chapter Two.

### Thesis Structure

To answer the thesis question, the research addresses key issues concerning future operations, fire support, and field artillery organization for combat. Chapter One provides the background for the thesis question and the significance of the study.

Chapter Two is a review of the literature and studies related to the thesis question. Included in the literature review are current periodicals, articles, and books related to Force XXI and the role of field artillery in future combat operations.

Chapter Three addresses the research methodology used for the thesis. The thesis examines two case studies, and the results of interviews with senior Army leaders, in order to determine the suitability of standard tactical missions for field artillery units.

Chapter Four presents the analysis of the information gathered in the review of literature, through the use of case studies and the methodology from Chapter Three.

Chapter Five contains the conclusion and presents recommendations for future standard tactical missions.

### Endnotes

- <sup>1</sup>Scott R. Gourley, "Vision 2020," Army (February 1995): 41.
- <sup>2</sup>U.S. Army, Force XXI: America's Army of the 21st Century (Washington, D.C.: U.S. Government Printing Office, 15 January 1995), 1.
- <sup>3</sup>Ibid., 2.
- <sup>4</sup>Claudia Kennedy, "The Dimensions of Threat," Looking to the Future, TRADOC's 20th Anniversary Seminar on Future Warfare (Washington D.C.: U.S. Government Printing Office, 1994): 29.
- <sup>5</sup>John A. Dubia, "Force XXI and the Field Artillery: State of the Branch 1994," Field Artillery (December 1994): 5.
- <sup>6</sup>U.S. Army, Field Manual 100-5, Operations (Washington D.C.: U.S. Government Printing Office, 14 June 1993), Glossary-2.
- <sup>7</sup>U.S. Army, Field Manual 6-20, Fire Support in the AirLand Battle (Washington D.C.: U.S. Government Printing Office, 17 May 1988), 2-8.
- <sup>8</sup>Ibid., 2-8.
- <sup>9</sup>Ibid., 2-8.
- <sup>10</sup>Joseph E. Oder, "Digitizing the Battlefield: The Army's First Step to Force XXI," Army (May 1994): 38.
- <sup>11</sup>FM 100-5, 2-23.
- <sup>12</sup>Ibid., 2-13.
- <sup>13</sup>FM 6-20, 2-10.
- <sup>14</sup>Oder, 38.
- <sup>15</sup>FM 6-20, 2-8.
- <sup>16</sup>Ibid., 2-9.
- <sup>17</sup>U.S. Army, TRADOC Pamphlet 525-5, Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-first Century (Washington D.C.: U.S. Government Printing Office, 1 August 1994), Glossary-6.

## CHAPTER TWO

### LITERATURE REVIEW

The concept of Force XXI is not current Army doctrine; it is a framework within which doctrine writers must define new warfighting tactics, techniques, and procedures. This chapter examines the literature that defines the ideas that will shape the future battlefield for Force XXI. The second half of the chapter defines and explains the principles of organizing artillery for combat, including the four standard tactical missions.

#### U.S. Army Force XXI Literature

HO, TRADOC Publications. TRADOC Pamphlet 525-5, Force XXI Operations, describes the Army's vision of future joint military operations. The concept provides TRADOC's Task Force XXI, Battle Laboratories, doctrine writers, combat developers, and trainers a vision of future conflict for the development of supporting concepts, programs, and experiments.<sup>1</sup>

Force XXI is the synthesis of emerging technologies, new doctrine and organization, and the use of quality, well-trained personnel to prepare the Army to fight in the twenty-first century.<sup>2</sup> In the area of emerging technologies, Force XXI will focus "on the advantageous exploitation of synergistic technologies among digital communications, intelligence, global positioning and navigation, and logistics."<sup>3</sup>

Force XXI is defined by five characteristics; doctrinal flexibility, strategic mobility, tailorability and modularity, joint and multinational connectivity, and versatility to function in war and operations other than war (OOTW).<sup>4</sup> Doctrinal flexibility and versatility are two areas that affect the research question of this thesis. Flexibility in military doctrine means being adjustable to change, without having to rethink or rewrite basic doctrinal ideas every time the world situation changes. Chapter Three addresses the areas of flexibility and versatility in greater detail.

Looking to the Future. The United States Army Training and Doctrine Command held a 20th Anniversary seminar at Fort Monroe from 30 June to 1 July 1993. The presentations from the seminar were published as a series of articles in the HQ, TRADOC booklet, Looking to the Future, TRADOC's 20th Anniversary Seminar on Future Warfare. Many articles in the booklet provide insight into how the Army's leaders think the Army will fight in the future.

According to Brigadier General Lon E. Maggart, then TRADOC Deputy Chief of Staff for Doctrine, in the future the U.S. Army will "rely on America's dynamic technologies to both tailor our fighting force and provide them with the weaponry necessary to dominate any battlefield on which we operate."<sup>5</sup> Again, technology is mentioned as one catalyst which will fuel the development of future doctrine.

Technological advances will allow concepts such as the digitization of the battlefield to become a reality. Digitization will allow all commanders to communicate battlefield information in near-real time, using a type of "local area network" which allows graphics and text to be "e-mailed" to everyone on the system.

Digitization is one of the three Army initiatives associated with a new strategy of horizontal technology insertion (HTI). Battlefield digitization will allow users to share a common situational awareness, which means that commanders and operations centers at all levels will see the same picture of the battlefield at the same time. Therefore, digitization will facilitate synchronization of all the battlefield operating systems.

The field artillery has been using digital communications for the past decade since the fielding of TACFIRE and BCS computers. There has been success and failure with digital communications; many of the failures are a result of lack of training and difficulty in establishing effective digital links with all of the nodes on the fire support system.

To be effective in the future all battlefield operating systems will be linked together using sophisticated communications technology. These links should enhance the field artillery's ability to respond to the needs of the maneuver commander. However, simply having this new technology will not guarantee success in digital communications, or in fire support. Control of the electromagnetic spectrum will be a key factor that may ultimately determine the effectiveness of future communications.

On January 19, 1991, in the allied air attack on Baghdad, the U.S. Navy used Tomahawk cruise missiles to deliver what Defense News described as "a new class of highly secret, non-nuclear electromagnetic pulse warheads" to disrupt or destroy Iraqi electronic systems. Such weapons cause no overt physical damage but can "fry" the components of radar, electronic networks, and computers.<sup>6</sup>

Books and Articles. An important factor in Force XXI operations will be the move from warfare based on industrial age

technology to armies that fight based on information age technology. Alvin and Heidi Toffler in War and Anti-War, Survival at the Dawn of the 21st Century describe the concept of information technology as it relates to the U.S. Army and Force XXI.

The basic premise of the book is that in today's society, corporations succeed in business in the same way the Army can succeed in future wars: through the use of information technology. The military must "perform at least four key functions with respect to knowledge."<sup>7</sup> The Army must acquire, process, distribute, and protect information, which may be the key to future military victories. Unfortunately, there is no system in place that encapsulates the entire concept of "information technology," although Force XXI planners are working on this critical issue. The Tofflers predict that in the future the information age will lead to new "knowledge strategies" that will dominate military thinking and strategy.

#### Field Artillery Force XXI Literature

Another important part of the thesis research is gathering information relating to how the field artillery community envisions operating in the twenty-first century. Currently, a task force at Fort Sill known as Task Force 2000 is investigating the application of Force XXI concepts to the field artillery. In the December 1994 issue of Field Artillery, Major General John A. Dubia, Chief of Field Artillery, described the impact of Force XXI on the field artillery.

In an article entitled "Force XXI and the Field Artillery: State of the Branch 1994," MG Dubia wrote about the changes occurring in the field artillery community. The article addresses new field artillery weapon systems, the joint venture teamwork and advanced

warfighting experiments, and leaders and soldiers for Force XXI. The objective of building the field artillery for Force XXI is to "create new formations that are strategically flexible, incredibly lethal, and remarkably versatile."<sup>8</sup>

To fight as a part of a unified force the field artillery must closely synchronize fires with maneuver. In Force XXI this will be accomplished by using technology to embed the process of synchronization within all of the automated systems used by the entire joint fighting force.

The future force will be connected by data links that enhance real time (or near-real time) access to a wealth of combat information, resulting in the ability of leaders to share information and have a common battlefield knowledge based on the current situation. The Force XXI joint force will operate in an expanded battle space, with the depth and volume of the battlefield greatly increased.

A second key feature of the Force XXI FA Vision will be the unified execution of the battle. The technological advances that enhance the commander's ability to make a decision and transmit it rapidly will result in the capability to engage the enemy with a "hair trigger" responsiveness.<sup>9</sup> One implication of this for the field artillery is that it may force a change to the principles of fire support. The future shared situational awareness will "allow the system to verify the conditions of engagement and vector fires virtually instantaneously without requiring clearance by multiple layers of the fire support system."<sup>10</sup>

The result of unified execution is that the commander can more readily dominate his battle space. This flexible application of combat

power will reshape the future roles and missions of the field artillery. Thus, the purpose of the future field artillery force will continue to be to ensure that the maneuver commander has the fires necessary to achieve success for any given mission.

The FA Force XI vision pictures a field artillery force adapted to meet the mission; in other words, breaking the force packaging paradigm. The future force will be packaged to provide the right mix of unified combat power for the full range of operations to defeat the specific threat. The dynamic concept of unified combat power may lead to redefined doctrinal ideas.

#### Organizing Field Artillery for Combat

Field artillery is organized for combat to provide responsive and effective field artillery fires and to coordinate all fire support.<sup>11</sup> The fire support coordinator recommends the field artillery organization for combat to the supported maneuver force commander. The factors of METT-T are considered, with the ultimate objective being the assignment of a tactical mission for each field artillery unit.

There are five fundamentals of field artillery organization for combat.

1. Adequate field artillery support for committed combat units.
2. Weight to the main attack in offense or most vulnerable area in defense.
3. Facilitate future operations.
4. Immediately available field artillery support for the commander to influence the action.
5. Maximum feasible centralized control.

Additionally, each fundamental considers the factors of mission, ammunition allocation, and positioning of units for support.

Adequate field artillery support for committed combat units.

The minimum adequate support for committed maneuver units is considered one field artillery battalion in direct support of each committed brigade.<sup>12</sup> The standard tactical mission given to this type of unit is direct support. According to current doctrine, there can never be more than one field artillery unit in direct support of a maneuver unit. This is done so that the field artillery unit can properly control fires for the maneuver unit through only one headquarters. If additional units are available, a reinforcing mission or general support reinforcing mission is used to provide additional field artillery support as necessary.

Adequate support is provided by allocating ammunition to field artillery units in support of more heavily committed units. This is done by controlling the supply rate during an operation, and by considering the enemy force array when deciding the correct ammunition mix.

Finally, positioning of field artillery is critical to providing adequate support. Artillery units must be in range to support the zone of action of the committed maneuver force, or the zone of action of the reinforced artillery unit.

Weight to the main attack in offense or most vulnerable area in defense. Field artillery units are allocated to provide flexibility and additional firepower to maneuver commanders conducting the main attack, or defending the most vulnerable area. This is accomplished by allocating reinforcing or general support reinforcing artillery units,

or by giving a field artillery unit a nonstandard tactical mission. The commander may also decide to provide additional ammunition stocks to field artillery units supporting the affected area.

Facilitate future operations. This fundamental is critical to ensuring success when transitioning between phases of an operation, and to be flexible when dealing with an unpredictable enemy. Field artillery units are given on-order missions to facilitate the planning process for future situations. Units may be ordered not to exceed a certain percentage of their ammunition allocation in a current operation, to ensure an adequate supply of ammunition is available for the future. Finally, field artillery units are positioned to ensure rapid movement in support of on-order missions.

Immediately available field artillery support for the commander to influence the action. The force artillery commander will normally retain some of his artillery battalions with which the maneuver force commander can influence the action on a fluid battlefield. Normally, this is done by assigning general support or general support reinforcing missions, which allow the force artillery commander to retain a degree of command and control. Ammunition storage areas are positioned forward to ensure the rapid resupply of critical stocks.

