

OVERCOMING THE ODDS: HOW THE U.S. ARMY CAN ACHIEVE INDIRECT
FIRE SUPERIORITY IN A NEAR-PEER ENVIRONMENT

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MASTER OF MILITARY ART AND SCIENCE
Strategic Studies

by

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ABSTRACT

OVERCOMING THE ODDS: HOW THE US ARMY CAN ACHIEVE INDIRECT FIRE SUPERIORITY IN A NEAR-PEER ENVIRONMENT, by Major Glenn Walton, 114 pages.

This study researched a capability gap that has recently been addressed by numerous senior Army leaders: how can the U.S. Army mitigate the numerical and range superiority of Russian indirect fires systems in conventional combat? The research is conducted as an applied professional case study. It first explores the functional needs of U.S. forces facing Russian formations, and attempts to articulate the gap between capabilities and need. The research then compares professional articles, studies, theses and monographs on past, present and potential future techniques to mitigate or overcome the gap. The research focuses on doctrinal, organizational and leadership/ training solutions to the problem, which can be implemented at low or no cost. Recommendations are then filtered through the lens of three primary stakeholders in the U.S. Army: the Fires Center of Excellence, the U.S. Army Combat Training Centers and the Army Capabilities Integration Center. The interests, position and abilities of the stakeholders produces refined solutions that are suitable, feasible and acceptable for the stakeholders. The final recommendations provide warfighters at the tactical level with a short-term means to mitigate the current indirect fires capability gap in conventional combat.

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ACRONYMS

A2/AD	Anti-Access/ Area Denial
ARCIC	Army Capabilities Integration Center
AWA	Army Warfighting Assessment
AWC	Army Warfighting Challenge
AWG	Asymmetric Warfare Group
BCT	Brigade Combat Team
CALL	Center for Army Lessons Learned
CBA	Capabilities-Based Assessment
CDID	Capabilities Development and Integration Directorate
CTC	Combat Training Center
CTCD	Combat Training Center Directorate
DIA	Defense Intelligence Agency
DIVARTY	Division Artillery
DOTML PF	Doctrine, Organization, Training, Military, Leadership, Personnel, Facilities
EUCOM	European Command
EW	Electronic Warfare
FAA	Functional Area Analysis
FCoE	Fires Center of Excellence
FNA	Functional Needs Analysis
FSA	Functional Solutions Analysis
GAAT	Georgia-Armenia-Azerbaijan-Turkey region
HIMARS	High Mobility Artillery Rocket System

JCIDS	Joint Capability Integration and Development System
JFC	Joint Force Commander
JIM	Joint, Interagency and Multinational
JMC	Joint Modernization Command
JMRC	Joint Multinational Readiness Center
JRTC	Joint Readiness Training Center
MCTP	Mission Command Training Program
MLRS	Multiple Launch Rocket System
MMAS	Masters in Military Arts and Sciences
NATO	North Atlantic Treaty Organization
NTC	National Training Center
PBOK	Professional Body of Knowledge
SAMS	School of Advanced Military Studies
TRADOC	Training and Doctrine Command
TTP	Tactics, Techniques and Procedures
UAV/UAS	Unmanned Aerial Vehicle/Unmanned Aerial System
USAFA	United States Army Field Artillery

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CHAPTER 1

INTRODUCTION

And what is modern war? An interesting question, what does it requires. It requires mass artillery. In modern war, artillery is god, judging by artillery . . . The artillery decides the fate of the war.

—Joseph Stalin, 1940 Speech to Commanders

On August 8th, 2008, the Russian 58th Army launched a combined-arms assault on South Ossetia, Georgia. Their leaders called it a “peace enforcement operation,” and it was the first time in nearly twenty years the world saw the Russian Army conduct conventional combat operations. This placed the North Atlantic Treaty Organization on notice: the Russian Army was again capable of conducting effective ground conventional warfare. Six years later, they repeated the process in slightly more subtle fashion: “little green men,” occupied Crimea, followed shortly by the region’s government “voting,” to secede from the Ukraine. Russia declared this a protectorate, and established a military task force in the region in Mid-March of 2014. This force has been fighting Ukrainian military and insurgent forces in Crimea since.

Crimea has become a window into the resurgence of a new threat to the post-World War II international order. The U.S. Army’s Asymmetric Warfare Group (AWG) conducted a two-year-long study into the way Russia conducted this war, resulting in the publication of the Russian New Generation Warfare Study.¹ This document is one of many recent publications to explore the newfound potency of an old adversary. Russia’s re-emergence as a power capable of influencing geopolitical strategy has caught the

¹ Asymmetric Warfare Group (AWG), *Russian New Generation Warfare Handbook* (Washington, DC: Government Printing Office, 2016), ii.

attention of much of our nation's leadership, and rightly so. They are a nation with a military built to defeat the United States during the Cold War, and who still possesses a keen understanding of the American model for conducting warfare. They have studied the wars in Afghanistan, Iraq and Syria,² have re-imagined themselves as a force to be able to meet and defeat both the U.S. and NATO, and have shown frighteningly lethal capabilities in combat.

Consequently, Russia is now a well-deserved focal point for both U.S. and NATO defense policies. General Mark Milley, the U.S. Army Chief of Staff, said that Russia was, "literally, an existential threat," citing both the belligerent regional actions of Vladimir Putin and Russian military capabilities.³ "In terms of capability, Russia is the only country on earth that has the capability to destroy the United States of America," he noted on another occasion.⁴ Lieutenant General Joerge Vollmer, the German Chief of Defense, echoed those same sentiments earlier this year, citing the growing menace in the east as the greatest threat to NATO and European security.⁵ Over and over, western militaries point to Russia as they develop national defense policies.

At the same time, the United States accounts for the bulk of the western world's combat power and defense spending. Nearly 41 percent of the 3.92 million service

² AWG, *Russian New Generation Warfare Handbook*, ii.

³ General Mark Milley, "Part for peace but prepare for war" (lecture, Washington DC, October 2017), accessed November 1, 2017, <http://www.ausa.org>.

⁴ General Mark Milley, "Remarks delivered at Defense One Summit," November 2015.

⁵ Lieutenant General Joerge Vollmer, "Exercise Determined Effort Closing Remarks," December 2017.

members and women in NATO nations come from the U.S.⁶ The economic toll paid—though this does not account for GDP disparities—is even higher. U.S. efforts accounted for 68 percent of all defense expenditures for NATO nations in 2016.⁷ These statistics are not an indictment; instead, they reflect the enormity of the role the U.S. plays in global security, and in opposing the states who seek to revise the current world order.

Russia has long presented herself as one of these threats to international stability. A former superpower, whose military and diplomatic strength stood in direct opposition to the interests of the U.S., Russia remains a significant regional power that seeks to regain global influence. Today we see a nation that does not shy away from showing the world how they have rebuilt their military in impressive form. They are manning, equipping and training a capable force. On top of this, Russia is one of the largest exporters of not only military goods, but also of training and systems. The Russian model for executing modern warfare has evolved rapidly, and is proliferated aggressively with allied and client states.⁸ For these reasons, this study will use Russian systems, organizations and methodologies as a model for future high-intensity conflict.

A lasting balance is critical to ensuring the stability of the current world order. That stability is threatened by expansionist or revisionist powers that manifest in the form of a rogue dictatorship bent on increasing regional or global influence, as a former super

⁶ Headquarters, North Atlantic Treaty Organization (NATO), “Information on Defence Expenditures,” *NATO Newsroom*, March 15, 2018, accessed March 22, 2018, https://www.nato.int/cps/en/natohq/topics_49198.htm.

⁷ *Ibid.*

⁸ AWG, *Russian New Generation Warfare Handbook*, iv.

power working aggressively to rebuild the stature it once held, or even as a trans-national terrorist threat bent on destroying the western world. Accordingly, our allies rely on the U.S. to maintain the ability to meet and defeat any military threat.

The U.S. Army Chief of Staff, General Mark Milley, has identified the mismatch between U.S. and Russian artillery capabilities as a critical capability shortfall.⁹ The Russian military's artillery currently outnumbered and out ranges U.S. systems by a marked amount (approximately 16 kilometers in range for primary brigade-level fire support assets, and a three-to-one advantage in numbers at most echelons).¹⁰

These topics have the attention of the U.S. Army Field Artillery (USAFA). During a two-day series of briefings and lectures at the Command and General Staff College, Brigadier General Stephen Maranian dedicated more than two-thirds of his comments to the ability of USAFA to match a peer- or near-peer competitor on the battlefield; specifically, the concerns center on the mismatch between U.S. and Russian artillery systems.¹¹ Artillery sets conditions for maneuver forces to close with and destroy the enemies of the United States on the battlefield. If we lack the capability to set these conditions, can we plan to meet and defeat an enemy force that is equipped and trained as a peer or near-peer?

⁹ Milley, "Pray for peace but prepare for war."

¹⁰ U.S. Army Training and Doctrine Command (TRADOC) G-2, *Worldwide Equipment Guide, Volume 1: Ground Systems*, (Washington, DC: Government Printing Office, 2011), iv.

¹¹ Brigadier General Stephen Maranian, "The Future of the Field Artillery" (lecture, Fort Leavenworth, KS, August 2017).

Problem Statement

The Russian army is a well-equipped force that appears to be able to match or beat the U.S. Army in decisive action. Russian willingness to occupy neighboring countries suggests a threat to NATO and eastern European allies. In the current security environment, an Article 5 NATO response to further aggression is a reasonable assumption. U.S., NATO and other allied planners must be ready to meet the potential threat posed by the Russian military.

The numerical gap between U.S. and Russian artillery is clear, the real shortfall cannot be determined without considering the way each army would use artillery in major combat operations. The western world caught a brief glimpse of the way Russia intends to fight when portions of Georgia were annexed in 2008, but it was not until the large-scale invasion of the Crimean region in eastern Ukraine that it became clear just how fundamentally Russia had overhauled their way of waging war. This new model, dubbed “Russian New Generation Warfare,” has been on full display for nearly three years in the Ukrainian war.¹²

Technology also continues to drive the shifting landscape of capability between the two forces.¹³ The Russian army has demonstrated proficient use of UAVs, dynamic targeting and counter-battery fires. A robust area denial/anti-access network might have the ability to mitigate the technological advantages the U.S. army has relied upon since the Persian Gulf War, and has the ability to contest aerial superiority.

¹² AWG, *Russian New Generation Warfare Handbook*, iv.

¹³ *Ibid.*, 21.

Just as Russia has worked to improve its ability to fight and win the modern conflict, the U.S. has been emerging from nearly two decades of counter-insurgency to find how lethal and capable the Russian army has become. The U.S. Army is working to develop solutions to capability gaps, but these will take time to get to the warfighter and are superseded by the needs of forces still fighting in Iraq, Afghanistan and Syria. Units must be prepared to meet potential threats now, with the personnel, training and equipment available today.

Research Question

The primary question this study will attempt to answer is: how can the U.S. Army mitigate the range and numerical superiority of adversary indirect fires and maintain the ability to mass lethal fires effectively in unified land operations? The following secondary research question will help to answer the primary question: how will Russia organize and employ artillery in a decisive action environment? How will the United States organize and employ artillery in a decisive action environment?

Assumptions

This study assumes the current state of the USAFA (manning, equipping and training) will not change significantly before the implementation of recommendations. It aims to identify what the capability gaps are now and to find short-term solutions for them. Several assumptions are necessary in order to move forward in this effort. First, that the geo-political situation in Eastern Europe, the Balkans and the Georgia, Armenia, Azerbaijan and Turkey (GAAT) region will remain unchanged for the near-term (3-7 years) future, and that the U.S. will make any major changes to foreign policy as it

pertains to these areas. Russian regional aggression, and the U.S. stance on the threat this poses, are key to the context of this study. Additional assumptions of stability in the current situation and direction look inward to the U.S. Army. First, it is assumed that the army will continue to plan and fight in accordance with core operating concepts (e.g., the Army Capstone Concept and the new FM 3-0), and that the army will continue towards and will complete the shift to a divisional focus.

Limitations

The scope of this study, the availability of information and the conclusions are subject to two primary limitations. Both are the result of the classification of relevant information. This research focused on existing capability gaps. These gaps, as approved by the Joint Staff J8, are derived from classified operational plans. Therefore, the associated force modernization efforts are classified to the same level as the operational plans on which they are based. I have been in contact with both the EUCOM J35 and the Fires Center of Excellence (FCoE) Capabilities Development and Integration Directorate (CDID), and have received the limited amount of unclassified information that is available.

The information used in this study will come from unclassified sources, principally professional forums and publications. This study intends to add to that discussion, and to organize disparate lines of thought and analysis into new recommendations and solutions. Meanwhile, USAFA and European Command (EUCOM) have focused on mid- to long-term material solutions to overcome the gaps. These material solutions are part of large, costly and time-consuming acquisition

programs. I am seeking to find no cost or low-cost, short-term solutions, including changes to doctrine, organizational structures, or through training and leadership.

Scope and Delimitations

In order to produce a clear and well-articulated solution for the capability gap(s), the scope of this study will be subject to three limits. First, it will use only one threat model (the Russian army). The second limitation is the use of only the doctrine, organization and leadership domains of the Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities (DOTML PF) construct. The third and final limitation is the use of no-cost and low-cost solutions for identified capability gaps.

The threat model used for this study will be the Russian Army, as understood today. This includes current doctrine, manning, equipping, training and observations from contemporary combat operations. While the U.S. recognizes several competitors as near-peers, the Russian military remains the most largely mimicked, exported and widely proliferated in the world. Historical observation has proven that Russia exports not only material goods, but the model under which its equipment is used. Additionally, the willingness of Russia to engage in contingency operations has provided the U.S. and NATO with a solid platform from which to observe their capabilities and tactics, techniques and procedures (TTP's). With all of this combined, the Russian model should provide the most comprehensive view of a near-peer competitor of all of the "4+1" adversary nations.¹⁴

¹⁴ The "Four" of the "Four Plus One" threat refers to Russia, China, Iran and North Korea as state-level actors considered threats to the security of the United States, with Jihadist Extremism as the "+1."

In order to articulate both the capability gap and potential solutions, I will limit the research to exploring Doctrine, Organization and Leadership solutions from the DOTML-PF force generation model. Current efforts from the Field Artillery proponent and EUCOM focus on material solutions, of which most are classified. Training and Leadership are interchangeable in this study; any change recommended for one impact the other domain equally. Likewise, the Organizational domain addresses any changes recommended to the Personnel domain.

This research aims to identify low- or no-cost solutions for the capability gaps. The U.S. military operates in a fiscally constrained environment that challenges efforts to modernize the force. Solutions that utilize existing organizations and equipment it are more likely to be accepted than those with a multi-million dollar price are. Therefore, this study will investigate *how* to mitigate the gaps, instead of what to use to mitigate the gaps.

R1 Position

This research will deliver three sets of recommendations to solve or mitigate the capability gaps: R1, R2 and R3. R1 is the initial position, informed by the author's professional experience and initial research. The R1 acknowledges the bias and perspective inherent to approaching a problem with which the researcher is familiar. The R2 position will come from the Chapter 4 data and analysis, informed by the professional body of knowledge (PBOK) that the author is attempting to bring together to answer the problem. After filtering the R2 position through the lens of three stakeholders, the final recommendations are the given as the R3 position. Chapter 3 provides details on these three positions and the processes used to reach them.

The approach to this problem is complicated; the focus of USAFA is on a material-based solution; U.S. Army Europe on specific operational plans, and the Maneuver Center of Excellence on fighting armor-versus-armor formations for the first time since 2003. Finding a no-cost solution that is applicable to the entire force means rethinking the way we train for and fight potential adversaries. In a multi-domain battlefield, ground forces will have a hard time creating overmatch; in a degraded environment, it might be impossible.

With these constraints in mind, the R1 position is that USAFA needs to better utilize joint fires to defeat the Russian-model threat. This includes every step of the process, from targeting processes, observing and acquiring targets, through fires integration and execution. In short, we need to get better at what we do doctrinally, at all echelons from battalion through division. This study will examine these points in detail, including methods for implementation, during chapters 4 and 5.

CHAPTER 2

LITERATURE REVIEW

This project groups the literature reviewed by past, present and future. This will show what the professional discussions on the problem were, are, and look to be going. The analysis model shown in figure 1 served as a filter for each document, sorting the relevant information into one of the three components of a Capabilities-Based Assessment (CBA). This model is based largely on the one developed by Major Semming Rusten in his 2015 thesis, *The Role of the Military Construction Engineers in Hybrid War*. The design of the analysis tool helps to identify the major discussion trends and recommendations from each of the sources as they relate to the Doctrine, Organization and Training domains of the DOTML-PF model. Chapter 4 discusses the results of that analysis, which form the R2 informed position.