Maximum feasible centralized control. Centralized control of field artillery permits flexibility in its employment and facilitates effective support to each subordinate element of the command and to the force as a whole.<sup>13</sup> The four standard tactical missions present varied amounts of centralized control to the force artillery commander. In defensive situations, a high degree of centralized control is desired, while the opposite is true in offensive operations. Massing the effects

of fires is most effective when it is centralized at the highest level possible consistent with the mission and tactical situation.

There has been much written on the subject of how to best organize field artillery for combat. When Non-Standard Missions Became Standard: Employing Field Artillery Brigades on the AirLand Battle-Future Battlefield by MAJ Donald C. McGraw, Jr. focuses on the adequacy of the four standard tactical missions when employing heavy force field artillery brigades on the AirLand Battle-Future (ALB-F). The study proposes two possible new standard tactical missions to meet the demands of a nonlinear ALB-F battlefield. MAJ McGraw did not propose that the standard tactical missions be entirely revised, but proposes that the current four missions include an "Area Support" and a "Direct Attack" mission.<sup>14</sup> This monograph provides a "springboard" to study the same general topic for this thesis.

A second monograph Close Support Field Artillery and the Challenge of AirLand Battle Future by MAJ Thomas W. Weafer scrutinizes the organization and employment of FA units to provide close support fires. This monograph examines organizing field artillery for combat, but is really a study of close support for a heavy maneuver brigade. There are, however, some interesting ideas concerning the use of standard tactical missions.

#### Field Artillery Command Relationships

Field Manual 6-20-1, The Field Artillery Cannon Battalion. In order for the field artillery to provide support to maneuver forces, units are assigned a tactical mission, which require them to perform seven inherent tasks. Command and control of field artillery is established through two basic steps.

The first step establishes the command relationship between the FA unit and its senior headquarters. The command relationship ensures that there is "clearly defined, systematic, and positive command and control"<sup>15</sup> that ensures the field artillery provides responsive fire support to the maneuver forces. There are four types of relationships: organic, assigned, attached, or operational control (OPCON).

Organic. An organic unit is assigned to and forms an essential part of a military organization, and is normally found in the unit table of organization and equipment (TOE). Some examples are a Firefinder radar section (AN/TPQ-36) that is organic to a light division direct support battalion, and the field artillery batteries that are organic to their battalion headquarters.

Assigned. The assigned relationship requires that the higher organization provides administrative and logistical support to the unit and their personnel. A field artillery battalion that is a part of a division artillery is assigned to that headquarters, where it will remain on a relatively permanent basis.

Attached. The attached relationship places units or personnel in an organization on a temporary basis. The attachment order will specify the degree of administrative and logistical support that the receiving unit exercises over the attached unit. An example is a field artillery battalion assigned to a corps artillery and attached to FA brigades in the corps.

Operational Control. The OPCON relationship delegates authority to a commander to direct forces assigned to accomplish specific missions or tasks, usually limited by function, time, or place. Field artillery units are not normally given the OPCON command

relationship. The four standard tactical missions accomplish the same task as the OPCON relationship, but more clearly define the relationship with the supported maneuver force.

#### Four Standard Tactical Missions

The second step to establishing command and control of field artillery units is the assignment of a tactical mission. A tactical mission performs two functions: it provides detailed support responsibilities to the field artillery unit, and establishes the relationship between the field artillery unit and a maneuver unit or another field artillery unit.

Direct Support (DS). One field artillery battalion is normally assigned a mission of direct support to each committed maneuver brigade. A direct support battalion is primarily concerned with the field artillery support required for the brigade. Fires are planned to support the scheme of maneuver, and are coordinated throughout the tactical decision making process. The fire support coordinator for the brigade is the DS field artillery battalion commander, assisted by the brigade fire support officer. The direct support mission is the most decentralized of the four standard tactical missions.

Reinforcing (R). The reinforcing tactical mission causes one field artillery battalion to augment the fires of another battalion. When a direct support artillery battalion requires additional fires to support the maneuver force, the reinforcing mission is given to another field artillery unit.<sup>16</sup>

General Support Reinforcing (GSR). A unit given this mission has two priorities of support. First, they provide artillery fires for the whole committed maneuver force, and as a second priority, they

reinforce the fires of another field artillery battalion. The GSR battalion remains under the command and control of the force artillery headquarters.

General Support (GS). This mission is the most centralized of the four standard tactical missions, because the unit remains under the immediate control of the force artillery headquarters. A unit assigned this mission provides fires for the force as a whole, providing immediately responsive fires for the maneuver commander.

Unpublished Sources. Another major source is an unpublished study of the fundamentals of organizing field artillery for combat, written by Mr. Ed Stiles, as a part of Close Support Study Group V. The document contains proposed revisions to the seven inherent responsibilities to the four standard tactical missions, as shown in Table 2.<sup>17</sup>

The study proposes the update to the seven inherent responsibilities to incorporate organizational and doctrinal changes applicable to the AirLand Battle Future. Many of the changes were proposed for simplicity and ease of understanding. The following paragraphs summarize the rationale for the proposal, many based on a major organizational change that was made in field artillery units in the late 1970s.

In 1977, the Army approved the use of fire support teams (FISTs), to improve the forward observation provided to maneuver units. The concept provided FISTs at the company level to replace the forward observer team in use since World War II.

The FIST was critical because the artillery had fewer pieces than the enemy, because the forward observer had a major role in registrations and the use of smoke and illuminations that the fire direction center had previously coordinated, because the envisioned

battlefield would be larger than in the past, because new equipment and new munitions were being introduced, and because airborne forward tactical air controllers would probably be absent because of Soviet-bloc air defenses. A fire support coordinator, also called the FIST<sup>18</sup> chief, would handle the fire support tasks for the company.

TABLE 2

PROPOSED REVISION OF THE TACTICAL MISSION MATRIX

AN FA UNIT WITH A MISSION OF:	DIRECT SUPPORT	REINFORCING	GENERAL SUPPORT REINFORCING	GENERAL SUPPORT
Priority of fires:	Supported unit	Reinforced unit	1. Force FA HQ 2. Reinforced unit	Force FA HQ
Zone of fire:	Zone of action of supported unit	Zone of fire of reinforced unit	1. Zone of action of supported unit 2. Zone of fire of reinforced unit	Zone of action of supported unit
External fire direction channels:	1. Observers and coordinators with the supported unit 2. Force FA HQ	1. Reinforced unit 2. Force FA HQ	1. Force FA HQ 2. Reinforced unit	Force FA HQ
Movement and Positioning:	In accordance with supported commander's guidance/directives	Reinforced unit	Force FA HQ	Force FA HQ
Fire planning:	In accordance with supported commander's guidance/directives	Reinforced unit	Force FA HQ	Force FA HQ

Deletion of "Furnishes Fire Support Team (FIST/FSS)": Due to the adoption of the FIST concept, furnishing fire support teams is a

function of organization. Furnishing a fire support team is no longer a responsibility associated with a tactical mission.

Deletion of "Furnishes Liaison Officer": The need for a liaison officer is a function of the specific situation and not of the tactical mission. Furnishing a liaison officer is not only a field artillery unit to field artillery unit responsibility. Furnishing a liaison officer is applicable when two units (allied or coalition partners) do not have compatible command and control systems. Units should furnish liaison officers whenever the tactical situation dictates.

Addition of "External Fire Channels": This proposal replaces the inherent responsibility of "establishes communications with". Communications is important with the entire fire support system, including the Force FA Hqs, FISTs, FSEs, COLTs, FOs, and maneuver unit headquarters. This rationale accounts for the proposed rewording of the tasks associated with the inherent responsibility for communications.

### Endnotes

<sup>1</sup>U.S. Army, TRADOC Pamphlet 525-5, Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-first Century (Washington D.C.: U.S. Government Printing Office, 1 August 1994), 1.

<sup>2</sup>Gordon R. Sullivan, "A New Force for a New Century," Army (May 1994): 26.

<sup>3</sup>Leon E. Salomon, "Army Materiel Command: Providing the Technological Edge," Army (February 1995): 26.

<sup>4</sup>TRADOC Pam 525-5, 3-1.

<sup>5</sup>Lon E. Maggart, "Future Battle Vision," Looking to the Future, TRADOC's 20th Anniversary Seminar on Future Warfare (Washington D.C.: U.S. Government Printing Office, 1994): 62.

<sup>6</sup>Alvin and Heidi Toffler, War and Anti-War (Boston: Little, Brown & Co., 1993), 149.

<sup>7</sup>Ibid., 142.

<sup>8</sup>John A. Dubia, "Force XXI and the Field Artillery: State of the Branch 1994," Field Artillery (December 1994): 1.

<sup>9</sup>James J. Carafano, "Vision 2020," (Unpublished briefing package, Fort Sill, OK, 1994).

<sup>10</sup>Leo J. Baxter, "Field Artillery Vision 2020," Field Artillery (December 1994): 13.

<sup>11</sup>U.S. Army, Field Manual 6-20, Fire Support in the AirLand Battle (Washington D.C.: U.S. Government Printing Office, 17 May 1988), 2-10.

<sup>12</sup>Ibid., 2-10.

<sup>13</sup>Ibid., 2-10.

<sup>14</sup>Donald C. McGraw, Jr., "When Non-Standard Missions Became Standard: Employing Field Artillery Brigades on the AirLand Battle-Future Battlefield," (Unpublished monograph, School of Advanced Military Studies, 1990), 35-6.

<sup>15</sup>U.S. Army, Field Manual 6-20-1, The Field Artillery Cannon Battalion (Washington D.C.: U.S. Government Printing Office, 29 November 1990), 1-2.

<sup>16</sup>FM 6-20, 2-9.

<sup>17</sup>Ed Stiles, "Field Artillery Organization for Combat," (Unpublished briefing package, Fort Sill, OK, 1994).

<sup>18</sup>Boyd L. Dastrup, King of Battle, A Branch History of the U.S. Army's Field Artillery (Fort Monroe, VA: Office of the Command Historian, TRADOC, 1992), 294-5.

CHAPTER THREE  
RESEARCH METHODOLOGY

This thesis will use two case studies to evaluate the suitability of the current field artillery standard tactical missions. In addition, the thesis will analyze the results of interviews with senior Army leaders, using a series of questions concerning future field artillery missions and employment.

Case Studies

Case study one will examine the U.S. Army Mobile Strike Force (MSF) 2010 analysis conducted by TRADOC. In May-June 1994, the TRADOC Analysis Center conducted a workshop to assess the impact of future technologies and organizational variations enabled by new technologies. The MSF 2010 force structure, new systems, and enemy threat varied from those used during the 1994 Prairie Warrior exercise conducted by the U.S. Army Command and General Staff College in May 1994.

The MSF is an experimental vehicle to aid in designing future organizations; it is not an objective force. The MSF is a maneuver organization of 2010 whose systems include extended capabilities in digitization, lethality, and mobility. Its mission is to strike deep into the enemy using shock, firepower, and speed to quickly defeat the enemy.<sup>1</sup>

The MSF case study will present a scenario with a unified force structure, because future technology will change the traditional means of waging warfare.

Combined arms is the 20th century endstate for warfighting. The dominant trend has been to achieve synchronization of fire and maneuver through a range of doctrinal, materiel, training, and

organizational innovations. In the next quarter century, technology will profoundly change our traditional means of balancing combat power, and the days of combined arms warfare will surely come to an end. Future technology will give the commander the ability to not just coordinate his fires, but to fuse them into a single powerful dynamic: unified combat power.<sup>2</sup>

Case study 2 will examine field artillery employment and operations during Desert Storm. There were many instances when the field artillery was positioned forward of friendly front line positions in order to fire deep strikes against Iraqi targets. This creative use of field artillery assets has implications for assigning missions in support of Force XXI.

Those who don't understand how to employ artillery might think it fights well behind the infantry and armored forces. Not so. Artillery has always been in harm's way, forward for counterfire or to fire in the combined arms fight. What do we need to rethink? Our forces must be modular. The force commander must be able to determine the nature of the mission and then rapidly mix and match modules to accomplish missions that cross the entire continuum of conflict from the lowest level of conflict to all out war.<sup>3</sup>

This thesis will use two criteria when evaluating the case studies: flexibility and versatility. One key to the successful employment of artillery is the ability to rapidly adapt to changing battlefield conditions. Artillery units must always be flexible in their planning and execution. Flexibility in artillery employment is directly related to the "facilitate future operations" fundamental of organizing artillery for combat. When organizing field artillery for combat, the commander must have a degree of flexibility, because combat missions in the future will be waged against enemies with varied capabilities and level of modernization.