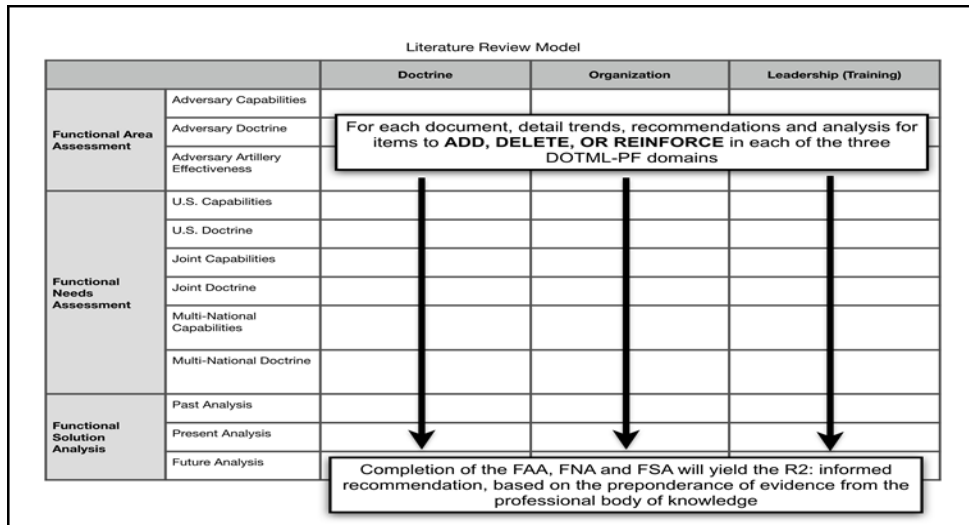


Figure 1. Literature Analysis Model

Source: Created by author.

The Past: Post-Vietnam through the Global War on Terror

The first group for this review is past literature, covering a period from 1975 through the early 2000's. Specifically, this section will end prior to the reconstitution of Divisional Artillery (DIVARTY) in the U.S. Army in 2013. From the artillery's perspective that marked the change in the strategic focus of the Army from fighting counter-insurgencies to preparing for the future of hybrid warfare. The bulk of the past document group focuses on the Soviet threat in the post-Vietnam/ pre- Gulf War timeframe.

This period opened with the U.S. Army operating on a singular focus: defeating the communist threat of the U.S.S.R. Two powers competed for global dominance, offsetting each other and creating a balanced world order. The west thought the Soviets would strike first, and that they held fewer reservations on the use of nuclear weapons. The Soviets thought that the west aimed to destroy their way of life. Both assumed an apocalyptic war that would end only with the complete destruction of the enemy. An uncertain time followed, between the fall of the Berlin Wall and the early years of the Global War on Terror. The documents reviewed in this section look less at a potential enemy, and are more introspective in nature. It is clear that the U.S. was not sure of our role in the world's strategic order, but was looking actively to find what it was.

The document selection for this period did not include professional analyses that did not consider a near-peer competitor. For the purpose of this research, only those framed by a peer or near-peer provide insight to the capability gaps investigated. The document needed to discuss contested air superiority during ground combat to be

included in this study. As a result, there are no documents on operations in Panama, Grenada or the Persian Gulf.

United States Divisional Artillery: A Study of Vulnerability to Soviet Counterfire (1976) is a Masters of Military Arts and Sciences (MMAS) thesis by U.S. Army MAJ Stephen Gallagher. Chronologically, this is the oldest document reviewed. Gallagher compared the artillery capabilities of a U.S. division against those of a Soviet division. In particular, he investigates early Soviet counter-fire methodologies. These are the base of two critical parts of this research: the first is how the Russian military approaches counter fire operations, and the second is Russian army change models.

Gallagher's investigation in many ways closely mirrors the goals of this project; he was also looking at a capability gap related to the ability of a threat force to quickly mass fires at a greater range than U.S. capabilities could with an overwhelming numerical superiority. His recommendations are material, doctrinal and organizational; the former two are no longer relevant, but the latter will add significantly to the trends identified within the professional body of knowledge (PBOK).

Field Artillery Survivability: The Soviet Perspective (1981) is a monograph by U.S. Army CPT Keith Dayton, who wrote this monograph as a Foreign Area Officer (FAO). It was published by the Soviet Studies Institute where the author researched Russian-language professional military publications and print forums in the 1970's to determine how the Soviet Army viewed artillery survivability towards the end of the Cold War. Dayton's writing focused what the Soviet Army thought was a threat to their artillery formations, and how they would counter those threats. His goal was to identify where the discussions within the Soviet constituted a strong break with historic norms.

His monograph was an applied professional case study, differing only from this project as he tapped the Russian professional body of knowledge, instead of the American.

Dayton's recommendations show a strong parallel between Russian ideas and current western artillery techniques. Where the Soviet army made significant efforts to change came in three areas: the elimination of close, linear formations in battery positions, the implementation of survivability movements, and shortening the duration of fire missions. All three of these changes, made in the early 1980's, are mainstays of modern Russian artillery doctrine. For the Russian artillery, these changes were a significant military-technical revolution that developed techniques still used today.¹⁵

Soviet Artillery Utilization (1989) by U.S. Army MAJ James Holcomb is a short paper written during the author's time in the Soviet Studies Office at Sandhurst. His aim was to outline the basic principles of artillery doctrine used by the Soviet Army. This document does not make any recommendations about how to counter the threat; however, it does provide detailed information on the foundations of Russian thought on the use of artillery, which is a scientific methodology that focuses on speed and mass to create lethality and opportunity. Additionally, Holcomb noted that the Soviet Army was turning away from the use of nuclear weapons to shape the deep fight.

Counterfire: Is It Time to Rethink the Problem? (1989) is a School of Advanced Military Studies (SAMS) monograph by U.S. Army MAJ William Parry. This monograph is also looking at the same problem as this study, albeit from a late-cold-war perspective. By 1990, the Soviet Army had achieved a, "quantitatively and qualitatively

¹⁵ MacGregor Knox and Williamson Murray, *The Dynamics of Military Revolution, 1300-2050* (Cambridge: Cambridge University Press, 2015), 2-3.

superior,”¹⁶ edge over the U.S. His analysis focused on finding facets of the artillery fight that were exploitable, rather than an attempt to win tube-against-tube. FM 100-5 *AirLand Battle*, which was the doctrine of the time, and a Soviet army at the apex of its power, framed the document. The upcoming dissolution of the Soviet state was unforeseen at the time, and they remained the only opposing super power to the United States. His principle recommendations are all found in current doctrine: mass, tempo, situational awareness, and effective targeting in the deep fight. In Parry’s threat environment, though, the U.S. was working to develop a decisive technological edge. Today, Russia appears to have effectively mitigated this edge with their own area denial network. As a result, not all recommendations will translate to a modern battlefield, even though methodologies and doctrine have not changed significantly since 1990. What have changed are the weapons and tools at a command’s disposal for today’s combat. This research uses Parry’s recommendations to frame how those weapons and tools affect the current capability gaps.

Who Says Dumb Artillery Can’t Kill Armor? (2002) is an article published in the Field Artillery Journal by U.S. Army MAJ George Durham. This article is the only unclassified record that could be located of the U.S. Army’s testing of artillery against armored targets. The initial study, called the “Soviet Artillery Effectiveness Study,” aimed to recreate a report published by Soviet Army in the 1980’s. The Soviets reported to have completed live-fire testing that showed artillery to have a much greater

¹⁶ MAJ William Parry, “Counterfire: Is It Time to Rethink the Problem?” (Monograph, School of Advanced Military Studies, U.S. Army Command and General Staff College, Fort Leavenworth, KS, 1989), iii.

effectiveness against armor than had been previously thought. MAJ Durham provides extensive evidence that, without the aid of DPICM or precision munitions, artillery can render an armored formation combat ineffective. He goes on to note several historic examples from World War Two, where, on multiple occasions, armored attacks were stopped by massed artillery fires. This information will weigh heavily on recommendations provided in chapter four.

The Optimal Force Mix and Allocation of Fires for the Future Field Artillery (1991) is a Naval Postgraduate School Thesis by U.S. Army CPT John Page. Page completed this thesis as a response to FM 100-5 *Airland Battle*, which, like current doctrine, emphasized smaller forces responding to a wide range of threats and contingencies around the world. Page focused on developing a linear programming model to determine the minimum cost weapon and munition mix for the modern battlefield. This is used for a more detailed and technical look at the criteria for engaging heavy armor than the previous article. The content and results of this project are otherwise unlike anything that could be found, and will provide more details for the recommendations of this project.

The King and I: The Impending Crisis in Field Artillery's Ability to Provide Fire Support to Maneuver Commanders (2008), is a White Paper by U.S. Army Colonels Sean MacFarland, Michael Shields, and Jeffrey Snow. Chronologically, this is the last of the “past” collection, and the only work reviewed written after the onset of the Global War on Terror (GWOT). The authors are three former Brigade Commanders, with the Chief of Staff of the Army as the primary audience. Written at the height of the “surge” in Iraq, it cites the use of artillerymen almost exclusively for maneuver tasks while howitzers sat in

motor pools unused. The DIVARTY headquarters became the bill payer within a division TO&E when the Army transitioned to the modular Brigade Combat Team (BCT) concept. These three commanders went so far as to describe USAFA in the paper as a, “dead branch walking.”¹⁷

The commanders’ analysis focused on training and CTC observations that showed an alarming drop off in basic artillery competencies at the height of the GWOT. This was a trend that had begun in the late 1990’s, and had been exacerbated by OPTEMPO, operational requirements, the restructuring of the force and attrition of talent from within the branch. They laid out five recommendations that are among the major trends identified by this study. Some have already been instituted (the reintegration of the DIVARTY), while others will inform the Functional Solution Analysis in this project.

The Present: DIVARTY through Today

The present discussion focuses on framing the capabilities of both the U.S. and the threat model. The literature used for this section begins with the reinstatement of the DIVARTY structure in the U.S. Army, and continues through the present. Documents show how the U.S. Army made a deliberate effort to restore conventional combat capabilities, while maintaining the ability to counter insurgent threats. They assessed that any future threat would try to exploit the American Army’s vulnerabilities with an unconventional force, while attempting to impose will with regular forces in pitched

¹⁷ COL Sean MacFarland, COL Michael Shields, and COL Jeffrey Snow, *White Paper The King and I: The Impending Crisis in Field Artillery’s ability to provide Fire Support to Maneuver Commanders* (Washington, DC: Government Printing Office, 2008), 3.

battle. Leaders understood that the only certainty about future conflict was uncertainty. Enemies would mix and match capabilities as they needed or saw fit.

Documents from this period reflect the growing uncertainty over the shape of future warfare. This is tempered by a determination to fix the issues highlighted repeatedly in the past discussions. At the same time, the U.S. Army began to move away from the modular Brigade Combat Team (BCT) and back to the Division as the primary warfighting element.

This section utilizes a wide selection of documents: MMAS theses and SAMS monographs, the professional dialogue, studies and doctrine. The prevalence and availability of “think tank” studies, magazine articles and open-source opinion documents make this the most accessible period of the three, which brings with it a wide range of opinions and recommendations. The problem set, though, of the artillery overmatch and the ability of the U.S. Army to fight in a near-peer environment, is a clear commonality for all of the literature.

The more recent documents show how the Russian Army has evolved since the fall of the Soviet Union and what the current Russian strategic aims are. This information provides important context to determine how and when the Russian Army is likely to fight, and how they intend to use artillery fires to support the achievement of those operational and strategic goals. Finally, this section shows and consensus within the PBOK on closing the fires gap. The documents reviewed in the following pages start with the discussion of Russian military doctrine and theory, then move on to U.S. professional observations and discussion, before finishing with a discussion of capability gaps.

Russian New Generation Warfare Handbook (2016) is a publication by the Asymmetric Warfare Group (AWG). Written after two years of on-the-ground study and observation of the Russian efforts in Crimea and the Eastern Ukraine, it serves as a guide to the way that Russia conducts warfare. The first half of the handbook is dedicated to the organization, equipment and procedures observed in use in combat. The second half gives vulnerabilities and potential strategies with which to defeat the observed threats, focused on maneuver units and leaders.

The recommendations relevant to this study cover three key Russian battlefield systems: reconnaissance, Anti-access/area denial (A2/AD) and fires. Reconnaissance comes from a variety of different sources: local national populace, snipers and low-level unmanned aerial vehicles (UAV). The report does not go into much detail or depth on counter-fire radar systems. Area denial systems are electronic warfare (EW) centric, with the ability to deny friendly forces radio communications and GPS capabilities. The discussion on fires is from the perspective of control and operational-level use. The final analysis of Russian systems also points to some critical vulnerabilities related to the fielding and employment of these systems. The study shows how those systems give Russian commanders standoff, and protect both space on the battlefield and key capabilities.

Russia's 2014 Military Doctrine and beyond: threat perceptions, capabilities and ambitions (2015) is an information paper written by the NATO Defense College. This document, written by the Research and Development division of the NATO Defense College, explores the “why,” behind the 2014 re-write of Russian Doctrine. It does not explore any of the tactical or operational events that preceded the re-write (e.g., Russian

operations in Georgia). Instead, the document examines how the doctrine relates to strategic goals and international affairs. The authors explore changes from the 2010 doctrine, including the exclusion of any mention of cooperation with NATO. The context provided is valuable to understand when, where and why the Russian Army is likely to engage with western forces. In short, the authors believe that Russian President Vladimir Putin's defense strategy views the western world as a threat to the existence of Russian culture and way of life. The design of this defense policy is to protect the homeland through a strong conventional and nuclear offensive capability.

In keeping with the idea of defense through offensive capability, the authors note how Russia has improved its conventional capabilities. They conclude that this posture is a powerful deterrence, and that, combined with the demonstrated offensive and limited power projection capabilities shown in the Crimea and in Syria, western powers were highly unlikely to engage in conventional or hybrid warfare with the Russian army.

Assessing Russia's Reorganized and Rearmed Military (2017) is a study by the Carnegie Endowment. This paper assesses the nature and capability of the threat posed by Russian forces conducting "New Generation Warfare." The author questions the availability and sustainability of the "impressive capabilities demonstrated in the Ukraine and Syria."¹⁸ He outlines the major changes within the Russian army, but goes on to point out the chronic issues left over from the 1990's and early 2000's. Mr. Giles concludes that the threat has been overestimated, and that it carries significant inherent vulnerabilities. This is not to say that the Russian military is not a powerful force;

¹⁸ Kier Giles, *Assessing Russia's Reorganized and Rearmed Military* (New York: Carnegie Endowment of International Peace, 2017), 1.

instead, he points out that the ability to apply decisive mass and an overwhelming advantage on the battlefield is limited to short durations and smaller areas than the first observation might suggest. This observation informs both the Functional Area Analysis and the Functional Solution Analysis, by providing context for threat capabilities and recommendations for how to defeat that threat.

Russia Military Power: Building a Military to Support Great Power Aspirations (2017) is a report published by the Defense Intelligence Agency (DIA) as a restart of the Cold War era *Soviet Military Power* publication. The document specifically states an intent to generate open-source discussion on the security challenges faced by the United States today. It uses the military power format from the Soviet era as a vehicle to isolate the challenges posed by the Russian military. This is the first edition published since the collapse of the Soviet Union, so it begins by framing what the agency terms as the “Fall and Rise of the Russian Military.” That provides the context for a discussion on the major capabilities of the Russian military that have changed in the last 20 years.

This project will make use of two sections to inform the functional area assessment: A2/AD, and precision strike. The Russian army employs these two important fires capabilities at the operational and tactical levels in very similar way. According to the DIA, the A2/AD network is built to deny adversaries a technological advantage or complete air superiority. They also assert that “Russian doctrine on Precision Strike is the a 21st century extension of the Russian doctrine of ‘deep battle’ initial codified during the

1920' and 1930's"¹⁹ They go on to discuss the development and application of precision weapons, and the use of these in Syria today.

The DIA's report does not discuss the implications of these systems on the battlefield; their aim, instead, is to use facts and capabilities to spur a dialogue on how to meet threats. It is comprehensive in the way that it ties capabilities to one another, yet concise enough to be easily referenced.

Comparing U.S. Army Systems with Foreign Counterparts (2015) is a research report by the Rand Corporation. Commissioned by the Army's Deputy Chief of Staff (G-8) during Fiscal Year 2013, it identifies capability gaps between the U.S. Army and foreign counterparts. Given the large scope of this project, the authors chose several smaller areas to give special emphasis to before grouping systems by war fighting functions. This research uses the technical data on indirect fires systems to inform the analysis in chapter 4.

This analysis of the three major types of artillery systems used by USAFA (towed, self-propelled and rocket artillery) will be used to articulate the gaps for the functional needs assessment. Of all of the literature reviewed, it is the most technically comprehensive, and informed much of the functional needs analysis. Unfortunately, it does not address force structure or employment methodologies, and even if it did, it predates the reintegration of the DIVARTY to the U.S. Army. Accordingly, any differences or recommendations would already be outdated.

¹⁹ Defense Intelligence Agency (DIA), *Russia Military Power: Building a Military to Support Great Power Aspirations* (Washington, DC: Defense Intelligence Agency, 2017), 34.

The Russian Way of Warfare (2017) is a primer from the RAND Corporation. This 12-page document aims to provide readers with a brief summary of the significant reforms that resulted from the Russian 2014 New Look doctrinal overhaul.²⁰ It provides operational- and tactical-level observations, framed around the way that the Russian Army will deter, mobilize and fight a near-peer adversary.

Key considerations revolve around the Russian Army's ability to defend the homeland, bring massive amounts of fires to bear quickly, as well as its inability to sustain a long-term fight. In his conclusion, the author contends that Russia can no longer afford to trade manpower and space for time. He attributes the strategy of annexing buffer states and the use of proxy forces to this fact, and asserts that this will be the Russian way of warfare for the foreseeable future.

Fires Readiness: The State of U.S. Army Fires in Support of Combined Arms Maneuver at the Division Level (2016) is an MMAS thesis written by U.S. Army Major Ryan Johnson. Johnson's research investigates the potential atrophy of artillery skills within a U.S. Army Division, and looks to determine if, on average, USAFA is still prepared to support maneuver forces in conventional combat. The author uses an applied professional case study to determine what capability gaps that exist after fifteen years of counterinsurgency operations. His research recommended solutions within the Doctrine, Organization and Leadership/Training domains of DOTML PF. In particular, he looked

²⁰ In 2014, the Russian military adopted a new doctrine, named after the Russian Chief of Defense General Gerasimov. This doctrine set completes the post-Chechnyan reforms, and is also known as the "New Look."

at the DIVARTY and Field Artillery Brigade (FAB) structures and used them as a representation of USAFA's current capabilities.

Johnson found the following four gaps in his Functional Needs Assessment: the ability of BCTs to clear fires for delivery, the sensor-to-shooter link, execution of counter-battery fire and the detection of targets.²¹ These four are some of the major thematic trends identified through this research, and the counter fire and targeting gaps, along with his recommendations for training to mitigate them, will contribute significantly to the FNA in this study.

Army Warfighting Challenge #17/18. This is the final "present," document reviewed for this study. The Army Capabilities Integration Center (ARCIC) maintains a package of research and development conducted by action agencies to address each challenge. The Chief of Staff of the Army chooses each challenge on a yearly basis. Army Warfighting Challenge (AWC) #17/18 is the employment of cross-domain fires: using fires outside of the ground domain to attack strategic, operational and tactical objectives. An information paper published by the FCoE describes the problem, presents areas of concern within the challenge, and summarizes initial research and solutions.

With a clear mismatch on the battlefield, the paper asserts that Joint, Interagency and Multinational (JIM) fires are the only assets currently available to mitigate range gaps. AWC 17/18 focuses on the "how" for integrating JIM fires, and packages the AARs

²¹ The sensor-to-shooter link refers to the digital or FM radio linkages between observers who acquire targets, the fire direction center that computes firing data, and the howitzers that execute the fire mission.

for more than a dozen exercises, the unclassified acquisition program summaries for incoming programs of record, and all of the proponent's research on the topic.

For this project, the April 2017 Information Paper is also used as a source document, looking at Doctrinal, Organizational and Leadership/Training options for the employment of cross-domain fires. Most of the recommendations are for material solutions that are not used in this study. However, using the solutions for the three chosen domains ties this study to the official Army research on the problem, and keeps recommendations in line with approved, contemporary solutions.

Fires! Magazine (2015-2018) is the official Field Artillery periodical, published by the FCoE on a bi-monthly basis. Along with selections for *Armor* and *Infantry* magazines, it comprises approximately half of the professional dialogue. This project researched the last three years of discussions about Field Artillery parity with near-peer competitors, and collated the major recommendations for training, doctrinal and organizational measures to address perceived gaps. All of the discussions used centered on identifying and defeating threats outside of the current counter-insurgency operations. Most come from unit leaders' lessons learned during major training exercises and CTC rotations, while others are the analysis of Observers at the Combat Training Centers. Chapter 4 discusses those recommendations, along with the overall dialogue trends.

Combat Training Center (CTC) Trends and Analysis (2014-2018). The Center for Army Lessons Learned (CALL) collated and published trends and observations from the National Training Center, Joint Readiness Training Center and Joint Multinational Readiness Center (with the exception of 2012-2014). These are presented in an "issue, discussion, recommendation" format. They provide a concise guide to training and

execution shortfalls observed during month-long rotations to each site. They are limited in scope, however, with almost all limited to Brigade Combat Team (BCT) operations, and a somewhat geographically constrained training area within which to work. Additionally, CTCs do not typically vary training scenario location or design.

The Mission Command Training Program (MCTP), which runs the virtual Command Post Exercises known as “Warfighter Exercises,” also publishes trends and observations. This section includes the MCTP observations from 2014-2018. These are useful for Division and Corps headquarters trends. For this project collated all available trends and observations for the last three years to find capability gaps and recommended solutions.

The Future: The Battlefield of Tomorrow

The third literature period is the future. Documents reviewed for this group focus on the professional discussion of the battlefield the U.S. Army will face in the future. Some of these documents articulate what they believe the future will hold, while others offer solutions for the predicted threat scenarios. The U.S. Army does not have a single unified vision of the future to use in capability development. This is an endemic problem cited by many of the authors reviewed; we know where we have been, have a good idea about what we are doing now, but the future is not clear. Again, “think tanks” and MMAS/SAMS theses and monographs have proven very useful. Some of the professional periodicals attempted to cover these topics, but most let the present situation suffice.

The Operational Environment and the Changing Character of Future Warfare (2016) is a publication by the Training and Doctrine Command (TRADOC) G-2 that provides a blueprint of the future of warfare through the year 2050. It breaks the horizon

into two eras: the era of accelerated human progress (2017-2035), and the era of contested equality (2035-2050). The first is a period during which potential adversaries use emerging technologies to gain an advantage and challenge the U.S. During the second, the authors expect that warfare will undergo a dramatic change as the result of the convergence of new technologies and capabilities. The paper monitors twelve trends to mark progress along these fronts and to forecast future changes in warfare. It then details the factors and players believed to be critical to these periods, and how they believe they will act in the environment.

This paper provides the context needed for future analysis. Solutions emerging from the FNA will be measured against suitability, feasibility and acceptability in the context of this environment. It is the most comprehensive prediction of future warfare available from a U.S. Army source, and is therefore being treated as an authoritative source on future requirements.

The Army Modernization Imperative (2017) is a 2017 report by the Center for Strategic and International Studies (CSIS). This report articulates the gaps CSIS has identified in five domains: electronic warfare, air and missile defense, cross-domain fires, advanced protection, and logistics. The gaps in electronic warfare and cross-domain fires are the most relevant to this study. CSIS takes an in-depth look at the U.S. Army's capability development programs and notes that, as a whole, the Army is facing significant challenges in its effort to modernize. Chief among these are budgetary restrictions (with little relief in sight), failure of recent programs, and a sharp decline in

the civilian-military complex's research and development efforts.²² Beyond a lack of new material development, the authors note a lack of consensus on modernization priorities.

This report recommends that the Army focus on the capability causing the gap, not the platform to solve it. Given the fiscal, political and social environment in which the Army must now operate, they argue that it is unrealistic to expect immediate developments or budgetary relief. As such, the authors argue for the need to seek out innovative solutions wherever they present themselves; they suggest that material solutions are not always the right answer, and that saving money whenever possible leaves military leaders more available funding to update aging equipment. The report provides a detailed, quantitative analysis of each of these points, looking at both a contemporary hybrid threat and the Russian Army in particular. The methodologies and recommendations in this report will be able to contribute to framing and filling the Functional Solution Analysis.

Future Warfare: The Rise of the Hybrid Wars (2005) is a *Naval Institute Proceedings* article by GEN James Mattis and LTC (Ret.) Frank Hoffman. Written in the context of the early years of the global war on terror, it provides valuable context for anyone attempting to frame the future battlefield. They take GEN(Ret.) Krulak's "Three Block War" concept one step further in this article arguing for a "Four Block War," construct. In the Three Block concept, troops are fighting on one block, conducting humanitarian assistance on the next, and providing security between rival factions on the third. They add a fourth "information" block, and contend that future adversaries will

²² Andrew Hunter and Rhys McCormick, *The Army Modernization Imperative* (New York: Center for Strategic and International Studies, 2017), IV.

always incorporate a hybrid threat. For these reasons, they say that the information domain will be critical to victory. They conclude that the Department of Defense needs to invest in a system of people, making a strong case for a leadership-based approach to mitigating the information domain superiority of potential adversaries.

Optimizing Artillery Fires at the Brigade Level (2006) is an MMAS thesis by U.S. Army MAJ James Langdeaux. As the counterinsurgency operations in Iraq and Afghanistan were nearing peak force levels, the author investigated the ability of USAFA to meet traditional, near-peer threats. He predates the mainstream discussion by two to three years, and frames the future operating environment very much the same way that the PBOK has since 2010.

Langdeaux's primary recommendation is an initiative to reinstitute the DIVARTY headquarters. Since the DIVARTY is back in the force structure today, his secondary recommendations—that are directed to BCTs—will be applied for the Functional Solution Analysis in this project. Among these secondary recommendations by the author is the idea to simplify the fires clearance and delivery process. He notes (again, several years before his contemporaries) that the fight in Afghanistan and Iraq had inculcated the army with a risk aversion that would not be acceptable in major combat operations. Additionally, he recommends training Army fire supporters to be more proficient in the use of joint fires. Both of these recommendations will weigh heavily in the doctrine and training recommendations.

The United States Army Field Artillery and the Hybrid Threat: Is It Time to Get Smart? 2014 This is a 2014 MMAS thesis by U.S. Army MAJ Jeffrey Fuller. His research accepts the premise of the hybrid war as a permanent fixture on the future

battlefield, and explores the ability of the U.S. Army's Field Artillery to meet the threat. He examines the capability of USAFA to execute its own doctrine at the time of the study, and the effectiveness of that doctrine against a hybrid threat.

Fuller used the Doctrine, Organizational and Materiel capabilities of USAFA to determine how well the branch could conduct three field artillery tasks: the ability to deliver fires against moving, armored targets, to deliver effects to the deep area, and to mass fires. His findings not only provide well-researched information on the capabilities of USAFA, but also combine to give vision of the artillery's future battlefield. Additionally, his doctrinal and organizational recommendations provided this study with an entry point for both short- and mid-term solutions to the capability gaps discussed here.

Doctrine

Doctrine provides the foundation for how the U.S. military and allies believe they should and can fight current threats. This study reviewed current U.S. Army, Joint and Allied doctrine covering targeting, fires and the integration of fires with maneuver. This research uses doctrine to determine what the U.S. military should be able to accomplish. Additionally, it provides guidelines on how to employ those capabilities. What it does not discuss is their effectiveness. There are two reasons for this: the first is that doctrine is only a prescription for how to accomplish tasks and missions; the effectiveness of a unit depends in its ability to execute as prescribed, and on the ability of an adversary. Doctrine does not consider the capabilities and effectiveness of specific threats. The second reason is that doctrine cannot take into consideration the quality of personnel and training. These studies use the previously discussed professional dialogue to assess

effectiveness. When compared to potential adversaries' capabilities, the study of U.S. and allied doctrine should reveal the doctrinal and organizational capability gaps faced by USAFA in a near-peer environment.

JP 3-09, *Joint Fire Support* is the joint publication that describes the planning, execution, control and assessment of joint fires. FM 3-09, *U.S. Army Fire Support* follows all of the methodologies and definitions found in JP 3-09. This JP provides the definitions of broad terms and processes described in this project. JP 3-09 also describes how the joint targeting process ties into the execution of fires and effects on the battlefield, so it is a useful handrail for the application of planning concepts like targeting. It also outlines the Joint Force positions within the fires warfighting function, and details their roles. Primary among these organizations are the Joint Fires Element (the Joint Force Commander's Fires Cell) and the Joint Air Ground Integration Cell (JAGIC), which is usually found at the Division and/ or Corps level. What it does not do, however, is provide a technical discussion on the use of lethal and nonlethal fires in major combat operations.

JP 3-60, *Joint Targeting* is the U.S. Military's lead manual on the targeting process. The targeting process shapes a commander's deep fight and affects the enemy's decision-making cycle. JP 3-60 prescribes the process for developing, nominating and approving targets for joint actions; ATP 3-60, *U.S. Army Targeting* provides the Army's targeting guidance. The key difference is the joint process' vetting and validation of targets before submission to the Joint Force Commander (JFC) for approval; the Army targeting cycle does not include a vetting and validation process, so those targets do not

meet the requirements for JFC approval. Additional differences between JP 3-60 and ATP 3-60 will be discussed in more detail in Chapter 4.

NATO Standard AJP-3.2, *Allied Joint Doctrine for Land Operations* is the capstone document for NATO land warfare. It provides joint and multinational commanders and staffs the philosophy and principles of NATO ground operations, and is the base document for *Land Tactics and Command and Control of Land Forces*. The publication assumes that the Joint Force Commander is from a NATO nation, and describes how NATO approached ground operations and the hierarchy of NATO doctrine.

FM 3-90-1, *Offense and Defense* provides the tactical framework for the U.S. Army to conduct basic maneuver tasks. It “focuses on the organization of forces, minimum essential control measures, and general planning, preparation, and execution considerations for each primary offensive and defensive task.”²³ The manual uses divisions and BCTs to illustrate principles and concepts, but it is not all encompassing. Separate manuals exist for detailed applications of the FM-3-90-1 tactics, broken down by echelon and unit or warfighting function.

TC 3-09.8 *Field Artillery Gunnery* and TC 3-09.81 *Field Artillery Manual Cannon Gunnery* are the two technical documents that govern how USAFA delivers surface-to-surface fires. These discuss training and combat employment standards. They also cover guidelines for the tactical employment of munitions and systems, to include weaponeering by target type and survivability techniques.

²³ Headquarters, Department of the Army (HQDA), *Field Manual (FM) 3-90-1, Offense and Defense, Vol. 1* (Washington, DC: Government Printing Office, 2015), viii.

TC 3-09.31 *Fire Support Training for the Brigade Combat Team Commander* will be used similarly to how the previous two TCs are used. This Training Circular covers specifics about how and for what direct-support artillery must train. Unlike the platform-specific manuals, the .31 covers the ways that USAFA integrates with and sets conditions for maneuver at the tactical level, and how that will translate to combat operations.

Chapter Summary

To find a fully informed opinion within the professional body of knowledge, this project examined professional discussions spanning nearly 75 years. Looking at the past, present and future discussions separately—as well as the existing doctrine—provided valuable context and helped to shape recommendations and to limit the personal bias’ of the author. Major trends quickly became self-evident, and will be discussed in chapter 4 through the DOTML PF framework. The next chapter will seek to take this informed opinion from the PBOK and filter it into a usable analysis, which could mitigate some of the gaps between U.S. and Russian artillery capabilities.

CHAPTER 3

RESEARCH METHODOLOGY

This project is an applied professional case study, focused by a DOTML PF Capabilities-Based Assessment (CBA). The applied professional case study model provides a persuasive argument to policy makers based on a, “systematic, disciplined, multi-perspective and critical,” approach to a complex problem.²⁴ This methodology takes a problem that is broad and ambiguous and allows the researcher to form cogent and useful solutions.

As the recognized method for applying analytical rigor to the Joint Capability Integration Development System (JCIDS), the CBA process will provide recommendations to stakeholders and decision makers. Ideally, the recommendations made through this process will be in concert with the ongoing material solutions development. The CBA is a three-part process, detailed below, along with the way it this research applies it. The three phases are the Functional Area Analysis, Functional Needs Analysis and a Functional Solutions Analysis²⁵.

The Functional Area Analysis (FAA) is the foundation of the research process in the CBA. The FAA will show what is required of USAFA in a near-peer conflict. The most important part of the FAA is the shape and scope of the discussion. If completed correctly, it will clearly show what USAFA needs to be able to confront. This study—for

²⁴ Kenneth Long, “Case Study Insights,” Fort Leavenworth, KS, 2016.