Versatility is the ability to be competent in many things; for the field artillery this means being capable of providing different

types of supporting fires based on the combat situation. According to FM 100-5, versatility is one of the tenets of Army operations.

Versatility is the ability of units to meet diverse mission requirements. Commanders must be able to shift focus, tailor forces, and move from one role or mission to another rapidly and efficiently. Versatility implies a capacity to be multifunctional, to operate across the full range of military operations, (and) allows for the smooth transition from one mission to another.<sup>4</sup>

### Interviews

This thesis examines the results of interviews with senior Army leaders concerning field artillery Force XXI issues. The following paragraphs summarize the questions asked during the interviews.

TOPIC: What role does the field artillery have in Force XXI?

1. Will the field artillery organizational structure be changed to meet the demands of the future force?
2. How will maneuver commanders use the field artillery in Force XXI to take advantage of the synergy of fire and maneuver?
3. How will technological advances in communications change the way the field artillery provides fire support to maneuver units?
4. Are there any lessons learned from field artillery employment in Operation Desert Storm that serve as an azimuth to it's employment in Force XXI?

TOPIC: Do the field artillery standard tactical missions need to change because of the U.S. Army's evolution to Force XXI?

1. Are the four current standard field artillery tactical missions (DS, GS, R, GSR) applicable to units supporting a tailored maneuver force operating in Force XXI?

2. Should field artillery units operating in Force XXI be assigned tactical tasks similar to the mission oriented tasks given to maneuver forces (e.g. deep attack, SEAD, close support)?

TOPIC: What is the present vision for Force XXI as defined by senior Army leaders?

1. What do you see as the future design of a heavy (mechanized or armored) division?

3. Will the future maneuver force be tailored in a design manner similar to the Mobile Strike Force concept?

3. How will the future heavy divisional force design affect the organization of field artillery battalions?

TOPIC: How is the role of the field artillery in Force XXI changing from its present role?

TOPIC: How will future doctrine developed for Force XXI modify the considerations used in assigning tactical missions to field artillery units?

1. What factors should the maneuver commander consider when organizing field artillery units for combat in Force XXI?

2. What degree of centralized or decentralized control should the commander consider when organizing field artillery for combat in Force XXI?

TOPIC: Will technological advances provide field artillery units with new capabilities that impact on their employment within a Force XXI context?

1. Which capabilities of the Crusader howitzer will be most important on the Force XXI battlefield?

2. What other future technological advances will be critical to the success of field artillery units in Force XXI?

Endnotes

<sup>1</sup>Timothy J. Bailey, et al, Technical Memorandum TRAC-TD-0194, Mobile Strike Force 2010 (HQ, TRADOC Analysis Center:Fort Leavenworth, KS), 23 September 1994, 1.

<sup>2</sup>Leo J. Baxter, "Field Artillery Vision 2020," Field Artillery (December 1994): 10.

<sup>3</sup>John H. Tilelli, Jr., "The Army and FA Challenges of Designing Force XXI," Field Artillery (December 1994): 9.

<sup>4</sup>U.S. Army, Field Manual 100-5, Operations (Washington D.C.: U.S. Government Printing Office, 14 June 1993), 2-9.

## CHAPTER FOUR

### ANALYSIS

#### Case Study One: Mobile Strike Force

Preparing the U.S. Army for Force XXI operations requires a plan to realize the vision and meet the demands of the future force. The challenge is to remain trained and ready for the present, while becoming more capable for the future. Army leaders have developed the Force XXI Campaign Plan, which provides the both "the intellectual construct and the key decision points to achieve Force XXI."<sup>1</sup>

[The Force XXI Campaign Plan] is guiding the Army in the design of the 21st Century force and will discipline us to make fielding and related support decisions by the year 2000. This time line will enable us to field a Total Army Force that meets the Nation's needs in the first decade of the next century. Executing this plan is a team effort for the entire Army, cutting across all organizational boundaries. We use the Louisiana Maneuvers (LAM)<sup>2</sup> process to synchronize this team effort.

The Force XXI Campaign Plan includes three distinct efforts that complement each other. The first and most critical effort is the redesign of the Army force, known as Joint Venture. The Commander of U.S. Army Training and Doctrine Command is responsible for coordinating this partnership among all of the major commands and the Army Staff. The focus of Joint Venture is the redesign of the division, with the ultimate goal being to produce the best operating force for the Army. This case study will concentrate on one part of the Joint Venture process, known as the Mobile Strike Force.

The second effort of the Force XXI Campaign Plan is the reinvention of the institutional Army, divided into four complementary efforts.

Redesign of the institutional Army is a major supporting effort, which is further divided into four complementary efforts to lead us to the institutional design of the 21st century Army. They are the major commands' reengineering efforts, the results of base realignment and closure decisions, the output of the Roles and Missions Commission, and functional area analyses on major Title 10, U.S. Code responsibilities. These, combined with the lessons of the General Headquarters Exercise series and Joint Venture efforts, lead to final design and implementation decisions by 2000.<sup>3</sup>

The Vice Chief of Staff of the Army supervises this effort.

The third effort is focused on developing and acquiring information age technologies, particularly digital communications hardware and software. The Director of the Army Digitization Office is responsible for ensuring that the digitization effort supports the other two by fielding technologies that are integrated across the entire operating force.

A key feature of the movement to Force XXI is a series of Advanced Warfighting Experiments (AWE), Advanced Technology Demonstrations (ATD), Advanced Concept Technology Demonstrations (ACTD), and Advanced Concepts and Technology II (ACT II) that will provide insights into the necessary changes in future organization, doctrine, equipment, and training. These experiments and demonstrations are divided into three phases, each with an experimental objective. The first phase focuses on the brigade, the second on the division, and the third on the corps. Force XXI implementation decisions will be the result of the completion of each phase.

The process of change is coordinated by the Louisiana Maneuvers and Battle Labs. The LAM process is a means for the Army's leaders to think about the future, and to manage the process of change.

In the broadest sense, LAM does four things. First, it provides a mechanism for the Army's leadership to identify the most important new ideas and questions we need to resolve. Second, it establishes the basis for reaching consensus among the leadership. Third, using a wide range of investigative tools, it causes those new ideas to be studied. Fourth, LAM provides accelerated feedback to the Army's leadership, providing strategic agility in decision making.<sup>4</sup>

Battle labs are staffs of trained and talented military and civilian personnel that focus on one of the battle dynamics: battle command, battlespace, depth and simultaneous attack, early entry, and combat service support.<sup>5</sup> Battle Labs experiment with simulation technology such as virtual reality to study new technologies and warfighting concepts in order to determine emerging opportunities for the future Army. The Battle Labs are an important test bed for many Force XXI concepts and experiments. They also provide input to the Army's series of advanced warfighting experiments (AWEs), such as Exercise Prairie Warrior.

The Prairie Warrior AWE is conducted at Fort Leavenworth, Kansas, as a part of the Command and General Staff College's (CGSC) curriculum. Prairie Warrior is the capstone exercise for the students attending CGSC. "Prairie Warrior 95, similar to a battle command training program (BCTP) Warfighter exercise, will be the second in the Prairie Warrior series of AWEs that focus on division-level operations".<sup>6</sup>

During Prairie Warrior, students will command a Mobile Strike Force (MSF), an experimental division sized force. The Mobile Strike Force will be able to employ the Army's latest technology and new

equipment in a simulated combat environment. The exercise will provide the basis for continuing evaluation of Force XXI concepts, much like Prairie Warrior 94.

The Prairie Warrior 94 exercise explored the warfighting capabilities of an experimental future force of 1998 organized with new equipment and possessing the latest digital and information technology. CGSC students fought this twenty-first century force against corps-sized enemy formations controlled by a professional and competent opposing force. Figure 2 shows the organization of the MSF for Prairie Warrior 94.

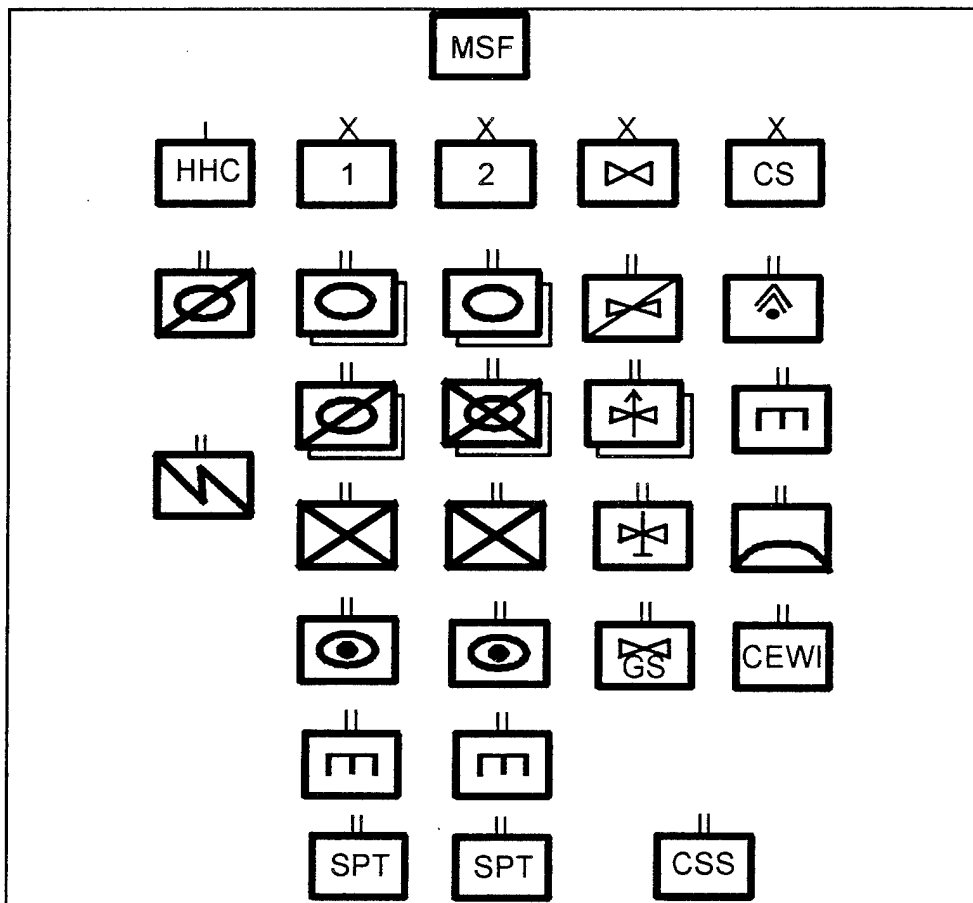


Figure 2. Mobile Strike Force for Prairie Warrior 94.

Appendix A contain a description of the military symbols shown in Figure 2.

The Prairie Warrior 94 simulation demonstrated clear gains in the effectiveness of a fighting force equipped with advanced equipment and digital technology. Modern information systems improved the commander's ability to synchronize operations, and the MSF commander's increased situational awareness allowed him to make decisions in a more rapid manner than a non-digitized force.

Digitization of data links and enhanced voice communications across the entire force provided it with an information connectivity that surpasses anything we possess today or will be available in the immediate future. Domination of information warfare, we hypothesized, would result in a significant improvement in the MSF's ability to fight effectively. . . . Throughout the exercise [the MSF commander's] view of the battlespace was more accurate and timely than the non-digitized corps for which he worked. As a result, the MSF proved to be as lethal as larger existing forces even though it possessed fewer major weapon systems than current divisions. In short, it could dominate a larger area than today's divisions.