²⁵ Headquarters, Department of the Army (HQDA), Army Regulation (AR) 71-9, *Warfighting Capabilities Determination* (Washington, DC: Government Printing Office, 2009), 23.

the reasons outlined in detail during chapter 1—will focus on a division-level fight between the United States (with NATO partners), against the Russian Army. Two key assumptions shape the discussion: it is location-neutral, to ensure solutions are broadly applicable, and the threat is operating within the protection of A2/AD.

Beyond this point, the availability of unclassified information is limited, as specific capability gaps are a product of Combatant Command operational plans. This means that the exact missions and tasks for ground forces (and USAFA in particular) are unknown. This research assumes that the task is to match or surpass the capabilities of threat forces, which scopes the FAA rather narrowly and focuses on articulating Russian indirect fire capabilities, ranges, lethality and preferred method of employment.

The second step in completing the CBA is the Functional Needs Analysis (FNA). The FNA is a detailed discussion of current capabilities and the gaps between those capabilities and the requirements found in the FAA.²⁶ For this study, the FNA will also focus on present-term analysis. Unlike the FAA, though, the FNA will revolve around an investigation of current U.S. Army indirect fire capabilities, ranges, lethality and doctrinal methods of employment. It will also investigate the capabilities of the U.S. Army to shape the deep fight using targeting methodologies and joint fires. This intends to produce a holistic picture of capabilities, to discuss gaps honestly. None of the scenarios in which the U.S. Army would be asked to face a Russian-based near-peer are very likely to be conducted unilaterally, so the only way to paint a comprehensive picture is to do so through a joint and multi-national approach.

²⁶ HQDA AR 71-9, 23.

The final step in completing the CBA is the Functional Solution Analysis (FSA). The FSA will yield specific recommendations that, in this case, focus on Doctrine, Organization and Leadership changes within the DOTML PF model. Recommendations are limited to the Doctrine, Organization and Leadership domains in order to find near-term, low-cost solutions. To identify possible solutions, research will focus on the PBOK's analysis of the capability gap. It will seek to identify trends in the analysis, for items to be added, deleted from or reinforced within one of the three applicable facets of DOTML PF.

The Doctrinal, Organizational and Leadership change recommendations will be the "R2" position: the informed personal recommendation. This differs from the "R1" position (initial position at the conclusion of chapter one) in that it is based on a systematic analysis of the PBOK.

A review of the literature discussed in Chapter 2 informs the R2 recommendations. It is critical to make these recommendations useable and realistic. For this study, they will be filtered through the lens of the three entities who will bear the burden in implementing any recommendations. These are the Field Artillery Proponent (FCoE), who would be the primary agent for re-writing fires doctrine or recommending organizational change, the U.S. Army Combat Training Centers (CTCs), who will execute the recommended training, and the Army Capability Integration Center (ARCIC), who would evaluate and integrate any recommendations into maneuver capabilities. Once filtered, the recommendations will form the "R3" position: improved with stakeholder insights, which will be achieved by determining the suitability, feasibility and acceptability of the recommendations to each of these stakeholders.

The final step in this case study will be to develop a road map for the application of the R3 recommendations. The audience for the application will be the Chief Decision Maker (CDM), who, for the purpose of this study, is the Field Artillery Commandant. The road map will be presented to the CDM in the context of Kotter's 8-step model for organizational change, in order to provide a clear and concise method for implementing the R3 recommendations.

CHAPTER 4

FINDINGS

The data compiled for this analysis is comprised as a Capabilities-Based Assessment (CBA). While a typical CBA is framed by a combatant command's operation plans, this case study considers the problem as it applies to the entire U.S. Army.

The CBA determines the needs, current capabilities, gaps and solutions associated with the problem set. The three parts of the CBA are the Functional Area Analysis (FAA), Functional Needs Assessment (FNA) and Functional Solutions Analysis (FSA). Theses, monographs and research reports are used as the FAA. The chapter will end with a summary of recommendations to solve the problem (R2) and an analysis of how it will affect the primary stakeholders (R3).

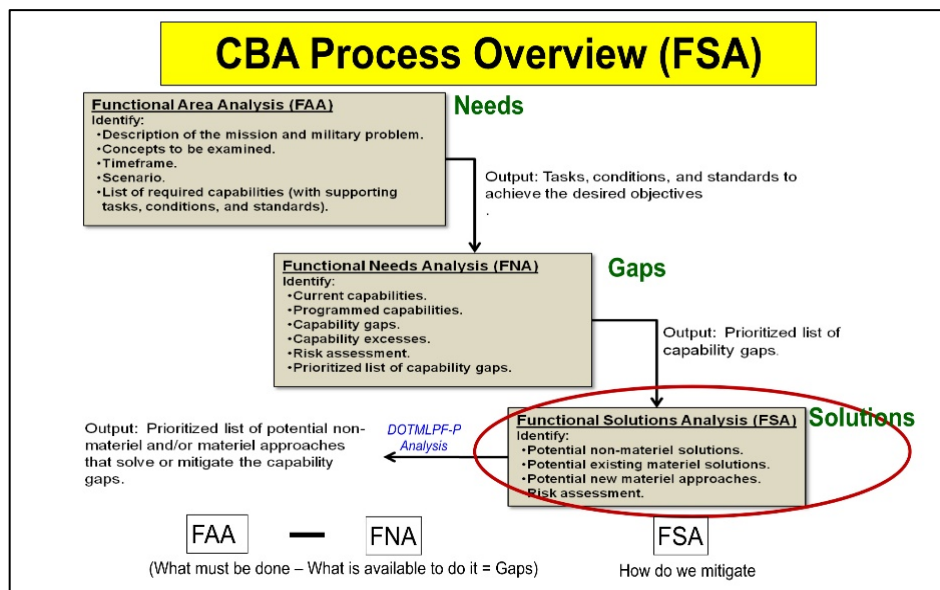


Figure 2. Capabilities-Based Assessment Process Overview

Source: Lieutenant Colonel Jeremy Weestrand, "CBA Process Overview" (PowerPoint Presentation, Force Modernization, Fort Leavenworth, KS, October 2017), slide 5.

Section I – Functional Area Analysis

The intent of the Functional Area Analysis (FAA) is to determine what needs to be accomplished by USAFA. This section ends with a list of doctrinal tasks required to solve the problem. As previously stated, this case study deviates from the norm by avoiding the use of a particular geographic command's assigned mission. This makes determining the mission more difficult, but avoids the potential of developing a solution that is limited in application. Once the assigned mission is articulated, it is juxtaposed against a hypothetical scenario that is used to discuss what capabilities the threat has, and how they are employed. It will conclude with what the USAFA needs to accomplish in order to maintain an asymmetric advantage on the modern battlefield.

Defining the Mission

The effort to scope USAFA's mission in this problem starts with the U.S. Army mission statement. According to Army Doctrine Publication (ADP) 1, *The Army*, it is "to fight and win our nation's wars, by providing prompt, sustained land dominance, across the full range of military operations and the spectrum of conflict."²⁷ TRADOC Pamphlet (TP) 525-3-0 *The Army Capstone Concept*, describes this concept further, stating that "the Army must maintain a credible capacity to *win decisively* and support combatant commanders across a wide range of military operations at home and abroad."²⁸

²⁷ Headquarters, Department of the Army (HQDA), Army Doctrine Publication (ADP) 1, *The Army* (Washington, DC: Government Printing Office, 2012), 2-5.

²⁸ Headquarters, U.S. Army Training and Doctrine Command (TRADOC), TRADOC Pamphlet 525-3-0, *The Army Capstone Concept* (Washington, DC: Government Printing Office, 2014), iii.

Two key capability requirements can be taken from these documents: the first is the ability of the Army to defeat any challenge presented in land combat. The second is the deterrent capacity provided by the presence of an overwhelming and broadly scoped ability to win. In the dynamic threat environment that exists today, these requirements are so wide-ranging as to appear unattainable. This research uses them, however, as guidance to avoid exploring mission-specific or narrowly focused options for the force.

The U.S. Army uses *The Army Capstone Concept* to describe how it sees this threat presenting itself in the future, and how it plans to meet it. It provides a detailed explanation of the “how,” and “why,” of the Army mission. As the Army’s unifying vision of the future force, it references the “credible capacity to win,” ten times in thirty-six pages of text. This emphasis gives a clear imperative for capability development: maintain an asymmetric advantage that gives land forces the ability to win in an overwhelming manner. Outside of that emphasis, the pamphlet does not scope the Army’s mission; this lack of boundaries allows for the flexibility to meet emergent and unforeseen threats across the globe.

Joint, Interagency and Multinational framework provides additional insight to the scope of the problem set. NATO, as the largest military treaty organization that the United States is a part of, is the focus of the JIM mission for this research. Allied Joint Publication-01, *NATO Doctrine*, is the foundational document for NATO operations, and it lays out a vision of the global security environment and how the alliance will respond to threats with military force. NATO specifically references the hybrid threat as one of the principle security challenges and acknowledges the changing definition of

sovereignty as non-state actors continue to emerge.²⁹ Further, NATO doctrine focuses on deterrence of threats. Like the Army's Capstone Concept, this relies heavily on the credible ability to win.

Comparison of the U.S. Army, NATO and the U.S. Department of Defense missions shows a common goal of deterrence.³⁰ JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, defines deterrence as "The prevention from action by the fear of consequences. Deterrence is a state of mind brought about by the existence of a credible threat of unacceptable counteraction."³¹ These main takeaway from the U.S. Army and JIM missions is the need to deter potential threats with the credible ability to win.

The role of the Field Artillery now needs to be identified within the broader framework of the mission sets. If the mission is first to deter, then to protect the nation through the ability to counter any threat, what specifically is the role of USAFA?

According to FM 3-09.22, the mission of the Field Artillery is to "destroy, defeat or disrupt the enemy with integrated fires to enable maneuver commanders to dominate

²⁹ Headquarters, North Atlantic Treaty Organization (NATO), Allied Joint Publication (AJP) 01, *NATO Doctrine* (Brussels: North Atlantic Treaty Organization, 2017), 2-6.

³⁰ The DoD mission is to "provide the military forces needed to deter war and to protect the security of our country."

³¹ Chairman, Joint Chiefs of Staff (JCS), Joint Publication (JP) 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, 2010), 102.

in unified land operations.”³² Simply stated, fires set conditions for maneuver to close with and destroy the enemy. The only requirement for USAFA is be able to place lethal indirect fires on any enemy, in any location. This is how the artillery will contribute to deterring potential adversaries and will help to ensure the security of the nation and national interests.

Concepts to Be Examined

The next step in the FAA is to determine what technical concepts will be examined within the fires warfighting function. These concepts are the tasks and task groups that lead to USAFA’s ability to place lethal fires on enemy forces. ADRP 3-09 *Fires*, lists the fires warfighting functions as delivering fires, integrating all forms of Army, joint and multinational fires, and conducting targeting.³³ For the purpose of this research, those functions are broken down to the following concepts. These concepts are both the principle components of each function and are the most commonly discussed topics in the professional dialogue. The concept is the delivery of fires, which includes deep or shaping fires, direct support/ close fires and counter-battery fires. The next is targeting, which includes both the execution of the targeting process and sensor management. The third concept is integration of Army, Joint and Multi-National (JIM) Fires, which includes synchronizing fire support and conducting air-to-ground fires integration Tactical risk is added at the discretion of the researcher; it is a necessary point

³² Headquarters, Department of the Army (HQDA), Army Doctrine Reference Publication (ADRP) 3-09, *Fires* (Washington, DC: Government Printing Office, 2012), 19.

³³ *Ibid.*, 13.

to be discussed with all major combat operations and the likelihood of success or failure on the battlefield.

ADRP 3-09 defines both deep and shaping fires. From the ADRP: “Fires in support of shaping operations disrupt or destroy the enemy’s attacking echelons and fire support, mission command, and logistic infrastructure. Fires may be used to limit the enemy’s ability to shift forces to meet attacking friendly maneuver forces and to sustain the momentum of the attack.”³⁴ The ADRP defines fires in support of deep operations as follows: “Deep operations involve efforts to disrupt uncommitted enemy forces (ADP 3-0). These types of operations frequently tie to events in time or space. Fires in support of deep operations disrupt enemy movement, command and control, sustainment and fires assets.”³⁵

Deep and shaping fires gain or maintain momentum for friendly forces by getting into and ahead of the enemy’s decision-making cycles. The primary means through which these fires are deliberately planned and executed is the targeting process. The Joint Task Force or Land Component Command normally controls or coordinates deep and shaping fires at the operational and strategic levels. Deliberate targeting lends itself to these levels of warfare, as it prioritizes and integrates effects to achieve the commander’s intent. Targeting also facilitates the commander’s visualization of the deep fight, both in space and time (the elements beyond his direct-fire weapons systems and beyond timelines for immediate commitment of maneuver). This case study will use the targeting

³⁴ HQDA, ADRP 3-09, 36.

³⁵ Ibid., 19.

methodologies in ATP 3-60 and JP 3-60 as the doctrinal basis for planning, executing and assessing deep or shaping fires, and the terms deep and shaping fires can be used interchangeably.

Direct supporting fires are defined in section 1-90 of ADRP 3-09 as fires in support of close operations: “Close operations involve efforts to have immediate effects with committed friendly forces- potentially in direct contact with enemy forces-to include enemy reserves available for immediate commitment (ADP 3-0). Fires in support of close operations include counterfire, indirect fire protection capabilities, combined arms for air defense, close air support (CAS) and final protective fires.”³⁶

These are the fires required immediately by a maneuver commander to gain or maintain a tactical advantage. Unlike deep fires, these are less likely to be pre-planned, and more likely to be dynamic targets. Similar to deep and shaping fires, close fires require integration with all warfighting functions and may be conducted across multiple domains of air, land, sea, space and information.

JP 1-02 defines counter-battery fires (a sub-task for close supporting fires) as “Fire delivered for the purpose of destroying or neutralizing indirect fire weapon systems.”³⁷ According to ATP 3-09.12, there are two ways to conduct counter-battery fires: proactive and reactive. Proactive counterfire is achieved by locating and attacking enemy indirect fire systems through the targeting process. Reactive counterfire occurs

³⁶ HQDA, ADRP 3-09, 19.

³⁷ JCS, JP 1-02, 127.

when enemy indirect fire systems are detected after engaging friendly forces and friendly indirect systems return fire.

Risk management discussions will focus on battlefield survivability. ATP 3-09.50 covers technical fires delivery and survivability in a variety of tactical situations. This research will focus on offensive field craft, using ATP 3-09.50 to describe techniques and procedures used to fight and survive in a contested environment. The FNA will investigate surviving in a high-counterfire threat, in an area with contested air superiority, and in a hybrid threat environment.

In summary, the CBA will be scoped to cover the core responsibilities of the fires warfighting function, and tactical risk. The FNA will produce the doctrinal tasks required to meet the threat (which will be articulated in more detail in the remainder of this section), and the capability gaps that correlate with these tasks. This will populate the second and third columns of the chart shown below.

Table 1. Capability Gap Crosswalk		
Function/Component	Task Required	Capability Gap(s) Identified
Targeting		
JIM Fires Integration		
Counter-Battery Fires		
Risk		

Source: Created by the author.

The Military Problem

In order to complete scoping the problem, the identified missions and tasks need to be compared to a military problem. A geographically-neutral scenario will be created strictly for this purpose, using the Russian threat model. That scenario follows:

It is the spring of 2019. After six months of political unrest in a former Soviet Republic, demonstrations turn violent. This has been preceded by months of reporting from pro-Russian media outlets about the incompetency of the current government. The violent demonstrations escalate to skirmishes, first with police and then with the army as they attempt to regain control of the border regions.

Reports of foreigners involved in the fighting surface, but are dismissed by Russian leadership as western propaganda. As the fighting intensifies, so do the weapons involved. Rebels are seen using SPG-9 recoilless rifles, RPGs and vehicle-mounted DShK machine guns. Casualties begin to mount, particularly amongst the ethnic Russians who populate the border regions. Amidst calls to end the violence, Russia declares support to the rebels, announcing an aid package that consists of advisors and some limited arms support.

Social media outlets show signs that Russian support is stronger than suspected. Brigade and Divisional units are identified moving into the region as Russian soldiers inadvertently post locations or telling pictures. Within days, reports reach the west of entire friendly mechanized regiments being annihilated by artillery strikes. Within a two weeks, the rebel forces are able to secure a key port of entry to the region. U.N. member nations condemn the actions by Russia, who stalwartly denies large-scale involvement beyond protecting ethnic Russians along the border. After only two days of deliberation,

the U.N. Security Council narrowly passes a resolution authorizing member nations to use force to restore peace and secure the port of entry.

This scenario is based on the model that Russia used in North Ossetia in 2008 and in the Ukraine in 2014. Using this as a basis for the employment and effectiveness of Russian indirect fire systems, along with the imperatives created by the analysis of the mission sets, will provide the articulated threat for this study.

The military problem—Russian indirect fire systems capabilities—is comprised of three categories: (1) the amount and technical capabilities of Russian indirect fire systems, (2) how they will be employed on this hypothetical battlefield, and (3) how effective these capabilities and methods will be.

To begin the discussion of Russian artillery it must be understood that the Russian army views artillery as a separate force on the battlefield, to be leveraged much the same way as a commander would use a maneuver element. It is not primarily used as a direct support system. Additionally, Russian fires are consolidated with the echelon's commander, creating maximum mass and flexibility for the commander. This comes at the expense of the subordinate element commander. For example, within a Battalion Tactical Group (BTG), the artillery is controlled by the battalion commander. A subordinate commander would need to request support through the BTG. More often, commanders use their artillery as a deep strike option. The July 2014 artillery strike on Ukrainian mechanized forces near Zenopillya characterized this tactic: Russian commanders were able to halt a highly successful offensive operation and deny their

enemy key terrain without engaging in direct-fire combat.³⁸ This mindset is necessary context to understand how the Russian army organizes and employs artillery.

Adversary Capabilities

Under the 2014 doctrine, Russian ground forces are organized around Combined Arms Brigades.³⁹ These brigades (either motorized rifle or tank) are equipped with two cannon, one rocket, one anti-tank and one air defense battalion, along with an electronic warfare company.

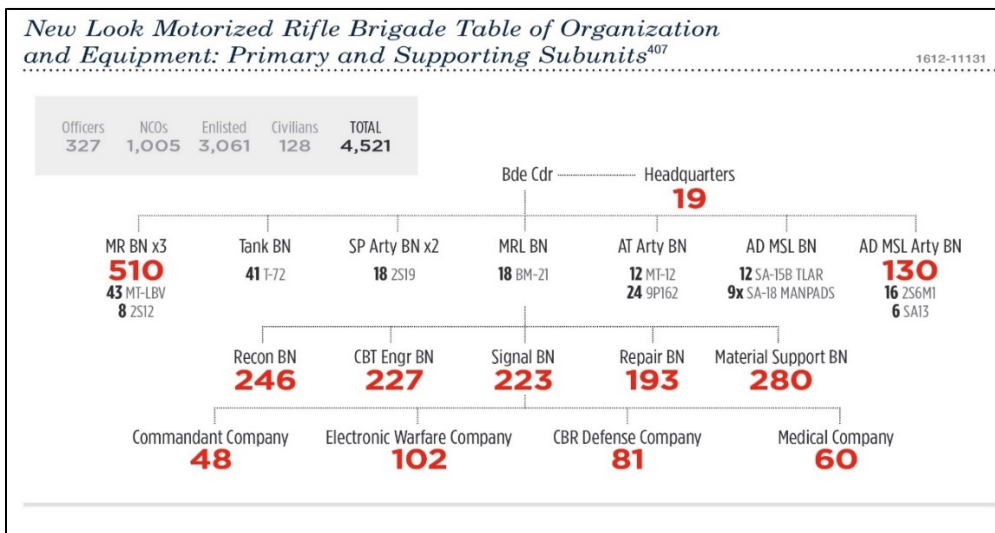


Figure 3. Russian Combined Arms Brigade Organization

Source: Defense Intelligence Agency, *Russia Military Power: Building a Military to Support Great Power Aspirations* (Washington, DC: Government Printing Office, 2017), 50.

³⁸ AWG, *Russian New Generation Warfare Handbook*, 23.

³⁹ DIA, *Russia Military Power: Building a Military to Support Great Power Aspirations*, 50.

This brigade structure has a comparable amount of artillery to an American division, but in practice, the Russian army has been deploying and conducting large-scale training with Battalion Tactical Groups (BTGs).⁴⁰ The BTGs are improvised combined arms organizations created by attaching artillery, air defense, anti-tank and armor companies to a maneuver battalion.

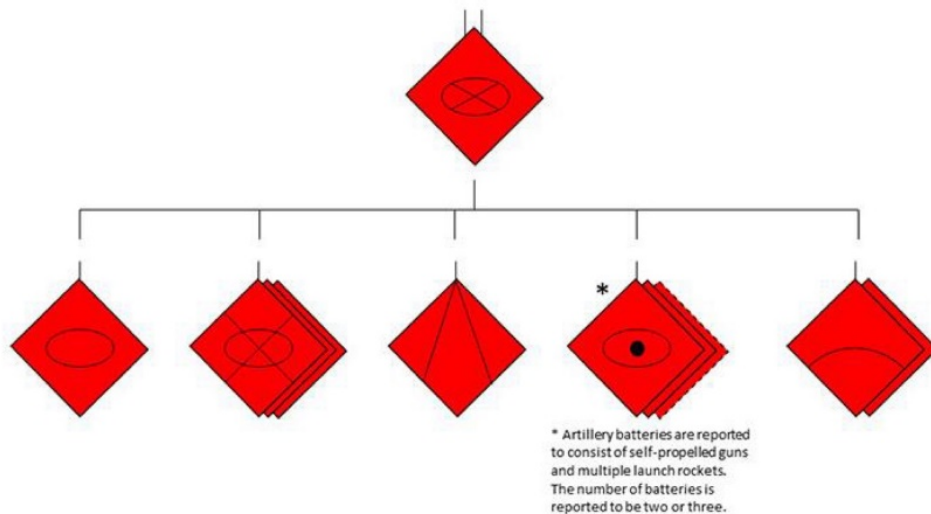


Figure 4. Russian Battalion Tactical Group Organization

Source: CPT Nicholas Fiore, “Defeating the Russian Battalion Tactical Group,” *Armor* (Spring 2017): 3.

There are an estimated sixty brigade or regimental sized formations in the Russian army, each of which can field one to two BTGs.⁴¹ This gives the Russian army about

⁴⁰ CPT Nicholas Fiore, “Defeating the Russian Battalion Tactical Group,” *Armor* (Spring 2017): 1.

⁴¹ Scott Boston and Dara Massicot, *The Russian Way of Warfare: A Primer*. (Santa Monica: RAND Corporation, 2017), 5.

sixty-six deployable BTGs now, with an ambitious goal of one hundred and five available in 2019.⁴² Each is given two cannon artillery batteries and one rocket artillery battery. Artillery batteries are organized into two three-gun platoons, for a total of twelve howitzers and six launchers per BTG.⁴³

Similar to the U.S. Army, Russian Division, and Corps headquarters have a general support brigade of rocket artillery. Divisional structures as a whole have changed significantly with the emphasis on brigades and battalions; under the Soviet model, a division numbered around 13,000 men. Most contemporary Russian divisions are about 9,000 men strong with two brigades per division headquarters.⁴⁴ Corps and army headquarters are interchangeable; with eight divisions fielded, corps and army headquarters will usually consist of four to six brigades (two to three divisions) and combat enablers.⁴⁵

This conscription program of the Russian army needs to be considered as well. The deployable BTGs are composed of contract soldiers, while the rest of the brigade is filled with 12-month conscripts.⁴⁶ This is the principle reason why the BTG is the primary deployable unit; there aren't enough trained and ready soldiers available to deploy whole brigades. The effect of this organizational structure is that it places one

⁴² DIA, *Russia Military Power: Building a Military to Support Great Power Aspirations*, 52.

⁴³ AWG, *Russian New Generation Warfare Handbook*, 23.

⁴⁴ Ibid.

⁴⁵ Ibid.

⁴⁶ Boston and Massicot, *The Russian Way of Warfare: A Primer*, 4.

Russian BTG on a front against a NATO brigade in the contingency outlined above.⁴⁷

The BTG has a similar number of combat enablers as a western brigade, with one-third the maneuver capability. Tube-for-tube, the numbers are even with NATO and U.S. force structures.

Adversary Equipment

The Soviet army developed and manufactured a wide array of combat vehicles; many of these are still in use with the Russian army. There are a few new systems that have been developed under the New Look reforms of the 21st century, so this study will assume that they are the most capable and will focus on those. At least one system of each caliber (122mm and 152mm cannon artillery and 122mm, 220mm and 300mm rockets) will be highlighted in order to establish the capabilities, ranges and effectiveness of Russian artillery equipment and munitions.

Cannon Artillery. Direct support fires for the BTG are provided by either the self-propelled 2S19 or the towed 2A65. Both howitzers mount a 152mm “MSTA” cannon barrel with a 54-caliber tube and an 18-liter chamber. The length of the tube, combined with a more powerful rocket-assisted round, give it a maximum muzzle velocity of 828 meters per second, base range of 45 kilometers and maximum range with rocket-assisted rounds of 62 kilometers. The 2S19 is an auto-loading system with automated fire control. The 2A65 differs only in that it is towed and is, therefore, less mobile.⁴⁸

⁴⁷ Fiore, “Defeating the Russian Battalion Tactical Group,” 3.

⁴⁸ TRADOC G-2, *Worldwide Equipment Guide, Volume 1: Ground Systems*, 7-30.

Rocket artillery. While they still field modestly updated Soviet-era cannon systems, the Russian army has made significant developments with rocket artillery. In the Ukraine they have deployed a combination of 300mm, long-range 9A52 (Smerch) rockets in conjunction with shorter-range 122mm BM-21 GRAD rockets.⁴⁹ Aside from the composition of rocket artillery, munitions have increased significantly in lethality. The Russian artillery has used Dual-Purpose Improved Conventional Munitions (DPICM) in conjunction with thermobaric (fuel and air mixture) round simultaneously. The Zenopillya attack used a mix of these rounds fired from BM-21 launchers just inside Russian territory with devastating effects, as they destroyed a motorized infantry battalion and rendered an entire regiment combat ineffective with just one volley of fire.⁵⁰ The BM-21 and Smerch and 2S19 technical specifications are outlined in the table below.

⁴⁹ AWG, *Russian New Generation Warfare Handbook*, 23.

⁵⁰ Ibid.

Table 2. Russian Artillery Capabilities					
Weapon System	Primary Armament	Range (KMs)	Warhead Weight	Rate of Fire	Reload Time
BM-21 GRAD	122mm HE FRAG	20.38	18.4kg	40 Rnds in 20 seconds	10 min.
	122MM HE FRAG type 90 (Chinese Variant)	32.7	18.3kg		
**also fires smoke, incendiary, chemical, RF jammer, Illumination, AT and AP mines					
9A52 Smerch	300mm HE FRAG	90	258kg	12 Rnds in 38 seconds	36 min.
	300mm DPICM	90	235kg		
	300mm sensor-fused MOTIV	90	233		
**also fires smoke, incendiary, chemical, leaflet, thermobaric and R-90 UAV					
2S19 SP	152mm HE	24.7		Max: 8 RPM	
	152mm HEAT	1 km (direct)		Norm: 6 RPM	
	152mm HE Base Bleed	29		Sust: 4 RPM	
**also fires DPICM, DPICM-BB, HE-RA, Incendiary, Chemical, Flachette and semi-guided					
**the 152mm 2A65 is ballistically matched to the 2S19					

Source: Created by the author using information from U.S. Army Training and Doctrine Command G-2, *Worldwide Equipment Guide, Volume 1: Ground Systems* (Washington, DC: Government Printing Office, 2012), 7-41.

Russian rocket artillery has the capability to place a very high volume of fire on a target in a single volley. Conversely, reloading is completed by hand when most competitor's systems have semi-automated reloading with "pods" of multiple rounds. This presents commanders with significant survivability issues; once a launcher fires all of its rounds, the crew has to dismount to reload. This lengthy process leaves the

launchers and crews vulnerable to counterfire if they remain in place to fire a second volley.

Counter-battery acquisition. The Russian army first began a significant effort to develop counterfire capabilities while observing the U.S. army in Vietnam. They used the Six-Day War and the Yom Kippur War in the Middle East along with their own experiences in Afghanistan to refine radar and locating techniques and equipment.⁵¹ Unclassified sources cannot determine the number, type or basis of issue for counter-battery radar systems in use with the Russian army; accordingly, the IL219 and IL220 are used for comparison. They have been produced in higher quantities than any of the competitive system, making them more likely to be found in Russian army formations. Both systems are capable of detecting high- and low-angle indirect fires, and can track incoming and outgoing rounds. The IL219 is known to have the ability to locate and track up to five UAVs at a time within its 60-degree search zone; it is not known at this time if the IL220 has this capability. Both systems have a semi-fixed array mounted on a tracked vehicle, with 60 degrees of search capability. The moderately limited search cone means that individual radars will either be exposed to anti-radiation threats for longer periods of time, or will require the use of more systems to generate adequate radar saturation of the battlefield.

⁵¹ MAJ James Holcomb, *Soviet Artillery Utilization* (Fort Leavenworth, KS: U.S. Army Combined Arms Center, 1988), 3.

System	Detection Ranges (km)				UAV Tracking	Maximum Simo TrackS
	Mortar	Cannon	Rocket	TBM		
IL219	12-15	8-10	12-20	35	Y	12
IL220U	30	20	40	55	unk.	unk.

Source: Created by the author using information from U.S. Army Training and Doctrine Command G-2, *Worldwide Equipment Guide, Volume 1: Ground Systems* (Washington, DC: Government Printing Office, 2012), 6-7.

Tactical Employment of Capabilities

With the primary delivery and acquisitions systems identified, the next step in the FAA is to determine how they will be employed. In order to understand how the maneuver fight might unfold it is critical to first understand the philosophy behind the New Look reforms.

The redesigned Russian army is built to maintain standoff from enemies while gathering combat power for a quick and catastrophic blow.⁵² Based on the new organization and doctrine, it appears that their defense establishment believes that the days of apocalyptic war are over. In an era limited war, they are structured to deal a crippling defeat to their enemies early enough in the conflict to keep it from escalating into the kind of total war that was prevalent in until the mid-1940's. This is illustrated in

⁵² Boston and Massicot, *The Russian Way of Warfare: A Primer*, 4.

the extensive investments made in combat multipliers (such as anti-access/area denial, or A2/AD networks) and in the lethality of long-range weapons systems.⁵³

In the 2017 RAND Corporation Study, *The Russian Way of Warfare*, Scott Boston and Dara Massicot summarize the new model of warfighting in ten points:

Ten Key Characteristics of Russian Warfare

1. Russia's military is postured to defend its homeland and vital industrial and population centers, using layered, integrated air defenses and a limited number of defensive bulwarks and buffer states to buy space and time to react to potential strikes or invasion.
2. Russia hopes to defend its territory and avoid decisive engagement with a peer or near-peer competitor by fielding defensive systems and strike weapons with extended ranges. These extended ranges would also provide operational advantages to Russian forces conducting offensive operations near its borders.
3. Given Russia's conventional weaknesses in a protracted war with a peer or near-peer adversary, it will attempt to use indirect action strategies and asymmetric responses across multiple domains to mitigate perceived imbalances. Russia will attempt to terminate a conflict quickly, using a series of measures that aim to control escalation dynamics.
4. The ultimate insurance for Russian escalation management is its arsenal of tactical and strategic nuclear weapons; Russia may threaten to employ or employ its weapons in response to a conventional attack that would undermine the regime's control of the state or threaten Russia's nuclear deterrent.
5. Several Russian and Soviet operations have involved a rapid, coordinated coup de main attempting to achieve campaign objectives in a very short period of time; this emphasis is likely to remain, especially in preplanned operations.

⁵³ The conclusions in this paragraph are the views of the author. They are based on the study of Russian doctrine and force structure, combined with the current state of the Russian economy and the nation's ability to produce materials required for long-term, full-scale war. The author concludes that the Russian defense ministry rebuilt their army with a pragmatic view of the future in mind, understanding that protracted war with the industrial capability of the west was unwinnable.

6. Recent reforms have made a substantially larger percentage of the land components of the Russian Armed Forces available at higher readiness for short-notice contingencies, while reducing the total number of units; units can deploy by rail to quickly build ground combat power within Russia in response to a crisis.

7. Conventional and unconventional warfare approaches will likely be mixed in many potential conflict scenarios; special operations forces, paramilitaries, and sympathetic civilians may provide targeting, situational awareness, and some harassment capabilities throughout the battle space.

8. At the operational and tactical levels, Russia will likely focus on disrupting, degrading, or destroying adversary command and control and enemy power projection capabilities through the use of kinetic fires, cyber/electronic warfare, and direct action by maneuver forces.

9. Russia has a limited number of long-range conventional precision strike capabilities that could be used against key operational and strategic targets, especially those at fixed, known locations.