The Prairie Warrior 94 exercise gave the Army insights into many areas that merit further study and experimentation. There is a need to further explore the modular design of forces and to study the advantages and disadvantages of deploying a smaller, more lethal force. Another element that impacts on this thesis is the need to understand fully the impact of digital technology on the proper mix between fire support and maneuver elements in the force of the future. The need to explore the role of fire support, and consequently field artillery forces, has a direct impact on the suitability of the current four standard tactical missions for field artillery units.

To further develop the MSF concept, the TRADOC Analysis Center (TRAC) hosted a Mobile Strike Force 2010 Workshop during May and June of 1994. The purpose of the workshop was to provide the TRADOC commander

and the Chief of Staff of the Army with insights into the development of Force XXI concepts.

In order to develop analytical insights by July 1994, TRAC conducted a workshop to assess the impact of future technological capabilities and organizational variations enabled by these new technologies. . . . TRAC assembled a group of subject matter experts (SME) from the proponent schools and centers to role play staff sections of a MSF 2010.

The TRAC used the same Southwest Asia scenario employed for Prairie Warrior 94, but set in the year 2010. The MSF force structure and systems varied significantly from the MSF 1998 force used in Prairie Warrior 94. At the conclusion of the exercise, TRAC's assessment team used after action reviews to collect qualitative data from the workshop participants. The after action review contains data that is useful to analyze for the purpose of this thesis. Figure 3 shows the organization of the MSF 2010.

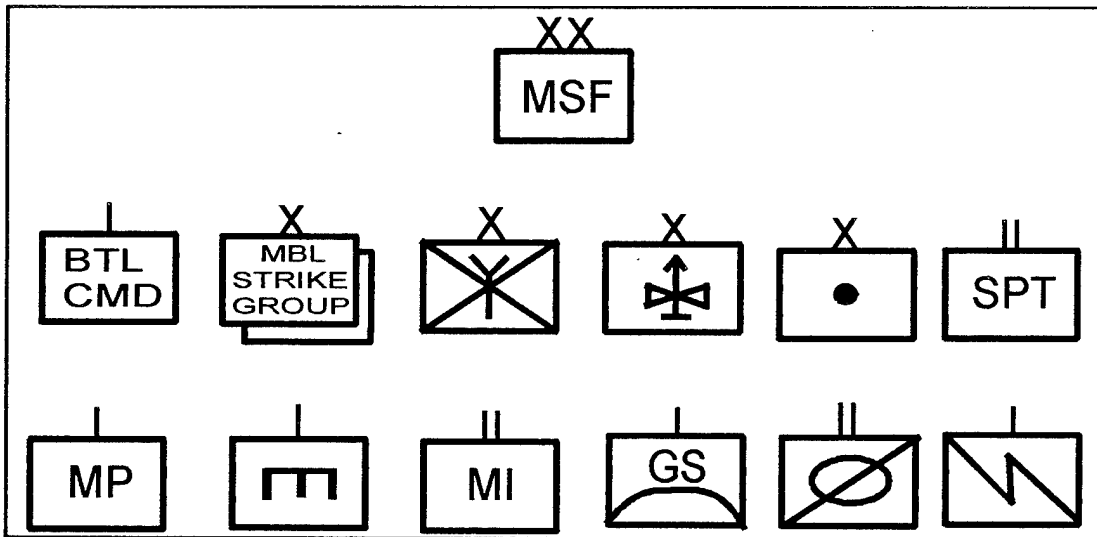


Figure 3. Mobile Strike Force for MSF 2010

The study focused on the areas of fires, maneuver, and combat service support. There were several areas studied under the fires portion of the exercise:<sup>9</sup>

1. Are the MSF fire support assets sufficient to provide both close support and fires in depth?

2. Are there sufficient target acquisition systems (FA and non-FA) to exploit the MSF fires capabilities?

3. Are there sufficient fire support delivery assets to support maneuver functions?

4. Do the addition of future technological fire support capabilities and/or changes in the fire support force structure enable the MSF commander to mass more of his force/systems sooner and increase the intensity of the battle?

5. Do the addition of future technological fire support capabilities and/or changes in the fire support structure improve the MSF's ability to kill the enemy at depth?

6. Do the addition of future technological fire support capabilities and/or changes in the fire support structure achieve increased survivability?

The detailed methodology used to conduct the exercise is not essential to this thesis, but a brief overview is helpful. TRAC conducted seven runs (base case and six alternatives) that switched certain capabilities and introduced different numbers of systems into the wargame. The MSF was successful in defeating the opposing force in the base case and each alternative. The study did uncover some useful information relating to the questions presented above.

Sufficiency of MSF fire support assets. Target acquisition assets are critical for fire support systems to have the ability to receive targeting data in a timely manner. The target acquisition systems were able to collect information, but the ability to process the targeting data and disseminate it to firing units needs improvement.

One target acquisition sensor under the direct control of the MSF was the unmanned aerial vehicle (UAV). The players used the UAV for reconnaissance, to monitor likely enemy avenues of approach, to gather battle damage assessment (BDA) information, to key ATACMS fires, and to screen the MSF flank during maneuver. The UAV proved to be a valuable asset for forces in the future. In fact, the UAV was the top rated new technology that affected the lethality, survivability, and tempo of the MSF.<sup>10</sup>

Sufficiency of fire support delivery assets. The ability of fire support systems to kill the enemy at depth requires different, but complementary systems. The MLRS and Crusader proved to be effective, with the MLRS being more effective at longer ranges against large area targets. The Crusader proved to be the weapon of choice in support of the brigade sized mobile strike groups (MSGs). The Crusader was used in direct support of the MSG because of its usefulness against hard or point targets. This information does not break any new ground, but it does point out the need for a howitzer unit to provide close support fires to maneuver units in the future. Figure 4 illustrates that cannons provide more utility than rockets in the close battle.

Future technology and force structure impact on massing and intensity of battle. The exercise participants felt much more successful with artillery in Alternative 1 (45 MLRS/72 Crusader) than in

the Base Case (99 MLRS/18 Crusader), due to the increased intensity of the battle shown with more cannons supporting the MSGs. While there was virtually no difference in the number of deep MLRS missions fired, in Alternative 1 the number of close support Crusader missions dramatically increased. The necessity of providing adequate artillery for the close fight is illustrated by Figure 5.

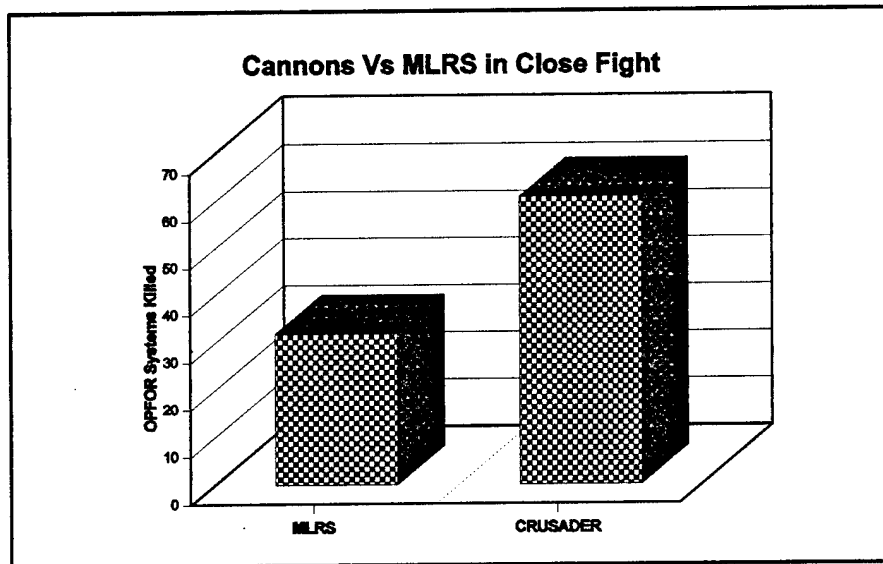


Figure 4. Cannons versus MLRS in Close Fight.

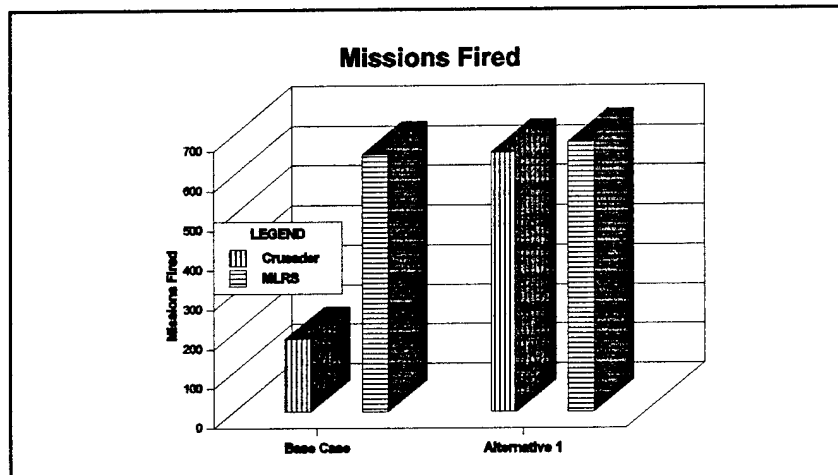


Figure 5. MLRS versus Crusader Missions Fired.

#### Future technology and force structure impact on deep battle.

Use of ATACMS allowed fires to maneuver over the breadth and depth of the battlefield, and allowed the MSF to increase the tempo of the battle by maneuvering with fires and massing maneuver assets (particularly attack helicopters) and fixed wing aircraft. There was some uncertainty between the role of the corps and the MSF in the deep battle, because the MSF can fight deeper than a current division. The corps must continue to use its assets to shape the deep battle before committing the assets of the MSF. "The MSF fight must be tied to the corps battle, especially for long range artillery fires and aviation support."<sup>11</sup>

Future technology and force structure impact on survivability. Survivability is particularly dependent on the ability of fires to kill the enemy deep and to provide close support fires when required. In the MSF 2010 case studies, maneuver was best supported by a combination of cannons and rockets with the right mix of ammunition types to win the deep battle and decrease the intensity of the close fight. When maneuver forces are able to avoid the close fight (or at least minimize the duration or intensity) they are more survivable on the battlefield. The ability of the MSF to fight deep is the key to their survivability.

#### Significance of Case Study One

Field artillery units will continue to provide critical fires in support of maneuver units today and in the force of the future. The MSF studies show that fires will be needed for the deep fight and the close battle, with an expanded battle space for the division and brigade. The current four standard tactical missions are inadequate because they are based on the assumption that fires only support other

activities, when in fact they may be used as the primary warfighting tool in some situations.

On the Force XXI battlefield, field artillery units will continue to provide fires that are tied to the maneuver commander's intent and mission. The main difference is that the force commander must clearly express the task and purpose of fires rather than assigning a tactical mission. Assigning one of the four standard tactical missions to a field artillery unit simply defines responsibility (via the seven inherent responsibilities) and allocates resources. To be adaptable means to be able to engage the enemy in many ways; fires must have a task and purpose associated with them to fit into the overall scheme of maneuver.

#### Case Study Two: Operation Desert Storm

The Gulf War in 1991 was a decisive victory for coalition forces over the Iraqi Army occupying Kuwait. The field artillery was a major contributor to the quick defeat of the enemy. In the words of Major General Fred F. Marty, then Chief of Field Artillery, "not since World War II has fire support in general and the FA in particular proved such a major force for the combined arms team."<sup>12</sup>

One of the innovative uses of field artillery prior to the commencement of the ground attack was the artillery task force. The Army and Marine Corps both used this concept to conduct artillery raids against Iraqi targets. The concept proved to be very effective; a study of this can provide insights into the possible employment of field artillery in Force XXI. General John H. Tilelli, Jr., commander of the U.S. 1st Cavalry Division during Operations Desert Shield and Desert Storm, describes such a mission conducted in February 1991:

During Desert Storm, the 1st Cavalry Division positioned all the MLRS (multiple launch rocket systems) one could imagine- all that VII Corps controlled- just behind our armored cavalry and forward of our infantry and armored brigades. On 17 February 1991, we fired a massive artillery missile and cannon strike on the Iraqis' 10th Armored Division. The artillery fired hundreds of MLRS rockets and conventional rounds with Firefinder radars aligned right behind the MLRS battalions for counterbattery. We immediately followed the prep with a cross border attack by our aviation brigade. The mission called for artillery far forward; therefore, that's the way we task organized to do it.<sup>13</sup>

This case study focuses on the artillery raids conducted by the 1st Marine Division in southwestern Kuwait during 23 January to 10 February 1991. The mission provides valuable insights into the employment of an artillery strike force organized as a combined arms team. Since one of the principles of combat organization in Force XXI is designing modular forces tailored to the mission, the Marine Corps example is worthy of study for its potential application for field artillery missions in the 21st century.