10. On the ground, Russian tactics will likely reflect a heavy emphasis on massed indirect fires (particularly long-range fires), with the effects of these fires exploited by highly mobile vehicles with substantial direct fire capability.⁵⁴

Dara and Massicot's first two points highlight the philosophical basis of the New Look, while the final three points articulate exactly what the Russian army aims to accomplish with indirect fires. High-payoff targets will include fixed-site infrastructure used to project power into their sphere of influence. These may include port facilities, airports, and regional command nodes. Once confronted with a maneuver force, they will attempt to gain or maintain the initiative through the use of massed lethal fires, as seen in Zenopillya. These measures are layered in a sophisticated A2/AD system that incorporates theater ballistic missiles, electronic warfare, cyber warfare, air defense and

⁵⁴ Boston and Massicot, *The Russian Way of Warfare: A Primer*, 3.

field artillery.⁵⁵ Boston and Massicot are careful to note, however, that the number of complete A2/AD systems is limited due to cost and logistical requirements.⁵⁶

Additionally, the Russian military has taken measures to increase lethality that cannot be reconciled with western principles of land combat. While most NATO nations (excluding the U.S.) have banned cluster-producing munitions out of fear for the safety of noncombatants, they have developed new and more lethal systems. Thermobaric rounds use oxygen from the air surrounding the bomblet to produce a significantly hotter explosion, resulting in blast waves that are exponentially stronger than those from conventional explosives. This has been packaged into a cluster round to produce effects on an area target; when massed from a single battery of rocket artillery, it can destroy everything inside of a 1.5-kilometer square.⁵⁷ In addition to the designed lethality of these systems, the Russian military has demonstrated minimal regard for collateral damage in recent conflicts, employing these systems in urban areas in the Syrian conflict.⁵⁸

At the tactical level, Russian artillery doctrine is formulaic in nature and highly prescriptive. They still use principles developed during the Soviet era for the application of fires. Their doctrine centralizes assets and control along a critical axis, so that

⁵⁵ DIA, *Russia Military Power: Building a Military to Support Great Power Aspirations*, 52.

⁵⁶ Boston and Massicot, *The Russian Way of Warfare: A Primer*, 4.

⁵⁷ AWG, *Russian New Generation Warfare Handbook*, 22.

⁵⁸ DIA, *Russia Military Power: Building a Military to Support Great Power Aspirations*, 53.

commanders have maximum flexibility to apply combat power at their own echelon. This combat power is used in accordance with a strict set of parameters that dictate everything from the density of howitzers required to attack a defense, to the percentage of rounds that need to be fired in the first three minutes of a barrage.⁵⁹ This allows commanders to plan for artillery in the same way that they would plan for a maneuver element. If recent trends of Russian units deploying to the Ukraine and Syria as battalion task forces instead of brigade tactical groups holds true, it makes sense for commanders to maximize long-range effects before making direct-fire contact with maneuver units.⁶⁰

Russian artillerymen began a focus on survivability in the 1970s that permanently shaped the way they deploy and shoot battery and battalion formations. As counter-battery capabilities in competing militaries grew, the Soviet army debated the best methods to provide accurate fires and to remain survivable. Prior to this time units would lay howitzers as close together and in as straight a line as possible. This simplified fire control—calculations could be made for the center of the battery and rounds would still mass effectively on targets—but made an easy target for counter-battery fires and air strikes. If they wanted to create better survivability conditions, Russian artillerymen had to learn how to quickly compute data for howitzers distributed across a wide area and in irregular formations. This measure was adopted along with several others. One survivability constraint that remains, though, is the lengthy reloading process for rocket artillery. As an answer for this the Russian army moved to almost exclusively using

⁵⁹ Holcomb, *Soviet Artillery Utilization*, 4.

⁶⁰ Fiore, “Defeating the Russian Battalion Tactical Group,” 5.

massed fires. They will typically fire missions at the battery or battalion level and attempt to destroy the intended target with a single massive volley. Once firing is complete, the unit will displace in order to reload and occupy a new position.⁶¹ This technique makes fixing and delivering counter-battery fires very difficult, as opposing forces may have only two to three minutes to acquire, process a mission and deliver counter-battery fire.

The last trend to note with Russian artillery employment is the conduct of proactive counter-battery fire. According to ATP 3-09.12 *Field Artillery Target Acquisition*, there are two types of counterfire: proactive and reactive. Proactive counterfire is designed to destroy the enemy's indirect fire capability before it can be used; reactive occurs immediately following an engagement by the enemy's artillery.⁶² Russian artillery augments counter-battery radar systems with tactical UAV capability, and have used it successfully in the Ukraine. On average, Ukrainian units found that they would receive effective indirect fires within eight minutes of spotting a Russian UAV observing their location.⁶³

In summary, the Russian army is manned, organized and equipped to defend the homeland by deterring potential aggression through strength.⁶⁴ Their doctrine is one of

⁶¹ CPT Keith Dayton, *Artillery Survivability: The Soviet Perspective* (Garmisch, Germany: U.S. Army Russian Studies Institute, 1981), 5-7.

⁶² Headquarters, Department of the Army (HQDA), Army Techniques Publication (ATP) 3-09.12, *Field Artillery Target Acquisition* (Washington, DC: Government Printing Office, 2015), 2-1.

⁶³ AWG, *Russian New Generation Warfare Handbook*, 22.

⁶⁴ Paulina Sinovets and Bettina Rez, *Russia's 2014 Military Doctrine and Beyond: Threat Perceptions, Capabilities and Ambitions* (Rome: NATO Defense College, 2015), 7.

aggressive defense through offensive capability, and at the national and strategic level, they have demonstrated a willingness to initiate conflict in support of national interests.

The output of the FAA is a list of tasks required to achieve the assigned mission set. This section defined the mission and scoped the role of USAFA within six specific fires concepts, given a hypothetical threat scenario. The final task list was developed using training tasks identified in the Combined Arms Training Strategies (CATS). A cross-walk of the six fires concepts with artillery Mission Essential Task Lists (METLs) produced the final set. CATS tasks are used in this research to define the baseline capabilities of the U.S. Army, since they are the official standard for the execution of doctrine.

Table 4. Capability Gap Crosswalk – Part II			
Function/ Component	Task #	Task Required	Capability Gap(s) Identified
Targeting	06-BDE-5431	Execute Targeting Process	
	06-BDE-6061	Integrate Sensors through targeting	
JIM Fires Integration	06-BDE-5066	Employ Fires*	
	06-BDE-1084	Synchronize Fire Support	
	061-284-3039	Clear Fires	
Counter- battery fires	06-BDE-6050	Conduct counterfire operations	
	06-BDE-2006	Direct Employment of FA Acquisition Assets	
Risk	06-BTRY- 4004	Defend FA Operations	
*the "Employ Fires" task includes direct support fires, long-range shaping fires and suppression of enemy air defense (SEAD)			

Source: Created by the author.

Section II – Functional Needs Analysis

The Functional Needs Analysis (FNA) is the second step in the CBA. It is a process used to identify gaps in current and projected capabilities. U.S. Army technical capabilities (USAFA equipment and organization) and the tasks identified in the FAA are defined before being compared to the professional dialogue. This determines what gaps exist between projected and actual capabilities. Once gaps are isolated, they are filtered through a risk assessment and then prioritized before being presented for the Functional Solution Analysis.

U.S. Army Field Artillery Organization

U.S. Army Field Artillery is organized into three categories: direct support (organic to Brigade Combat Teams), Field Artillery Brigades and general support (echelons above brigade, or EAB) battalions. Divisional Artillery headquarters (brigade-equivalent) are now organic to division headquarters.

Field Artillery Brigades (FABs) are the highest echelon of field artillery in the U.S. Army.⁶⁵ The FAB is designed to conduct strike operations and to provide direct support, general support or general support/reinforcing fires to any formation. The FAB can serve as a Force Field Artillery (FFA) headquarters for any echelon, but is not organic to any echelon. It possesses the same mission command capability and can conduct the same fires synchronization roles as a Division Artillery headquarters; the

⁶⁵ Note: the term “Field Artillery Brigade,” or FAB, may be used interchangeably with “Fires Brigade,” or FiB. Both refer to the same element. ADP 3-09 deletes the term “Fires Brigade,” and replaces it with “Field Artillery Brigade.”

principle difference between the FAB and DIVARTY is the presence of organic support (signal company and support battalion) and organic firing units.

General Support/Echelons Above Brigade (GS/EAB) artillery battalions are located in the Army National Guard. Each has a training and readiness oversight relationship with a Fires Brigade, but they may be separated by significant distances. The Army National Guard has twelve HIMARS battalions, two MLRS, nine Paladin self-propelled battalions and seven towed artillery battalions. They are designed to be task organized underneath a FAB headquarters for combat operations, and in total, provide an additional ten brigades' worth of artillery assets.

Direct support artillery battalions are organized in three configurations: M109A6 self-propelled 155mm units (direct support to ABCT/HBCT), M777A2 155mm towed units (direct support to SBCT) and composite M119A3 105mm towed and M777A2 towed units (direct support to IBCT). Each is organized with three batteries of six howitzers.

U.S. Army Field Artillery Equipment

The U.S. Army currently fields three cannon artillery systems: the M109A6/7 Paladin (155mm self-propelled), the M777A2 (155mm towed), and the M119A3 (105mm towed). Most of these systems are found in BCT direct support battalions; the exception is nine M109A6 and seven M777A2 battalions in the National Guard. The M109A6 compares most closely to the 2S19, while the M777A2 compares to the 2A65. The Russian army does not field an equivalent to the M119A3, but also does not field the

same light infantry that the howitzer supports. Even the Russian VDV (airborne) is equipped with infantry fighting vehicles and self-propelled howitzers.⁶⁶

Cannon artillery. The M109A6 and M777A2 are ballistically matched and have similar capabilities. In spite of the larger tube diameter, U.S. 155mm howitzers have a range that is significantly shorter than the MSTA tubes on Russian artillery. This is due to a smaller chamber capacity (approximately 13.5 liters) and a 39-caliber tube.⁶⁷ The reduced chamber capacity and shorter tube allow for less propellant and less time for gasses to accelerate rounds in the tube, which produces the range of only 23 kilometers for a standard round and 30 kilometers for rocket-assisted projectiles. For comparison, the Swiss 155mm “Archer” howitzer has a maximum range of 40 kilometers. The rate of fire is also slower than the 2S19, with a maximum of four rounds per minute and sustained rate of three rounds per minute⁶⁸.

The M119A3 is a 105mm towed howitzer system designed to support light infantry. It features a digital fire control system and weighs 4,700 pounds. It is small enough to be towed by a High Mobility, Multi-Wheeled Vehicle (HMMWV), and light enough to be slung underneath a UH-60 Blackhawk with the howitzer crew in the aircraft. It has a maximum range of thirteen kilometers (unassisted) and twenty kilometers (rocket assisted). With a rate of fire of eight rounds per minute (three RPM

⁶⁶ DIA, *Russia Military Power: Building a Military to Support Great Power Aspirations*, 56.

⁶⁷ Technical data on U.S. Army artillery systems is derived from the author’s professional knowledge.

⁶⁸ DIA, *Russia Military Power: Building a Military to Support Great Power Aspirations*, 56.

sustained), it provides fire support to dismounted or motorized infantry during airborne, air assault operations and operations in terrain that would normally be inaccessible for larger artillery.⁶⁹

Rocket artillery. Rocket artillery provides the long-range indirect fires capability for division, corps and armies. It is found in Field Artillery Brigades and is not usually task organized to a direct support role. The U.S. fields two variants: the tracked M270A1 and the wheeled M124 HIMARS. Both fire the same 227mm rockets from six-rocket pods. The M270A1 carries two, while the C-17-transportable M124 carries one pod. Each pod can be substituted for a single MGM-140 Army Tactical Missile System (ATACMS). The ATACMS provides a medium-range ballistic missile capacity for the artillery. While MLRS systems carry fewer rockets than the Russian GRAD or SMERCH launchers, ranges are not as dissimilar as with cannon artillery, and reload times are significantly shorter for the MLRS and HIMARS. Technical data for U.S. artillery systems is compared to Russian artillery in the table below.

⁶⁹ DIA, *Russia Military Power: Building a Military to Support Great Power Aspirations*, 56.

Table 5. Comparative Artillery Capabilities					
Weapon System	Weapon System	Weapon System	Weapon System	Weapon System	Weapon System
BM-21 GRAD	122mm HE FRAG	20.38	18.4kg	40 Rnds in 20 seconds	10 min.
	122MM HE FRAG type 90 (Chinese Variant)	32.7	18.3kg		
**also fires smoke, incendiary, chemical, RF jammer, Illumination, AT and AP mines					
9A52 Smerch	300mm HE FRAG	90	258kg	12 Rnds in 38 seconds	36 min.
	300mm DPICM	90	235kg		
	300mm sensor-fused MOTIV	90	233		
**also fires smoke, incendiary, chemical, leaflet, thermobaric and R-90 UAV					
M2701 A1	227mm Guided DPICM	70	258kg	12 Rnds in 40 seconds	3 min.
	227mm Guided Unitary	70	404 submunitions		
2S19 SP	152mm HE	24.7		Max: 8 RPM	
	152mm HEAT	1 km (direct)		Norm: 6 RPM	
	152mm HE Base Bleed	29		Sust: 4 RPM	
**also fires DPICM, DPICM-BB, HE-RA, Incendiary, Chemical, Flachette and semi-guided					
**the 152mm 2A65 is ballistically matched to the 2S19					
M109A 6	155mm HE	23		Max: 4 RPM	
	155mm Rocket Assisted	30		Norm: 3 RPM	
	155mm Excalibur	40		Sust: 3 RPM	
**also fires DPICM, DPICM-BB, HE-RA, Incendiary, Guided (PGK), Illumination and FASCAM					
M119A 3	105mm HE	13		Max: 8 RPM	
	105MM Rocket Assisted	20		Norm: 3 RPM	
**also fires Incendiary, Smoke and Illumination					

Source: Created by the author using information from U.S. Army Training and Doctrine Command G-2, *Worldwide Equipment Guide, Volume 1: Ground Systems* (Washington, DC: Government Printing Office, 2012), 7-41.

Counter-Battery Target Acquisition. The U.S. Army’s primary counter-battery radar is the AN/TPQ-53. The Q-53 replaced the Q-36 and Q-37, which were legacy systems that each tracked only low- or high-angle fires. The Q-53 is capable of tracking UAVs as well as incoming and outgoing mortar, rocket and cannon fires. It can be operated in 90-degree mode with a 60 kilometer range, or in 360-degree mode with a 20 kilometer range. It can track incoming and outgoing fires at the same time and is capable of up to 50 simultaneous tracks.⁷⁰ Two are fielded to every direct-support battalion and to every DIVARTY and FAB headquarters. This system is compared to the Russian IL219 and Ukranian IL220 in the table below.

System	Detection Ranges (km)				UAV Tracking	Maximum Simo TrackS
	Mortar	Cannon	Rocket	TBM		
IL219	12-15	8-10	12-20	35	Y	12
IL220U	30	20	40	55	unk.	unk.
AN/TPQ-53	20	34	60	60	Y	50

Source: Created by the author using information from U.S. Army Training and Doctrine Command G-2, *Worldwide Equipment Guide, Volume 1: Ground Systems* (Washington, DC: Government Printing Office, 2012) p. 7-6.

U.S. Army Field Artillery Employment

Unlike the Russian Army, the U.S. Army prefers to use artillery in support of maneuver. As outlined in section one, USAFA sets conditions for maneuver forces. In the

⁷⁰ HQDA, ATP 3-09.12, 6-1 – 6-7.

Russian army the opposite is typically true. USAFA firing units can provide one of four types of support: direct support, reinforcing, general support and general support/reinforcing. The roles of general support and direct support artillery are discussed in this section, as well as the Joint Air-Ground Integration Cell located in Division and Corps headquarters.

DIVARTY/ FAB. The DIVARTY and FAB have roles that are almost completely interchangeable. Notable differences include the FAB's organic firing units (HIMARS or MLRS) and the DIVARTY's organic relationship to a Division headquarters. The DIVARTY has no organic firing units, and the FAB does not have an organic relationship to any corps or division headquarters. ATP 3-09.90, *Division Artillery Operations and Fire Support for the Division*, lists the following tasks for a DIVARTY (with the interchangeability of the two organizations, the FAB is assumed to have the same tasks when performing the same role).

- Support the integration of Army, Joint, and Multinational fires.
- Deliver fires.
- Mass fires in support of the decisive operation.
- Conduct targeting.
- Manage the establishment of common survey and meteorological data across the division area of operations (AO).
- Provide the counterfire headquarters for the division and synchronize radar employment in the division AO.
- Advise the division commander on standardization of all FA training and certification.
- Support brigade combat team (BCT) standardization, training, certification and mentoring of FA battalions.