In January 1991, the I Marine Expeditionary Force (I MEF) was given the mission to deceive and disrupt Iraqi forces operating in defensive belts along the southwestern border between Kuwait and Saudi Arabia. The 1st Marine Division conducted a mission analysis and decided that the artillery raid was the best way to accomplish the mission. Organizing the artillery raid was a major challenge because it is normally conducted by air assault units, and it is not a mission that most artillery units train for in peacetime. In fact, the doctrine outlined in FM 6-50, Tactics, Techniques, and Procedures for The Field Artillery Cannon Battery, provides minimal guidance for such a mission.

The air assault artillery raid is the rapid movement of artillery assets by air into a position to attack a high priority target with artillery fires. It could involve operation across the forward edge of the battle area (FEBA). Normally, the raid is extremely short and should not involve sustained operations. Detailed planning,

surprise, and speed in execution are the key factors in the successful conduct of a raid.<sup>14</sup>

After conducting the mission analysis, the 1st Division commander and the commanding officer of the 11th Marines (the divisional artillery regiment) selected the 5th Battalion, 11th Marines (5/11) to conduct the raids. The 5/11 Marines was the general support artillery battalion organized with two batteries of M198 howitzers (155mm, towed) one battery of M109A3 howitzers (155mm, self propelled), and one battery of M110A1 howitzers (203mm, self propelled). The GS battalion was the logical choice because it "had more positioning flexibility than the direct support (DS) battalions that had to remain in a position to provide fires for their supported maneuver task forces."<sup>15</sup>

One of the primary concerns for the raid force was security and force protection. Task Force Shepherd, consisting of elements of the 1st and 3rd Light Armored Infantry Battalions, was conducting screening operations in the proposed operating area for the artillery raids. Company B of Task Force Shepherd was selected to provide ground security for the artillery raid force. As the raid force continued to determine the required support assets for the mission, it became apparent that the mission would involve a combined arms team.

Providing another layer of security and adding to the combined arms nature of the raids was fixed wing aviation from the 3d Marine Aircraft Wing. Under control of Company B's forward air controller (FAC), EA-6B Prowlers jammed Iraqi ground surveillance radars as soon as the raid force entered a radar capabilities fan and continued jamming until the raid was complete. F/A-18, AV-8B, and A-6E strike aircraft were on call to provide support if the raid force ran into trouble and to attack certain targets in coordination with the artillery when it was appropriate. The F/A-18s were exceptionally valuable in a later raid as we refined concepts and devised more innovative methods.<sup>16</sup>

The need for additional support elements was apparent due to the nature of the operation, and the great distances the raid force

would have to travel. The raid force needed heavy equipment transport (HET) trucks to move the M109A3 and M110A1 howitzers to the final raid assembly area near Al Qaraah. To assist in navigation under conditions of darkness, the raid force used the hand-held Rockwell global positioning system (GPS), capable of providing 10 meter location accuracy by tracking up to 16 navigational satellites. Figure 6 depicts the final task organization for the raid force.

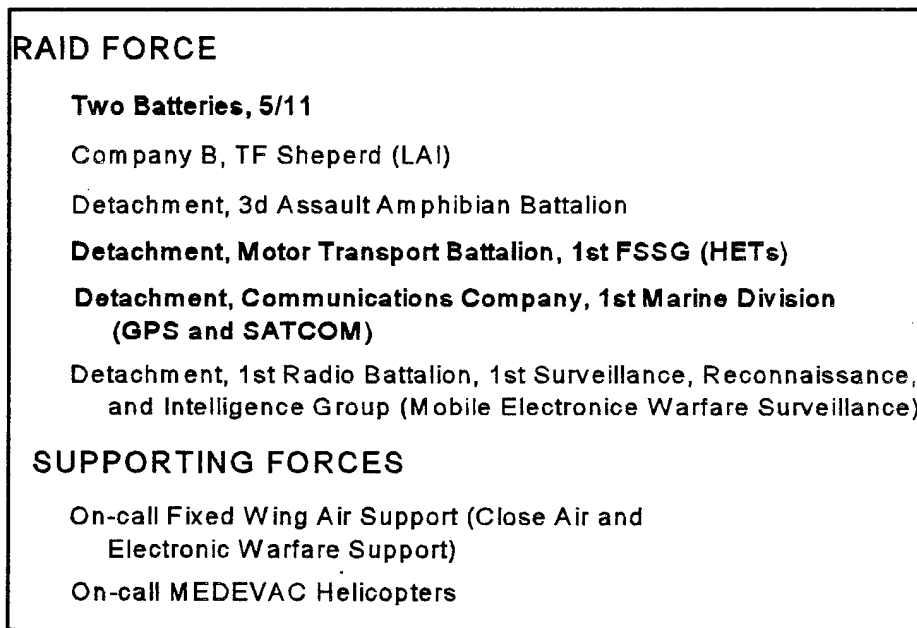


Figure 6. 5/11 Artillery Raid Force Organization.

On 18 January 1991, the raid force moved from their battalion position 30 kilometers south of Safaniya to the final raid assembly area near Al Qaraah, approximately 25 kilometers south of the border with Kuwait (see Figure 7). The raid force moved into revetments built by Seabees. Final coordination was made with Bravo Company, Task Force Shepherd, and the raid force waited for its first mission, which came on 23 January.

Raid 1: The Police Post at Qalamat Al Manaqish. The target for this raid was an Iraqi infantry brigade command post near Qalamat Al Manaqish. The M109A3 battery (Battery S) and one battery of M198s (Battery Q) moved to the firing position after midnight, with Bravo Company providing a screen. The batteries occupied, laid their howitzers, and began firing their mission to destroy the Iraqi command post at approximately 0053 hours.

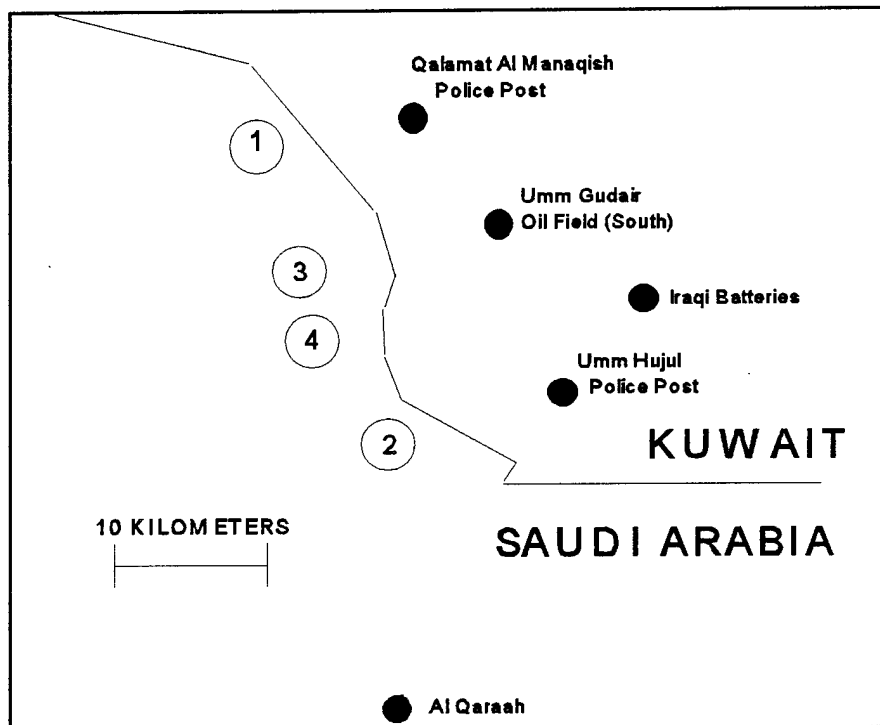


Figure 7. 5/11 Artillery Raid Operational Area.

Battery Q had the mission of firing on any enemy activity detected near the Battery S's location. Once Battery S began firing, a forward observer posted on the berm at the border spotted enemy activity, and adjusted Battery Q's rounds onto the target. One of the Iraqi vehicles receiving Battery Q's fires wandered into the area where Company B was screening, and was destroyed by machine gun fire.

The mission was aborted when Battery S began receiving mortar fire near the friendly side of the berm. As the battery withdrew, Company B's FAC called in two F/A-18s with Rockeye bombs on the brigade command post and the enemy activity. The mission was a success, and it was aborted as soon as friendly assets were put at risk of enemy counterbattery fire. Protection of the force was critical to the ability to conduct additional raids and to participate in the upcoming ground campaign.

Raid 2: The Police Post at Umm Hujul.

This was not really an artillery raid but an LAI raid with artillery in direct support, or as it came to be known, the "drive by shooting." The same division fragmentary order that established the 5/11 as the raid force also tasked 5/11 to be prepared to support TF Shepherd in any raids it might execute. The raid on the police post at Umm Hujul was such a raid. Considerable Iraqi activity had been noted near the police post, and the raid was intended to disrupt enemy activity, spoil his intelligence gathering efforts, and discourage any further buildup in the area. The concept was very simple. TF Shepherd slipped up to the border and fired on the police post with mortar and 25mm cannons while 5/11 isolated the objective area by firing on an enemy position behind a low ridge line just to the east of the post. The police post was heavily damaged, and the raid force received no return fire from the Iraqis.

Raid 3: Signals Intelligence Site near Umm Gudair. The target for this raid was Iraqi signals intelligence and ground surveillance radars near the Umm Gudair oil fields. Two firing batteries were involved in the mission; Battery T (the M110A1 unit) and Battery Q (an M198 unit). The M110A1 unit was selected because it had a greater range (22,500 meters vs 17,500 meters) when firing dual purpose improved conventional munitions (DPICM).

This mission was similar to the first raid, with EA-6Bs used to jam the enemy ground surveillance radars and counterbattery systems. The Iraqis were unable to use their sound ranging radar systems to acquire

the friendly artillery units. Therefore, there was no counterbattery received by the raid force. The Marines began to suspect that the Iraqis could only spot friendly firing with visual means through forward observers in frontline trenches.

Raid 4: Iraqi Batteries. The target for this raid was two Iraqi artillery batteries. The two M198 batteries (Q and R) were given this mission, and moved out under the cover of an LAI screen provided by Company B. This mission was different than the first three, because the plan was to stay in position long enough to tempt the Iraqis to fire counterfire so the F/A-18s could attack. Also, there was no jamming provided by the EA-6Bs. In other words, the raid force wanted the Iraqis to know they were nearby, allow the Iraqis to acquire them, and destroy them with airpower and artillery fire.

Soon after the friendly artillery began firing, the raid force saw the enemy artillery returning counterfire. It appeared to be enemy multiple rocket launchers (MRLs). The airborne FAC called in the F/A-18s, and within seconds of their firing, the Iraqis were devastated by Rockeye bombs.

The fourth raid proved to be the last, because on 10 February the raid force was recalled to their battalion assembly areas. The raids accomplished their overall mission of demoralizing the Iraqis and deceiving the enemy as to the location of the coming ground attack. These raids can be a model for the future force, because there is "no doubt that during Operation Desert Storm the previously insignificant artillery raid became a very significant combat multiplier."<sup>18</sup>

### Significance of Case Study Two

Field artillery units will no longer simply provide fires only in support of maneuver units in the future. The 5/11 case study shows that artillery can perform important tactical missions when supported by other forces. There may be tasks to perform that are particularly suited for field artillery as the primary means of combat power. The current four standard tactical missions would be inadequate in this type of situation. The artillery was not supporting a maneuver force, it was being supported by maneuver and Marine air power elements.

With the increased range, maneuverability, and survivability of future systems such as the Crusader howitzer, the artillery raid is becoming a more realistic tactic for units other than air assault forces. Improved situational awareness will allow the force commander to task organize his forces and tailor them to meet the requirements of the mission.

It is important for Army leaders to think about innovative solutions for Force XXI. An artillery raid force supported by joint forces could be given the mission of striking deep into enemy territory to destroy, delay, or disrupt key high payoff targets. This type of mission would serve to protect the force by shaping the deep fight and not allowing the enemy to close with friendly forces. Fires will now employ standoff as a basic tactic because technology will allow the commander to acquire and shoot targets at much greater ranges and with improved lethality.

### Interview Results

This portion of the thesis examines the results of interviews with senior Army leaders concerning field artillery Force XXI issues.

The discussion focuses on the key topics posed to these leaders during informal oral and written interviews. The purpose was to identify trends that will have an impact on how field artillery can be organized, trained, and employed on the Force XXI battlefield. The comments are not attributable to any one source; they are a synthesis of the ideas given by each interviewee.

TOPIC: What role does the field artillery have in Force XXI?

The U.S. Army force structure is not organized in the same manner as it was during Operation Desert Storm. The Army will continue to downsize it's forces until it reaches the 10 division forces proposed for the final structure. With the current national security strategy that focuses on two nearly simultaneous regional conflicts, and units involved in OOTW, it is clear that the future force will have to "do more with less."

It is probable that fewer resources will require the U.S. Army to prepare to fight future warfare based on the principle of war "economy of force." FM 100-5 explains economy of force in the following manner:

Economy of force is the judicious employment and distribution of forces. No part of the force should ever be left without purpose. When the time comes for action, all parts must act. The allocation of available combat power to such tasks as limited attacks, defense, delays, deception, and even retrograde operations is measured in order to achieve mass elsewhere at the decisive point and time on the battlefield.<sup>19</sup>

In Force XXI, every combat operation will become an economy of force effort where the commander must package the right amount of forces to accomplish the mission. This will require the field artillery to be given tactical missions that are adapted to the purpose of the force as a whole.

The adaptive artillery force is necessary to provide the optimum fires to accomplish each task. In the past, the field artillery standard tactical missions allowed the flexibility to mass combat power everywhere on the battlefield, because we did not have the technology to know where combat units needed to mass in a timely manner. Therefore, our structure and tactical missions allowed the ability to mass everywhere, creating redundancy that is not necessary or possible in the future.

The future technology that will allow a shared situational awareness will give all commanders a common picture of the battlefield. This will lead to the maneuver commander being able to make rapid tactical decisions that will result in optimum execution: getting the right combat power, to the correct point on the battlefield, at the right time, to accomplish the given task. The maneuver commander will be able to use his limited assets to accomplish unified execution in which every element of combat power is focused on the specific task and purpose of the operation.

Some combat tasks in the future may lead to situations where the term "maneuver commander" is no longer applicable, and the use of the term "force commander" is appropriate. There may be tasks that are so critical to the overall success of the operation that an armored or infantry unit will support a field artillery unit. The commander responsible for accomplishing the task is the supported commander; all other commanders assisting are the supporting commanders. The example of artillery raids in Operation Desert Storm provide a clear understanding that this type of mission is possible in the future. With

increased range and lethality of field artillery systems, this situation is even more probable.

The field artillery of Force XXI will support the force with two basic types of fires. The first type is protection fires which are fires that facilitate the maneuver of elements in accomplishing their task. For example, a field artillery unit may provide protection fires to silence enemy artillery units that are firing on an infantry unit maneuvering to their objective. The second type are fires to accomplish the mission. These are fires that significantly contribute to the success of the mission of the force as a whole. These fires can be lethal or non-lethal (such as electronic warfare). The lethality that the field artillery brings to the battlefield will play an important role in supporting the future force.

TOPIC: Do the field artillery standard tactical missions need to change because of the U.S. Army's evolution to Force XXI?

After examination of the case studies and interviews it is apparent that the four standard tactical missions are inadequate for the future force. They are based on the assumption that fires support maneuver and other activities when in reality fires can shape the battlefield for success in other missions. The Field Artillery School is studying the fires paradigm for the information dominant force and proposes some basic changes to doctrinal terms.

Fires refers to the act of applying firepower by ground, sea, and aerial platforms. It includes all line-of-sight and non-line-of-sight systems delivering lethal or non lethal fires. This concept applies to the full range of military operations. The term fire support is not used in this new paradigm. Fire support was derived from a 20th century notion that as much as possible we wanted to have the ability to provides indirect fires to support the whole force across the whole battlespace. Fire support also implied that fires always supported other activities. The premise of information operations and shared situational awareness is that we can determine

where we need fires and when we need them much more efficiently. In addition adaptive forces will be much more flexible, providing fires where they are needed . . . and not necessarily always in support of other activities. Rather, adaptive forces will be able to engage the enemy in many different ways . . . sometimes fires will support other activities . . . in other instances<sup>20</sup> other activities will support fires as the primary activity.

The current four standard tactical missions allocate field artillery resources, but do not adequately address the intent for fires. Missions given to field artillery units must reflect the task and purpose of the fires, which is tied to the commanders intent, concept of the operation, and scheme of maneuver.

One possible way of ensuring that field artillery units are given a proper mission is to issue a mission oriented task and purpose (MOTP). Issuing this type of order would ensure that supporting field artillery unit fires are tied to the maneuver task and purpose for the mission. In those cases when the field artillery unit is operating in a supported role, the MOTP would provide the basis for issuing missions to the supporting commanders.

The key to ensuring the MOTP process works is the integration of multiple tasks that may conflict with one another. For example, a unit may provide protection fires for one force while at the same time providing deep fires to shape the close battle. The problem can be overcome only through the application of superior information technology that allows the commander to synchronize all activities early in the planning process. In Force XXI, this superior information technology will be a reality.

This thesis proposes several categories of mission oriented task and purpose statements for use in the future. Many of these terms are found in current Army doctrine for maneuver task and purpose

statements, and have application for field artillery units in the future. The commander must link each mission oriented task with a purpose that provides a clear connection to the force commander's intent for the operation. The purpose is a critical element because the method and endstate for each mission are derived based on the purpose of the task.

Mission Oriented Tasks. The force commander is responsible for assigning fire tasks to his subordinate units or for requesting support to accomplish fire tasks from his higher headquarters. The fire tasks are grouped into two categories: fires that protect the force, and fires that accomplish the mission. The source for these tasks is an unpublished information paper written by LTC James J. Carafano, chief of Task Force 2000 at Fort Sill.<sup>21</sup>

Protect the Force Fire Tasks. These are fire tasks designed to assist commanders in accomplishing maneuver, sustainment, information operations, and protection.

1. Close support fires: Lethal or non lethal fires to support the maneuver and protection of ground forces in contact from attack by mounted and dismounted platforms.

2. Suppression of enemy air defense (SEAD): Lethal or non lethal fires to support the maneuver and protection of aerial forces in contact from attack by aerial, mounted, or dismounted platforms.

3. Air defense: Lethal or non lethal fires to support the maneuver and protection of forces in contact from attack by aerial or space based platforms.

4. Deep fires: Lethal or non lethal fires to support the maneuver and protection of forces not in contact from attack by mounted, dismounted, or aerial platforms.

Accomplish the Mission Fire Tasks. These are fire tasks designed to assist the overall force commander in accomplishing his critical tasks on the battlefield.

1. Destruction of enemy air defense: Lethal or non lethal fires that attack the capabilities of air defense units.

2. Counterfire: Lethal or non lethal fires that attack the capabilities of the enemy to conduct indirect fire operations.

3. Strike: Lethal fires that attack an enemy's ability to maneuver, deliver fires, or protect and sustain by the physical destruction of aerial, mounted, and dismounted systems.

4. Information Operations: Lethal or non lethal fires that attack the capabilities of the enemy to make decisions and enhances friendly commanders ability to gain information.

Mission Oriented Purposes. The source for these missions is a pamphlet published by the U.S. Army Field Artillery School, entitled Battlefield Operating Systems, published in September 1990. The terms are found on pages 84-85, and are direct quotations from that pamphlet.<sup>22</sup>

1. Destroy: To physically disable the majority of enemy vehicles and to kill the majority of enemy soldiers. The focus is on the physical and moral destruction of the enemy to deny him the ability and will to fight as a unit.

2. Neutralize: To render enemy personnel or material incapable of interfering with a particular operation.

3. Suppress: Direct and indirect fires, electronic countermeasures or smoke brought to bear on enemy personnel, weapons, or equipment to prevent effective fire on friendly forces.

4. Disrupt: To counter the enemy's initiative and synchronization to prevent him from concentrating overwhelming combat power.

5. Fix: Actions taken to prevent the enemy from moving any part of his forces from a specific location and/or for a specific period of time by holding or surrounding them to prevent their withdrawal for use elsewhere.

6. Interdict: To isolate or seal off an area by any means; to deny use of a route or approach; to prevent, hinder, or delay the use of an area or route by enemy forces.

7. Deny: A task where it is not necessary to prevent every enemy unit from entering or passing through an area, but where constant pressure is maintained on any that do.

8. Contain: To restrict enemy movement by stopping, holding, or surrounding his forces or causing them to center their activity on a given front to prevent the movement of any part of his forces for use elsewhere. The limits of the containment may be expressed in terms of geography or time.

9. Block: A mission assigned to a unit which requires it to deny the enemy access to a given area or to prevent enemy advance in a given direction. It may be for a specified time. Units assigned this mission may have to retain terrain and accept decisive engagement.

10. Canalize: To restrict operations to a narrow zone by use of existing or reinforcing obstacles or by direct or indirect fires.

Unfortunately, these mission oriented purposes are not appropriate to every situation for artillery units. The Field Artillery School has proposed six fire task purposes that may serve to define the mission assigned each field artillery unit.<sup>23</sup>

1. Destroy: To eliminate a force's ability to accomplish any doctrinal mission by physical destruction.

2. Limit: To prevent an enemy force from conducting an activity. The purpose must specify the limitation in relation to time and space. Limitations can extend to the duration of the operation, effectively eliminating a force's ability to accomplish an assigned mission or task. The purpose statement must specify the mission or task that must be limited.

3. Divert: To influence a force to change a course of action or an enemy capability to change a task.

4. Delay: To slow the tempo of an enemy force or activity. The purpose statement must specify the delay required in terms of time and space.

5. Disrupt: To interfere with an enemy force's ability to accomplish a task. The purpose statement must specify what degradation of enemy capability is required.

6. Suppress: To prevent an enemy action that will interfere with the maneuver or protection of friendly forces in contact.

#### Analysis of Suitability of Mission Oriented Tasks and Purposes

The MOTP listed above merit further study to determine their suitability for field artillery units. To be suitable, the tasks must meet two basic criteria. They must be flexible and versatile to the needs of the future force. They must also be applicable to the two

standard types of fires that field artillery units will employ in the future: protection fires and fires to accomplish the mission.

There are several purposes contained in the first list that are more suited for maneuver forces, because they imply the necessity of seizing, holding, or retaining ground. Field artillery units are not capable of using fires for this purpose. Several ways in which field artillery units could support this purpose are contained in the second list. The following purposes are eliminated based on this criteria: fix, deny, contain, block, and canalize. Elimination of these leaves eight basic purposes for further study.

One way to determine if the eight mission oriented purposes meet the basic requirements is to compare each against a particular enemy capability that field artillery units might provides fires against. The following paragraphs provide a discussion of each purpose, and give a sample task and purpose statement for each.

Destroy. Field artillery units can destroy targets using a variety of systems and munitions. The destruction mission may require expenditure of a large amount of ammunition, and is probably best used against a small enemy formation or targets with particular vulnerabilities. Artillery fires can destroy such targets as command and control (enemy command posts), air defense sites, logistics installations (ammunition or petroleum storage), and concentrations of enemy vehicles (assembly area). A sample task and purpose statement may be: 2-45 FA provides information operations fires to destroy the 23rd Motorized Rifle Regiment command post, disrupting the enemy's command and control capability and thereby denying him the use of his tactical reserve force.