- Provide the force field artillery headquarters for the division.
- Provide indirect fires in support of the division when indirect fire assets are allocated to the DIVARTY.
- Provide suppression of enemy air defenses (SEAD), when task organized with firing units.
- Provide input to the division's shared common operational picture.⁷¹

Direct support artillery. The only echelon at which direct support artillery is organic to a maneuver formation is the Brigade Combat Team.⁷² At this level, artillery units provide counter-batter acquisition and surface-to-surface fires for the maneuver commander. ATP 3-09.42, *Fire Support for the Brigade Combat Team*, describes the tasks assigned to direct support artillery:

Plan BCT fires

Integrate and synchronize BCT fires and GS/GSR fires from division and higher

Provide responsive and accurate fires to the BCT

Provide counter-battery fire against mortar, cannon and rocket fires

Provide target acquisition capability to the BCT⁷³

⁷¹ Headquarters, Department of the Army (HQDA), Army Techniques Publication (ATP) 3-09.90, *Division Artillery Operations and Fire Support for the Division* (Washington, DC: Government Printing Office, 2017), 1-1.

⁷² There is one exception to this: Task Force 1-28 Infantry, in the 3d Infantry Division, is an infantry battalion task force located at Fort Benning, GA. 1-28 IN has one battery (A Battery, 1-10 FA) of M119A3 howitzers assigned.

⁷³ Headquarters, Department of the Army (HQDA), Army Techniques Publication (ATP) ATP 3-09.42, *Fire Support for the Brigade Combat Team* (Washington, DC: Government Printing Office, 2016), 1-4.

It is important to note that targeting is not a doctrinal role of BCT-level fires. While a BCT may conduct informal targeting to help facilitate the operations process, it lacks organic assets (such as MLRS) to deliver effects beyond the range of 155mm artillery. The BCT also lacks the organic capability to integrate joint fires, but an Air Force Tactical Air Control Party (TACP) can and usually is attached to the BCT headquarters to facilitate the delivery of joint fires.

JAGIC. The Joint Air Ground Integration Cell (JAGIC) is a fires organization within the Division Current Operations cell. The JAGIC is manned by Air Force and Army personnel, and is the synchronization point for joint fires in the division. ATP 3-91.1, *Joint Air Ground Integration Cell* lists the following current operations functions as the JAGIC's responsibility: fires, airspace control, interdiction coordination, friendly force identification, and information collection.⁷⁴

The JAGIC is the lowest echelon where joint fires can fully integrate with maneuver operations. In the brigade and battalion, TACPs are able to synchronize and conduct terminal guidance for joint fires, but the JAGIC is equipped with all of the battle command systems and warfighting functions required to plan for and manage airspace.

Trend Analysis

Doctrine, CATS tasks and tables of manning and equipping provide a detailed insight to the capabilities that USAFA should be able to provide for a maneuver commander. However, real-world readiness, maintenance, training and operational

⁷⁴ Headquarters, Department of the Army (HQDA), Army Techniques Publication (ATP) 3-91.1, *Joint Air Ground Integration Cell Operations* (Washington, DC: Government Printing Office, 2014), 1-3.

tempos invariably degrade capability. In order to determine the difference between what USAFA should be able to accomplish and what USAFA is accomplishing in real-world training, this research studied the last five years' worth of professional dialogue.

Documents studied included the field artillery, armor and infantry branch magazines, combat training center (CTC) trends, major exercise AARs, and theses and monographs.

Issues and recommendations were grouped by the basic premise of the issue or recommendation; exact wording did not have to match for two sources to count as, for example, the need to clearly articulate the roles and responsibilities of fires in doctrine. If one source listed a need to articulate the role of the Division FSCOORD, while another listed the need to specify the role of the Division Fires Cell, both were placed under the same heading. This allowed the research to find definitive trends within the aggregated recommendations and issues.

Issues and recommendations were then catalogued by the need to add, delete or reinforce the issue within one of the DOTML PF domains. Only those recommendations and issues that involved the doctrine, organization and training domains were catalogued in this research, but it is important to note that the professional dialogue almost exclusively ignored potential material solutions. Articles and trends that addressed the current indirect fires overmatch focused heavily on training and the application of doctrine. The results of the analysis are shown in the table below.

Table 7. Issues and Recommendations

Issue/Recommendation	Add	Delete	Reinforce
Organization			
Clearly articulate roles and responsibilities for the fires WFF in doctrine	3		
Add detailed guidance on how to structure and run a Division - Theater fires cell	1		
Exercise Design			
Train on existing systems in JIM environment to increase interoperability			5
Conduct JIM training at all echelons to increase interoperability			7
Codify the ASCA manual in doctrine to provide a blueprint for JIM training	2		
Establish a formal network solution for JIM training exercises	1		
Conduct all culminating training events (CTEs) across multiple complete echelons			7
Targeting			
Train using established, rehearsed and doctrinal targeting methodologies IOT shape the deep fight			13
Utilize joint targeting doctrine	1		
Conduct targeting using multiple cycles of varied lengths for different target types	2		
Air to Ground Integration			
Simplify airspace coordination measures to maximize the flexibility of fires (POO and POI ROZs)		3	
Use existing resources to train DIV-Theater fires' cells on the conduct of AGI (ASI 5A school)			5
Field Craft			
Utilize speed and mobility to survive inside of the enemy counter-fire bubble			3
Use low-angle fires at higher charges to mitigate EN target acquisition effectiveness			1
Practice and conduct proactive counter fire			4
Increase STRAC for home-station training on cannon-delivered precision-guided munitions			3
Increase proficiency in core tasks: shoot, move, communicate, RSOP, security & dispersion			8

Source: Created by the author.

Targeting. Trends show that the army is not doing an effective job of shaping the deep fight through targeting. The most common issue is the inability to plan more than 72 hours in advance. The Air Force publishes the Air Tasking Order on a 72-hour cycle; the ATO tasks all air component assets in the Joint Task Force. Army planners have consistently failed to get beyond this timeline in order to use joint and multinational delivery systems—with their longer ranges—to provide deep and shaping fires. The assets are available to mitigate the surface-to-surface range advantages of Russian artillery, but are not being planned for effectively. This was most often attributed to a lack of training and experience. Personnel are either not qualified to conduct joint targeting, or did not get enough practice in garrison training prior to executing a culminating training event.

Exercise design. The next highest number of recommendations focused on training and exercise design. Recommendations to include multiple, complete echelons (entire division staffs training with entire BCTs) during major exercises is both an emerging best practice and strong recommendation to reshape training moving forward. Training with joint, interagency and multinational capabilities more consistently is the other prevailing recommendation. Assets exist within sister services and allied nations that are capable of affecting the Russian fires structure, but like targeting, the U.S. Army is not well practiced on how to plan for, integrate and synchronize those systems.

Air-ground integration. Ground forces have not fought under contested airspace since the Korean War. It is expected that, given the air power and A2/AD capabilities of the Russian army, this would no longer be the case. Articles and trends pointed out that units have been unable to provide responsive surface-to-surface fires while utilizing

fixed-wing and helicopter support. Most issues concern airspace management, and the inability to transition from aerial support to indirect fires (or the reverse) quickly. Units are not creating or using doctrinal control measures and are not well-trained on how to execute on a rapidly changing battlefield. Again, the doctrinal methods exist, but are misused or executed poorly in practice. USAFA elements also do not execute suppression of enemy air defenses (SEAD) well, from the targeting process through execution with surface-to-surface fires. They are accustomed to the air component handling the SEAD fight and have not consistently been able to provide responsive deep fires for the aviators.

Counter-battery operations. The Russian army's counter-battery capability makes this the most dangerous environment USAFA has faced since the Korean War. American artillery doctrine prescribes survivability measures, but they have not been a point of training emphasis until recently. As the priorities for training have shifted to major combat operations, units have struggled to provide continuous fires coverage in a contested environment. In almost every case investigated this is due to the inability to employ effective survivability measures, including radar queuing schedules, survivability moves, the use of terrain and cover and concealment and position selection. Doctrine and systems have been validated through these exercises, but they are not consistently executed well. This is another area where targeting can help, and where unit struggles reflect more training shortfalls than doctrinal.

Capability Gaps

This data collected by this study from the professional body of knowledge identified the specific gaps listed in the table below. In accordance with the CBA process, the nine gaps listed in the right-hand column are the output of the FNA. The final step of

the CBA—the functional needs assessment—will weigh the recommendations found in the trend analysis against each of the gaps to find suitable and feasible solutions for the short-term future.

Function/ Component	Task #	Task Required	Capability Gap(s) Identified
Targeting	06-BDE-5431	Execute Targeting Process	Execution of targeting process across multiple echelons
	06-BDE-6061	Integrate Sensors through targeting	Tying acquisition assets from collection to execution plans (NAI/TAI development)
JIM Fires Integration	06-BDE-5066	Employ Fires*	Using surface-to-surface fires to shape the deep fight (beyond 72 hours)
	06-BDE-1084	Synchronize Fire Support	Develop and use fire support planning products across multiple echelons (HPTL/TSS/AGM)
	061-284-3039	Clear Fires	Conducting SEAD in a contested air environment
Counter-battery fires	06-BDE-6050	Conduct counterfire operations	Synchronize and integrate responsive JIM fires against range-superior enemy forces
	06-BDE-2006	Direct Employment of FA Acquisition Assets	Manage airspace in order to provide responsive JIM fires
Risk	06-BTRY-4004	Defend FA Operations	Provide proactive and reactive fires against range-superior enemy forces
*the "Employ Fires" task includes direct support fires, long-range shaping fires and suppression of enemy air defense (SEAD)			

Source: Created by the author.

Each of these gaps has the ability to contribute to mission failure in the research scenario. None of these gaps are catastrophic enough to cause overall failure on their own; the inability of USAFA to accomplish any does translate to mission failure for the proponent. If the role of the artillery is to set conditions, they will not do so without accomplishing each of the tasks above. Significantly, these gaps also prevent the U.S. Army from providing a credible ability to win, and as a result, to deter Russian forces. As long as Russia maintains the appearance of indirect fire superiority over USAFA, ground forces will not be able to provide a credible deterrence.

The identified shortfalls are all proficiency gaps. Current personnel and equipment readiness factors were not considered in this research and it is assumed that sufficiency is not an issue. Trend analysis strongly indicated that the capability to mitigate Russian indirect fire advantages exists if proficiency levels can be raised across the force. The need for recapitalization was not investigated because material solutions were not considered. Even so, nothing in the trend analysis suggested a need to mitigate aging equipment and systems.

This study will move forward with nine proficiency-based capability gaps for the FSA. Each of these gaps contributes to an overall inability to shape the deep fight, which is the one common thread throughout the professional discussion: the U.S. Army has the tools, but is unable to execute the systems and processes needed to affect the enemy before he engages ground forces with direct and indirect fires. The most prevalent gaps identified are: (1) doctrinal execution of the targeting process across multiple echelons (BDE-DIV-Corps). (2) The effective utilization of acquisition assets to shape deep fires (NAI/TAI development). (3) Employ surface-to-surface fires to shape the deep fight. (4)

Develop and use doctrinal fire support planning products across multiple echelons. (5) Provide surface-to-surface SEAD fires in a contested air environment. (6) Synchronize and integrate responsive JIM fires against range-superior enemy forces. (7) Manage airspace in order to provide responsive JIM fires. (8) Provide proactive and reactive counter-battery fires against range-superior enemy forces, and (9) Provide responsive close fires under a persistent counter-battery threat.

Section III – Functional Solution Analysis

The functional solution analysis (FSA) is the final step in the CBA. This research will discuss solutions that fall into the doctrine and training domains of the DOTML PF model. Organizational solutions were investigated but none will be proposed as a result of this study. The FSA will be presented in three parts: the R2 position, a stakeholder analysis and the revised R3 position.

R2 Position

The R2 position consists of the recommendations exactly as the research concludes. While they are based on the study of the professional dialogue, they are academic in nature and are not yet screened against the needs of the agencies who would be most affected by proposed changes. Solutions are grouped by the DOTML PF domain they fall under to facilitate implementation.

All of the recommendations focus on the ability of a division to shape the deep area. As the lowest echelon capable of integrating JIM capabilities, the division is the lowest echelon capable of accomplishing this. The deep area is defined by FM 3-0:

1-150. A *deep area* is the portion of the commander's area of operations that is not assigned to subordinate units (ADRP 3-0). Operations in the

deep area involve efforts to prevent uncommitted or out of contact enemy maneuver forces from being committed in a coherent manner or preventing enemy enabling capabilities, such as fires or air defense, from creating effects in the close area. A commander's deep area generally extends beyond subordinate unit boundaries out to the limits of the commander's designated AO. The purpose of operations in the deep area is to set the condition for success in the close area or to set the conditions for future operations. Operations in the deep area might disrupt the movement of operational reserves, for example, or prevent an enemy from employing long-range cannon, rocket and missile fires. Planning for operations in the deep area includes considerations for information collection, airspace control, joint fires, obstacle emplacement, maneuver (air and ground), special operations, and information operations.⁷⁵

The analysis of the professional dialogue shows a clear trend towards an inability to affect the deep area as defined in FM 3-0. The need to employ existing capabilities from sister services and from multinational partners is paramount to this effort to provide battlefield effects beyond the range of organic systems.

Doctrine. Only two clear trends emerged from the within the doctrine domain: the need to define roles and responsibilities more clearly, and the simplification of air-ground integration procedures. TC 3-09.90 *Division Artillery Operations and Fire Support for the Division*, defines the roles and responsibilities of the DIVARTY staff, but only discusses the Division fires cell roles in targeting. JAGIC operations are governed by TC 3-90.91 *Joint Air Ground Integration Cell Operations*, which clearly articulates roles and responsibilities of the personnel in the JAGIC. This leaves the division fires cell somewhere between the DIVARTY staff and the JAGIC, performing an undefined role. If the DIVARTY manages subordinate echelon firing units and the JAGIC plans, integrates and synchronizes joint fires, the division fires cell should bridge the gap

⁷⁵ Headquarters, Department of the Army (HQDA), Field Manual (FM) 3-0, *Operations* (Washington, DC: Government Printing Office, 2017), 1-34.

between the two. It should provide the fires representation in the division current operations cell (COIC), run the targeting process, and provide personnel to both plans and future operations; the fires cell is no longer manned sufficiently to achieve more, and the remainder of the functions are conducted by the JAGIC and the DIVARTY staff. The effect of the undefined roles is seen as the professional dialogue struggles to define roles through experiential knowledge, which typically comes at the expense of failures in training. The first recommendation is for the Fires proponent to add one additional section to TC 3-09.91, explaining the role of the division fires cell and of each of the personnel allocated to the cell.

The second recommendation for doctrine is the simplification of airspace clearance procedures. The trend analysis showed that units rely on anecdotal knowledge to conduct the process and do not understand how to efficiently manage airspace. The focus of this recommendation is the division; echelons below division are only equipped to monitor airspace instead of managing it. ATP 3-52.1, *Multi-Service Tactics, Techniques and Procedures for Airspace Control* does not specify a method for synchronizing army surface-to-surface fires and joint assets in a unit's airspace. In the "Fires Integration" chapter, the ATP only states that careful planning and continuous coordination are required to execute surface-to-surface fires.⁷⁶ In this scenario, rotary wing aviation will stay below 500 feet AGL and fixed wing above 10,000 feet to maximize survivability, unless in direct support of ground forces. Coordinating altitudes

⁷⁶ Headquarters, Department of the Army (HQDA), Army Techniques Publication (ATP) 3-52.1, *Multi-Service Tactics, Techniques and Procedures for Airspace Control* (Washington, DC: Government Printing Office, 2015), 21.

can be set at 10,000 feet to ensure any fires that might pose a danger to fixed-wing aviation are cleared through the air component, while allowing the ground commander to manage all of the airspace below that level. If the only users below 10,000 feet are rotary-wing aviation and fires, and rotary-wing is staying below 500 feet, the amount of airspace that needs to be cleared is much smaller. In fact, only a 500-foot tall restricted operations zone needs to be established around the points of origin and impact for fires in order to safeguard rotary-wing assets. By not clearing the airspace in which no aviation assets are flying, fires will become significantly more responsive. The recommendation is to codify this technique in doctrine so that units can train this way consistently enough to become proficient with airspace management.

Training/Leadership Recommendations. All of the training and leadership recommendations found in the trend analysis are components of exercise design, so this recommendation is for the design of unit culminating training events. The current design for these training events is the CTC (combat training center) model. There are four CTCs in the U.S. Army: the Mission Command Training Program (MCTP), National Training Center (NTC), Joint Readiness Training Center (JRTC) and Joint Multinational Readiness Center (JMRC). The MCTP travels to units and conducts virtual Command Post Exercises (CPXs) known as “Warfighter Exercises.” The training audiences for the warfighters include brigade, division and corps headquarters. The other three CTCs are physical locations used by BCT-level formations. Units travel to these locations for 30-day training rotations. This study is recommending the synchronization of CTC training to facilitate multi-echelon training. Warfighter exercises are typically supported by response cells from the training audience’s subordinate units, while CTC rotations are

usually supported by a “white cell” from the brigade’s division headquarters. Neither system allows complete staffs to train with the full complement of either subordinate or higher headquarters.