Neutralize. Neutralization is a task that field artillery units can perform extremely well. The artillery can strike rapidly to render an enemy force incapable of influencing the battle against a friendly force. Artillery fires can neutralize such targets as air defense radar sites, field artillery target acquisition assets, and engineer assault crossing assets. A sample task and purpose statement may be: 2-45 FA provides close support fires to neutralize enemy target acquisition assets during the assault on Objective Taylor, protecting friendly fires assets as they support the assault.

Suppress. Artillery units can provide suppression fires against a variety of targets to prevent them from providing effective fires against friendly units. Artillery fires can suppress such targets as enemy air defense units, weapons firing platforms, and artillery units. A sample task and purpose statement may be: 2-45 FA provides SEAD fires to suppress enemy air defense sites operating near Engagement Area (EA) Red to protect the 12th Aviation Brigade's attack on EA Red.

Disrupt. Disruption of enemy units attempting to accomplish a mission can slow the tempo of the battle and allow friendly units the time to maneuver decisively. Artillery units can disrupt such targets as river crossing units, radio direction finding sites, and maneuver units moving through a chokepoint. A sample task and purpose statement may be: 2-45 FA provides strike fires to disrupt the 155th Assault Crossing Company as they attempt to establish crossing sites across the Zuger River, denying the 15th Tank Regiment use of secured bridgeheads along the river.

Interdict. Interdiction fires are effective against enemy maneuver or support units attempting to move through a constrictive

avenue of approach, occupy an assembly area, or escape from their defensive positions. A sample task and purpose statement may be: 2-45 FA provides deep fires to interdict the 148th Tank Regiment as it attempts to move through Highland Pass, sealing off their advance route, and facilitating their destruction by air interdiction sorties.

Limit. Field artillery units can provide lethal fires to limit an enemy force from conducting an activity that will affect a friendly scheme of maneuver or support function. Limiting the enemy for a specified time can buy space or time for friendly units to conduct maneuver or support activities. A sample task and purpose statement may be: 2-45 FA provides on-call counterfire to limit the enemy regimental artillery group for 20 minutes as Task Force Thunder breeches the enemy defensive obstacle belt vicinity Phase Line Phantom.

Divert. Field artillery units can provide fires to cause an enemy force to change their course of action on the battlefield. If this type of fire is incorporated into a deception plan designed to deceive the enemy commander, it can provide friendly forces with an opportunity to surprise the enemy. A sample task and purpose statement may be: 2-45 FA provides close support fires to divert the enemy counterattack into 2nd Brigade's zone (supporting attack), thereby causing the enemy force to expose his flank to 1st Brigade's main attack.

Delay. The force commander may find it desirable to delay the enemy force for a specified time in order to slow the rate of his operation. A sample task and purpose statement may be: 2-45 FA provides strike fires to delay the enemy second echelon regiment north

of Phase Line Phoenix, denying him the ability to maneuver his forces against the friendly attack on Objective Freedom.

These sample MOTP are not the only examples of the types of missions that field artillery units will receive in the future. However, they do show how a clearly stated task and purpose can support the overall force commander in the future information age force. Again, each MOTP must have a connection with the force commander's mission and intent in order to integrate fires into the overall tactical plan.

TOPIC: What is the present vision for Force XXI as defined by senior Army leaders?

The design of the future force is still being questioned by senior Army leaders. The division may or may not take the form of the Mobile Strike Force, since it is simply an experimental force designed to test the capabilities of future technology. The overall theme that will affect the future force is its design must facilitate modularity and adaptability. TRADOC intends to develop several possible models of the future force, and test them to see what works best.

The future division will be able to cover an expanded battle space due to technological advances and information ability. The division commander will allocate his resources and subordinate units will do the actual fighting. This will allow the division commander (or force commander) to monitor the battle using increased situational awareness, and reallocate assets as needed.

The divisional field artillery battalions will likely continue to be the principle fires asset supporting the division. However, the future force structure may lead to changes in the organization of field artillery units. Field artillery units may become organized more like

infantry and armor units to allow ease in maneuver and force packaging. The biggest impact on the future field artillery unit may be the changes brought about by technology. For example, the ability to have common situational awareness will decrease the amount of fire support coordination that is necessary before clearing and executing fires. This should lead to a reduction in the amount of time needed to process a fire mission from the time the target is identified to when the firing unit delivers the fires.

TOPIC: How will future doctrine developed for Force XXI modify the considerations used in assigning tactical missions to field artillery units?

The analysis of the MOTP presented above shows that the force commander's most important decision involves identification of the critical tasks in the operation. Therefore, the five fundamentals of organizing field artillery for combat may change because the force commander will focus all of his resources around the critical tasks. The two concepts that will be important in the future are depth and simultaneous attack, and asymmetrical engagements.

Depth and simultaneous attack refers to the ability of friendly forces to acquire and engage targets throughout the depth and breadth of the battlefield in a rapid manner. The Depth and Simultaneous Battle Lab at Fort Sill is the TRADOC proponent for this mission, and has one core initiative: "reducing the sensor-to-shooter time line to allow precision targeting of short-dwell and moving targets."<sup>24</sup>

Asymmetrical engagements is the attack of enemy systems with dissimilar friendly systems. In the future this will be possible due to technological advances, and is desirable because of the flexibility it gives the force commander. For example, tanks may engage field

artillery, attack aviation may engage field artillery, and field artillery may engage tank formations. This concept is not new to the way the Army fights, but is more deadly to the enemy in the future due to the increased lethality of U.S. weapon systems and munitions.

TOPIC: Will technological advances provide field artillery units with new capabilities that impact on their employment within a Force XXI context?

Technological advances in the future field artillery force will bring new capabilities to the Force XXI battlefield. The innovations are in two broad categories: equipment and munitions. The following paragraphs summarize a few of the technological advances that will enhance the employment of the field artillery on future battlefields. The source for this information is a briefing packet provided by the Directorate of Combat Developments at Fort Sill.<sup>25</sup>

The Crusader howitzer features a maximum range of 40-50 kilometers, fully automated ammunition handling, on board navigation capabilities, and liquid propellant technology. The Crusader howitzer also provides enhanced survivability for the crew and improved mobility equal to that of maneuver forces. The howitzer will be able to fire 10-12 rounds per minute, giving it the capability of firing a mission and achieving simultaneous impact of 4 to 8 rounds on one target. The Crusader will change the way field artillery provides large volumes of fires on target by massing effects with fewer howitzers than the traditional means of firing entire battalions.

The Army Tactical Missile System (ATACMS) is undergoing several product improvement. ATACMS Block I is an improved missile, capable of firing from an MLRS launcher, and is designed to attack targets at ranges up to 165 kilometers. The program is fully funded and complete

fielding of the missile is expected to be completed by fiscal year 1997. ATACMS Block I will give the force commander an important deep strike capability against soft, stationary targets until the fielding of ATAMCS Block Ia.

ATACMS Block Ia is designed to attack targets at operational ranges up to 300 kilometers. The missile contains a Global Positioning System augmented guidance system, giving it increased accuracy on target. It is designed to defeat soft, stationary targets such as command and control facilities, air defense sites, and logistics storage areas. When the initial fielding begins in fiscal year 98, ATACMS Block Ia will give the force commander the ability to strike targets at greater depth that has never been possible with tactical ground based forces.

Future planned ATACMS upgrades (Block II and IIa) will feature the Brilliant Antiarmor Submunition (BAT). BAT is a dual mode (acoustic and infrared) submunition designed to defeat moving armored vehicles.

The BAT system supports the Army's deep fires doctrine, which calls for the destruction and disruption of threat forces and long-range weapons at ranges in excess of 100 kilometers before they can influence the battle. In the past, the only options have been to engage these targets with attack helicopters or fixed wing aircraft. While effective, these options place critical resources and their aircrews at risk. The BAT system significantly reduces this risk through its autonomous acquisition and terminal guidance capabilities to attack well-defended, high-value targets deep behind enemy lines.<sup>26</sup>

Sense and Destroy Armor (SADARM) is a fire-and-forget, sensor equipped submunition designed to detect and destroy armored vehicles, primarily self-propelled howitzers. When fired using either the 155mm howitzer, the submunitions dispense over the target area. Using dual mode millimeter-wave and infrared sensors, the submunition descends by parachute, detects the target, and fires an explosively formed

penetrator through the top of the target. SADARM development is possible for the MLRS, but is not currently approved. This technology will give the force commander a lethal munition to fire counterbattery against enemy artillery.

There is no doubt that future weapons and munitions will greatly increase the field artillery's lethality and survivability on the Force XXI battlefield. The ability to strike deep and avoid the close fight is an important force protection consideration. The force commander will have many important "tools in his tool box" to integrate into his battle plan. This chapter analyzes and demonstrates how the field artillery will continue to be a powerful combat multiplier today and in the future. Chapter Five presents the conclusions and recommendations based on this analysis.

### Endnotes

<sup>1</sup>U.S. Army, Force XXI: America's Army of the 21st Century (Washington, D.C.: U.S. Government Printing Office, 15 January 1995), 11.

<sup>2</sup>Ibid., 11.

<sup>3</sup>David H. Ohle, "The Campaign Plan," Army (February 1995): 19.

<sup>4</sup>Ibid., 14.

<sup>5</sup>U.S. Army, TRADOC Pamphlet 525-5, Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-first Century (Washington D.C.: U.S. Government Printing Office, 1 August 1994), 3-3.

<sup>6</sup>John A. Dubia, "Force XXI and the Field Artillery: State of the Branch 1994," Field Artillery (December 1994): 3.

<sup>7</sup>U.S. Army, Force XXI, 17.

<sup>8</sup>Timothy J. Bailey et al., Technical Memorandum TRAC-TD-0194, Mobile Strike Force 2010 (HQ, TRADOC Analysis Center: Fort Leavenworth, KS), 23 September 1994), 1.

<sup>9</sup>Ibid., 5.

<sup>10</sup>Ibid., 15.

<sup>11</sup>Ibid., 17.

<sup>12</sup>Fred F. Marty, "FA on Target in the Storm," Field Artillery (October 1991): 1.

<sup>13</sup>Patrecia Slayden Hollis, "The Army and FA Challenges of Designing Force XXI," Field Artillery (December 1994): 9.

<sup>14</sup>U.S. Army, Field Manual 6-50, Tactics, Techniques, and Procedures for The Field Artillery Cannon Battery (Washington D.C.: U.S. Government Printing Office, 20 November 1990), F-5.

<sup>15</sup>James L. Sachtleben, "Artillery Raids in Southwestern Kuwait," Field Artillery (October 1991): 25.

<sup>16</sup>Ibid., 27.

<sup>17</sup>Ibid., 28.

<sup>18</sup>Ibid., 29.

<sup>19</sup>U.S. Army, Field Manual 100-5, Operations (Washington D.C.: U.S. Government Printing Office, 14 June 1993), 2-5.

<sup>20</sup>James J. Carafano, "A Fires Paradigm for an Information Dominant Force," (Unpublished information paper, Fort Sill, OK, 1995), 2.

<sup>21</sup>Ibid., 4.

<sup>22</sup>U.S. Army Field Artillery School, Battlefield Operating Systems (Fort Sill, OK, September 1990), 84-5.

<sup>23</sup>Carafano, 4.

<sup>24</sup>Larry G. Lehowicz, "Determining Future Requirements," Looking to the Future, TRADOC's 20th Anniversary Seminar on Future Warfare (Washington D.C.: U.S. Government Printing Office, 1994): 56.

<sup>25</sup>U.S. Army Field Artillery School, Directorate of Combat Developments, "Force Modernization Briefing," (Fort Sill, OK, 6 March 1995).

<sup>26</sup>"Army Weaponry and Equipment," Army: 1994-95 Green Book (Arlington, VA: Association of the United States Army, October 1994): 282.

## CHAPTER FIVE

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

The field artillery community must rethink the way it assigns tactical missions to field artillery units. The Army is moving towards Force XXI with "a comprehensive approach to redesign the force, organized around information, to be inherently more versatile and flexible,"<sup>1</sup> and the field artillery must move with the rest of the force. Information technology will allow the future force to maneuver faster and mass the effects of fires more efficiently. The Force XXI commander must use his assets to exploit information technology and integrate field artillery into his overall fires plan. Future field artillery units must use tactical missions that are as versatile and flexible as the force for which they will provide fires. The conclusions in this section are organized around the three areas mentioned in Chapter One as being the keys to the future of change to the field artillery standard tactical missions: doctrine, modern equipment, and force mix.

Doctrine. It is too early in the doctrinal revision process to say that the four field artillery standard tactical missions should be eliminated in favor of a new approach. The current four standard tactical missions allocate field artillery resources, but do not adequately address the intent for fires. Tactical missions given to field artillery units must reflect the task and purpose of the fires.

This shortfall in current doctrine requires a fresh approach in order to solve the problem.

As outlined in Chapter Four of this thesis, the best method of ensuring that field artillery units are given a proper mission is to issue a mission oriented task and purpose (MOTP). A clear, concise intent for fires from the maneuver commander to his supporting fire support is essential for this to work. Issuing this type of order would ensure that supporting field artillery unit fires are tied to the maneuver task and purpose for the mission. In those cases when the field artillery unit is operating in a supported role, the MOTP would provide the basis for issuing missions to the supporting commanders.

Modern Equipment. No one can predict with certainty what the future force structure will look like. What is probable is that if the Army is able to procure the necessary equipment and technology, it will exploit it and attempt to achieve decisive victories in the next century. One area of concern that came to light from this research is the impact of research & development constraints and budget limitations on the ability to field the necessary future technology. What will be the impact on the field artillery and Force XXI if the Army is not able to acquire the future information technology and weapon systems that Force XXI requires?

Force XXI will rely heavily on the ability to use information technology to provide a common situational awareness on the battlefield. One way the Army will accomplish this by the application of information age technologies across existing weapon systems, through a program known as Horizontal Technology Insertion (HTI). HTI is only an interim measure; integration of digital technology in future command and control

systems and weapon platforms will change the way the Army gathers, processes, and disseminates battlefield information. The Crusader howitzer is an example of a future weapon system that features this type of technology. While the Army will be more effective in the near term by using HTI, without new weapon systems this will leave the Army equipped with nothing more than 20-30 year old equipment upgraded with digital technology. The future of Force XXI depends on the ability of the Army to procure the necessary systems to transform completely into an information age force.

The equipment forecasted for use on the Force XXI battlefield shows that the Army will be able to engage targets at a much greater depth than in the past. Engaging deep targets will allow the force commander to shape the battlefield and kill the enemy before he can influence the close fight. Field artillery plays an important role in the deep fight, even more so with the fielding of future systems such as the Crusader howitzer, ATACMS upgrades, and the UAV. The deep fight is critical, because no Army wants to engage in attrition warfare where two equal forces engage in direct fire exchanges in the close battle. Again, the development and fielding of future field artillery systems will be critical to avoiding this costly type of warfare in Force XXI.

Some critics argue that budget constraints will defeat the Force XXI initiative.

Equipping the Army for Force XXI will be the toughest challenge we face as we make the transition to the 21st century Army because equipping requires near term, sustained investment for a payoff that will not occur for five to ten years. However, our near term resources are constrained, and we continue to be an incredibly busy Army.<sup>2</sup>

Compounding the problem is the fact that the Army already has some of the best military equipment in the world, and the belief that the Army

does not need new technology as much as the other services do. To overcome these problems, the Army must continue to define its roles and missions, and aggressively seek increases to resource its modernization effort.

Another area of concern for the future is the actual vision for Force XXI. Since the senior Army leadership changes periodically, what will happen if the vision for Force XXI is no longer advocated by senior leaders? The answer to this question is not clear, but it is probable that the Army would continue to modernize the force within the fiscal constraints imposed by the budget.

Force Mix. Force XXI envisions an Army structure that is versatile and tailorable to meet the demands of a variety of missions. The proposed active Army structure will contain 10 divisions, which should be suitable to meet the nation's future land combat needs. The ability to determine an optimum force mix will depend heavily on the continuation of Advanced Warfighting Experiments (AWEs) such as the Exercise Prairie Warrior mentioned in Chapter Four. The Mobile Strike Force (MSF) concept is one example of how the Army is experimenting with the future force mix problem to provide a modular, tailorable force to fight the information age battle.

#### Recommendations

This section will extrapolate the information contained in the conclusions and discuss its applicability for the future. The data is organized in the three key areas used in the conclusions section. This section will also provide recommendations for areas that need additional study that were discovered during the research for this thesis.

Doctrine. The field artillery community should experiment with the MOTP process to see if it adequately addresses the intent for field artillery fires. The best place to experiment is during the conduct of the Army's AWEs such as Exercise Prairie Warrior. Another opportunity to test this concept is with the Task Force AWE in 1997, which will experiment with a brigade from the 2nd Armored Division. The brigade will be digitally equipped and trained and organized to fight with the latest information age technology. These AWEs will test the validity and usefulness of the MOTP statement in providing a focus for field artillery fires of the future.

Modern Equipment. Some of the equipment that is needed for the Force XXI battlefield is being fielded within the next few years. The Army must continue to integrate this new equipment into the current force structure to remain combat ready for "today's fight." At the same time, Army leaders must evaluate the possible impact of a loss in budget on the Force XXI initiative.

Force Mix. The field artillery should experiment with the structure of artillery organizations to prepare for the modular force packaging requirements of Force XXI. One way to do this is to use a composite battalion that would consist of different caliber weapon systems within a battalion or division artillery organization. The logistical requirements of this arrangement would be difficult, but it is a challenge for the future that must be addressed now.

The challenge for the entire Army will be the structuring of a force that is modular and being able to train with it in peacetime. There is no post in the active Army that has all of the equipment and personnel to bring together the force mix that would equate to the

modular concept of a division sized Mobile Strike Force. As the Army moves towards the Task Force AWE in 1997, and the division and corps experiments in later years, they must ensure that different organizations are used to truly test the concept of bringing together different type units to fight on the Force XXI battlefield.

Areas for Additional Study. There are some additional areas that need further study as a result of this preliminary research.

1. The Army faces another tough challenge as it attempts to build a future force based on the concept of unified combat power with tailorable modular forces. The leadership challenge will be the ability of the force commander to build a cohesive fighting force with units that have never trained together in peacetime. Successful combat has always been predicated on the soldier's basic human need to have confidence in the fighting ability of his comrades in arms.

Men who have been in battle know from first-hand experience that when the chips are down, a man fights to help the man next to him, just as a company fights to keep pace with its flanks. Things have to be that simple. An ideal does not become tangible at the moment of firing a volley or charging a hill. When the hard and momentary choice is life or death, the words once heard at an orientation lecture are clean forgot [sic], but the presence of a well-loved comrade is unforgettable.

Army commanders attempt to build effective fighting units by fostering cohesion, unity of action, and esprit de corps at all levels of their command. Commanders of the future must pay attention to the increased need to build a cohesive unit if the modular force concept is to fight as a truly unified combat team. A clearly communicated vision and commander's intent can assist in this endeavor. The leadership implications of future warfare is an area that demands additional research.

2. Fire support coordination procedures will drastically change in Force XXI. Information technology will streamline the process of clearing fires to avoid fratricide. Task Force 2000 at Fort Sill is studying this problem, but it requires further evaluation for inclusion in future Army doctrine and as revisions to joint fires doctrine. Coordination and control of fires on the Force XXI battlefield is made easier by the advent of information age technology, but it is just as important as it always was from a force protection viewpoint.

3. This thesis provides a good basis for discussion about the possible revision of standard tactical missions. However, the analysis only included two case studies and interviews with senior artillery leaders. One area for future study could include an analysis of other case studies, or the organization for combat procedures of the military forces of other countries. This would shed additional light on the research question of this thesis, and provide further information for doctrine writers who will eventually need to revise the current field artillery doctrine for use in the future.

The Force XXI initiative will bring the Army closer to realizing the vision of fighting the twenty-first century war in the information age. This thesis is based on the author's belief that the concepts of Force XXI will continue, and make their way into emerging Army doctrine. However, the findings of this thesis are relevant even if Force XXI does not become the future doctrine for the Army, because there is still be a need for a clear task and purpose to be associated with each artillery mission.

Endnotes

<sup>1</sup>Gordon R. Sullivan, "America's Army: Focusing on the Future," Army: 1994-95 Green Book (October 1994): 23.

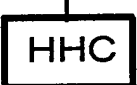
<sup>2</sup>William H. Forster, "The Toughest Challenge We Face," Army, (February 1995): 31.

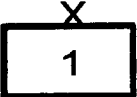
<sup>3</sup>S.L.A. Marshall, Men Against Fire: The Problem of Battle Command in Future War (Gloucester, MA: Peter Smith, 1978), 161.


APPENDIX A  
MILITARY SYMBOLS

This appendix provides a guide to the military symbols used in Chapter Four of the thesis. The reference for these symbols is FM 101-5-1, Operational Terms and Symbols.


  
MOBILE STRIKE FORCE HQs

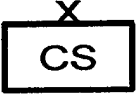
  
HQs & HQs COMPANY


  
1ST BRIGADE, MSF

  
AVIATION BRIGADE

  
ARMORED BATTALION (2)


  
SIGNAL BATTALION

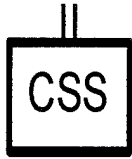
  
COMBAT SUPPORT BRIGADE

  
ARMORED CAVALRY SQUADRON (2)

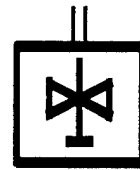
  
FIELD ARTILLERY BATTALION, SP

  
ENGINEER BATTALION

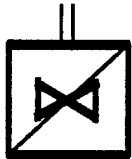
  
SUPPORT BATTALION



COMBAT SERVICE SUPPORT BN



LIFT HELICOPTER BN



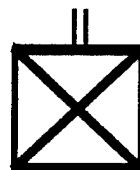
AIR CAVALRY SQUADRON



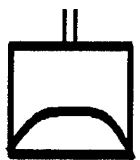
MECHANIZED INFANTRY BN (2)



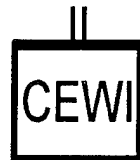
MLRS BATTALION



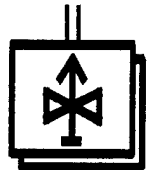
INFANTRY BATTALION



AIR DEFENSE ARTILLERY BN



MILITARY INTELLIGENCE BN



ATTACK HELICOPTER BN (2)



AVIATION BN, GS

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Carafano, James J. "A Fires Paradigm for an Information Dominant Force." Information Paper, US Army Field Artillery School, 1995.

\_\_\_\_\_. "Vision 2020." Briefing Package, US Army Field Artillery School, 1994.

Directorate of Combat Developments, USAFACS. "Force Modernization Briefing." Briefing Package, US Army Field Artillery School, 6 March 1995.

McGraw, Donald C. Jr. MAJ. "When Non-Standard Missions Became Standard: Employing Field Artillery Brigades on the AirLand Battle-Future Battlefield." SAMS Monograph, US Army Command and General Staff College, 1990.

Stiles, Ed. "Field Artillery Organization for Combat." Briefing Package, US Army Field Artillery School, 1994.

#### Interviews

Author's interviews on video tapes and notes in his possession.

Brigadier General Leo J. Baxter  
Brigadier General Geoffrey D. Miller  
Lieutenant Colonel James J. Carafano

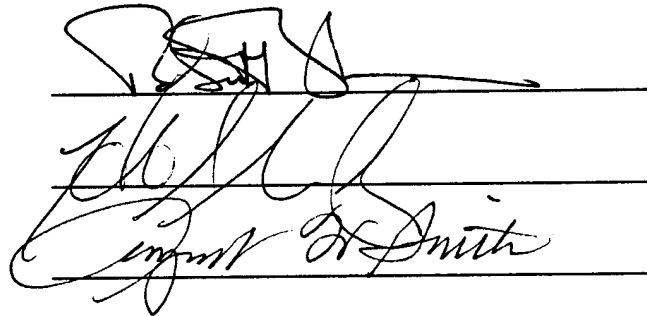
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