If a division were to conduct a warfighter exercise that is linked virtually to at least one brigade conducting a simultaneous CTC rotation, they would gain the experience of maneuvering formations and managing complete staff processes. Additional subordinate BCTs can be virtual units in the simulation, which would allow a division headquarters to fight along a contiguous front, and would give the BCT on the ground additional context for their mission set. This is based on the emerging best practice known as distributed multi-echelon training.

The principle complaint with the targeting process is that units do not have enough experience to execute effectively. Conducting exercises as complete divisional units (it is not necessary to use organic brigades for a division; this can be accomplished using any unit in a CTC rotation) allows staffs to work through multiple, complete iterations of the targeting process and to see the results in real time. It would also facilitate the execution of simultaneous targeting cycles of different types. A staff could execute dynamic, deliberate and stability operation targeting processes at the same time, gaining valuable experience in shaping future operations. Deliberate targeting cycles would start during mission planning and dynamic once operations begin. Further, this model allows units to develop and implement collection plans that use organic sensors. In a warfighter, division and corps headquarters manage collection plans for virtual sensors. In a BCT rotation at a CTC, radar systems that should belong to a division remain with the BCT. The dialogue analysis showed a strong trend of units not using counter-battery

radars effectively to shape the deep fight. If the deep fight belongs to the division and the division is not present, the BCT cannot be expected to train on the deep fight effectively.

The second advantage of multi-echelon training is the ability to integrate JIM fires in routine training. The current model training rotation leaves most joint training opportunities to Regionally Aligned Forces (RAF), with a few select training exercises abroad. Given the capabilities in a division headquarters, these new, complementary CTC exercises are able to integrate joint and multinational capabilities with maneuver units at the BCT level. Units will get the opportunity to work through the problems inherent to joint operations: communications, networks, processes, systems and languages. Proficiency can only be built through repetition, and this training model will provide the regular repetitions needed for the army as a whole.

Field Craft. The final recommendation set is to reinforce current trends; CTC rotations are now fought with a persistent counter-battery and A2/AD threat. At the conclusion of the New Generation Warfare Study, the AWG made the same recommendation. All training must assume that enemy forces can place effective counter-battery fires on friendly units. This kind of training needs to translate to home-station training as well; again, proficiency can only be obtained through repetition. USAFA needs to be just as adept at defense against artillery as they are against ground threats.

Units have demonstrated success countering the Russian indirect fire threat at the CTCs when they accept prudent tactical risk. The Russian army's artillery has three significant advantages: they can shoot further, have more tubes and have less restrictive rules of engagement (collateral damage and clearance of fires). However, USAFA is more accurate, is allowed more tactical flexibility, and can acquire, shoot and reload

faster. CTC rotations have shown that commanders who are willing to accept risk can close the gap and use speed and accuracy advantages to win the counter-battery fight. This requires units to either find the enemy first or to bait the enemy into firing first. When units can find the enemy first, joint fires can be leveraged to close the range gaps. When the enemy can be forced to shoot first, counter-battery fires from prepared units can destroy enemy indirect fire systems (or cripple command and control/logistical support) before the enemy is able to move or counter.

Stakeholder Analysis

The recommendations in the R2 position is an academic solution to the problem; they do not account for the tendencies, mission or motivations of the organizations who would be tasked to carry out the changes. Recommendations need to account for those factors to ensure the change is going to be executable and lasting. To accomplish this the R2 recommendations will be filtered through the lens of three primary stakeholders in the solution. Those stakeholders are the Fires Center of Excellence, the Combat Training Centers (and the Combat Training Center Directorate at Fort Leavenworth), and the Army Capability Integration Center (ARCIC). This section will explain who the stakeholders are, how the problem effects them, and what resistance they might have to the solution. This section will conclude by revising the R2 position to meet the stakeholder's projected concerns, producing the final R3 recommendations.

Fires Center of Excellence. The Fires Center of Excellence (FCoE) is the headquarters of the U.S. Army's artillery, located at Fort Sill, Oklahoma. The FCoE houses the Field Artillery and the Air Defense Artillery schools, Directorate of Training Development (DOTD), Capabilities Development and Integration Directorate (CDID)

and the Army Targeting Center (ATC). The FCoE develops is the nerve center of the U.S. Army's Field Artillery; it is the lead agency for all DOTML PF issues relating to the Field Artillery.

The FCoE is currently working on a number of material solutions for the problem, and is constantly revising and updating artillery doctrine. DOTD at Fort Sill would be the executor of any updates to Army Techniques Publications (ATPs), and the Field Artillery Commandant (the FA deputy to the commander of the FCoE) would be the approval authority.

There are two likely arguments that the FCoE would make against the R2 position: doctrine needs to leave some flexibility for the commander, and the FCoE is heavily invested in material solutions for the problem. The first—and less complicated issue—is the revision of doctrine. The gaps in division-level fires doctrine may be intended to provide some flexibility for commanders. If doctrine becomes too prescriptive, it limits how a commander and a unit can approach differing problem sets and situations. Doctrine is not intended to provide a “one size fits all” solution, and these recommendations could be viewed as such. The second issue is the heavy investment already made by the branch in material solutions. This research was unable to locate a single capability being developed now that was not material.⁷⁷ In a fiscally constrained environment, funding is heavily reliant on need, and problems like this create an urgent need across the formation. This research has found that the overmatch may not be as

⁷⁷ The author contacted multiple offices within Fort Sill DOTD and CDID, as well as EUCOM planners between October and December 2017. None were able to provide any non-material capabilities being developed to address this gap. All sources acknowledged the gap, and that capabilities were being developed.

severe as is thought. What the Russian army is likely to be able to field against a western force is far less formidable than what they could field on paper.

The concerns will be mitigated through the way the recommendations are presented; nothing in the solution will be significantly changed. This research has shown that units are requesting the additional clarification on airspace management and division fires. In presenting the solution to the chief decision-maker this needs to be clear. Likewise, material concerns will be used to provide the context for training recommendations when presenting the data. The U.S. Army is tasked to provide the credible ability to defeat any threat; combining superior range and lethality with increased proficiency will accomplish that task, and the training proficiency will both mitigate the gap until material solutions are fielded, and will prevent or delay the development of new gaps in the future force.

Combat Training Center Directorate. The CTC directorate at Fort Leavenworth, KS, is an agency within the Combined Arms Center-Training that develops the CTC programs for MCTP, NTC, JRTC and JMRC. According to their website, the CTC directorate will, "...lead the Army's transition to Unified Land Operations as described in ADP 3-0."⁷⁸ The CTCD is the synchronizing agency that ensures all four programs are training units in accordance with U.S. Army priorities and doctrine. Importantly, they set the framework for CTC threat scenarios.

⁷⁸ U.S. Army Combined Arms Center, "Combat Training Center Directorate (CTCD)," U.S. Army, accessed April 19, 2018, <https://usacac.army.mil/organizations/cact/ctcd>.

The CTCD is the coordinating agency responsible for implementing the R2 training recommendations. For this study the coordinating agency role means that the CTCD is also representative of the individual CTCs' concerns and requirements. The directorate's responsibilities for implementing the change include building a scenario (to include threat, capabilities and situation) that aligns with both the new model's training objectives and those of the rotational units. The CTCD will work with FORSCOM to align brigade, division and enabler rotations that support army readiness and availability requirements. Finally—and perhaps most importantly—the CTCD will set conditions for the CTCs to work together through simultaneous rotations.

The CTCs are expected to provide the most resistance to the R2 position, since this is where the most significant change is recommended. For the three physical locations, the introduction of a live division headquarters introduces an uncontrolled variable to the scenario. The constructed headquarters in place now is a training aid for the subordinate brigade. Exercise controllers cannot regulate the outputs of a real division staff to shape the exercise for the rotational BCT the way they do now. This leads to the second point of contention for the CTC establishment: who is the primary training audience for each rotation? Each CTC is independent; the CTCD does not command the four programs, it only coordinates between them. Inevitably, battlefield friction will cause one of the units to struggle during training operations. The inability of one unit to accomplish a task will strongly impact the other, and will force a decision on whose training objectives are more important. Retraining units during a scenario will have the same effect.

The solution for these issues has three parts: first, develop an Exercise Rules of Engagement (EXROE) that covers inter-CTC relationships. If one unit's objective are indeed more important, it should be specified in the EXROE. The EXROE needs to specify which CTC covers each event, and information sharing for AAR purposes. Additionally, a decision maker needs to be specified who can settle issues between two CTCs if they arise. Traditionally, CTCs have been able to reconstitute and reset struggling units to make sure training objectives are met. This model requires the CTCs to adopt an "all or nothing," mindset. If a unit is destroyed, it will have to remain as such until the replacement/reconstitution can be completed through normal channels. This might mean some units not meeting training objectives, but the realism and experience gained by the larger unit outweighs this concern. Finally, the scenario can be simplified by working on a 1-to-1 radio for divisions to live BCTs. A single BCT, assigned as the main effort, can run live through a rotation with virtual units on its flanks. This gives the units the context and experience required to build proficiency. It does mean that leaders will need to accept the probability of failure and friction during the rotation, but the findings of this research show that those might prove the most valuable lessons. The U.S. Army cannot afford to try to put all of these systems together for the first time in combat.

Army Capabilities Integration Center. The Army Capabilities Integration Center (ARCIC), based out of Fort Eustis, Virginia is responsible for providing oversight to the capability development process, managing the Army Warfighting Challenges and for integrating new capabilities with the force. The Joint Modernization Command (JMC) is a component of ARCIC at Fort Bliss, TX responsible for testing new concepts and capabilities. The Warfighting Challenges represent the intellectual process for developing

capabilities, while the exercises conducted by JMC are used to experiment with their implementation in the force. The techniques recommended in this study—effective use of targeting and field craft to find and destroy enemy artillery—would be formally evaluated in the Army Warfighter Assessment (AWA) exercise. Once validated, ARCIC would incorporate the new concepts into the interim solutions for Army Wafighting Challenges.

There are no apparent reasons why ARCIC and the JMC would disagree with attempting to implement the proposals of this research. The JMC's role in implementation is to allow the concept to be tested and to provide objective feedback on the validity, and AWAs are already conducted as distributed multi-echelon exercises. They have no stake in the success or failure, but would play a major role in the distribution and implementation of the solution.

R3 Position

The final recommendations presented are based on the analysis of the stakeholder's view on the problem. The R2 position recommended refining division-level fires doctrine, and creating a new CTC training model based on emerging best practices. The stakeholder analysis identified several mechanisms needed to ensure the feasibility of the solutions, which are summarized in the refined position below.

Doctrinal refinements. The research recommends two additions to doctrine. The first is to articulate the roles and responsibilities of the division fires cell, and the second is to define airspace management procedures that simplify delivery of fires in a division battle space. The second proposes that only the point of origin and point of impact be cleared for the delivery of fires, and that doctrine codifies a 500-foot ceiling for rotary-wing aviation (modified by exception).

Distributed, multi-echelon training. This study proposes a significant change to the way the U.S. Army conducts CTC rotations. Distributed, multi-echelon training seeks to take advantage of the network and simulation capabilities by combining division warfighter exercises with a live BCT rotation in one of the CTCs. More importantly, it seeks to train the primary tactical warfighting element as a complete system. To accomplish this, the CTC Directorate at Fort Sill will need to align rotations, set training priorities between the two units, and develop and exercise “Rules of Engagement” that governs how the two CTCs involved will work together. Adjacent units for the live BCT will be virtual, and the live BCT will be the main effort for the division and enablers.

The distributed training model facilitates the complete execution of targeting and the integration of JIM assets. The additional repetitions build proficiency that, based on the research in this study, does not commonly exist in the force today. The ability to target effectively and to integrate JIM assets is critical to overcoming the range gap between Russian and U.S. Artillery systems. It allows USAFA to leverage advantages in speed, accuracy, target acquisition capability and tactical flexibility.

The final change is to teach commanders to accept the tactical risk needed to close with and defeat enemy artillery forces. This is accomplished by training leaders to understand the vulnerabilities of the Russian threat model. They must understand what the threat is likely to look like (actual deployable, ready forces) versus what it could look like (perfect-world scenarios), and where Russian capability gaps exist (mission processing times, reload times and vulnerability of logistical and command structures).

The stakeholder analysis revealed several control measures needed to implement these proposals. The Combat Training Center Directorate is the action agency for these

controls. The first is the alignment of BCT and division CTC rotations, and the second is to set priorities for training objectives between the simultaneous rotations. The third is to develop a scenario with the live BCT as the division main effort and with virtual BCTs as adjacent units, and the final control measure is the development of exercise ROE to govern interactions between CTCs during simultaneous rotations.

Chapter Summary

Chapter four completed the Capabilities-Based Assessment. It compared the problem (the Russian threat model indirect fire capability) to U.S. Army capabilities to produce the capability gaps. These gaps were then analyzed against the current professional dialogue to find viable contemporary recommendations to solve the problem. The last step was to compare the recommendations to the positions of three primary stakeholders, and to then produce refined recommendations for action.

The analysis in this chapter showed that the U.S. Army is capable of mitigating the range and numerical superiority of Russian indirect fires. The Russian Army lacks the readiness to place numerically superior forces in the field, and is far slower and less accurate in execution. Additionally, supply chains are highly vulnerable to disruption. The U.S. Army can take advantage of these vulnerabilities by executing the current doctrine to standard. Currently, divisions and BCTs consistently fail to shape the deep fight in training exercises, which would allow for the efficient employment of Joint and Multinational systems capable of exploiting these vulnerabilities. The recommendation to significantly change training methodologies (the distributed, multi-echelon model) aims to address this training and leadership shortfall by training a complete division-level system. Chapter 5 discusses the execution of this recommendation in detail.

CHAPTER 5

RECOMMENDATIONS

Kotter's 8-step model is used to describe how the author would implement the change, as if the author were appointed as the action officer by the chief decision maker. Implementation of the change will be conducted in five phases: inform, plan, test, evaluate and implement. Those phases and timelines are discussed in detail below. For the purpose of this research, the Chief of Staff of the Army is the chief decision maker. With stakeholders in both the Training and Doctrine Command and in Forces Command, the decisions have to be made at the next higher echelon. This chapter concludes with personal reflections and with recommendations for future research.

Implementation

Establish a sense of urgency. This step has already been completed. Included as one of the Army Warfighting Challenges, the ability of USAFA to overcome the capability gap is a priority from the headquarters of the Department of the Army. The Russian New Generation Warfare study highlighted the lethality and effectiveness of Russian indirect fires, and training scenarios in every CTC are built to reflect the capability of this potential adversary.

Create a guiding coalition. This step would be accomplished in the first thirty days after being appointed as the action officer. Each stakeholder needs to be met individually and briefed on the proposed change. This briefing would include the vision for change discussed in the next step, and would involve a significant amount of time with the chief decision makers (CDM) and primary operations officers within the

stakeholder organizations. Gaining the commitment of the CDM within each stakeholder is absolutely critical to being able to implement the change. Within the FCoE this includes the commander and the directors of CDID and DOTD. For the CTCs, the author would target the director, and the operations officers for each CTC. At ARCIC, the Commander or the operations officer for the Joint Modernization Command would need to be part of this coalition. These personnel would give the change movement someone with either positional or personal power in all of the stakeholder organizations. This step is complete when the FCoE agrees to provide a cadre of personnel to train the concepts and the JMC agrees to incorporate them into the upcoming AWA. Finally, and perhaps most importantly, at least one Division Commander needs to be convinced of the merit of the training model. With the backing of one of the ten active duty commanders, the likelihood of conducting this training is significantly higher.

Develop a vision and strategy. This step would occur before the development of a guiding coalition. This is as simple as creating a ten-minute briefing for the stakeholders that communicates what the change is, what it is not, and what it can achieve. This vision would be based on the premise that we, as Army leaders, cannot wait for material solutions to be developed. We must train forces to fight and win today, with who and what they have right now.

Communicate the change vision. This would occur during the first and second phases. It begins with the stakeholder meetings and continues as the FCoE cadre and JMC planning teams are formed. The training cadre would then become the face of the vision as they work with maneuver units, first during the AWA and then prior to CTC

rotations. This step continues through the entire process and does not end until the new training model is codified by FORSCOM and the doctrinal updates are complete.

Empower broad-based action. Once the guiding coalition is formed and the cadre is in place, they will develop a training program. Likewise, the JMC planners for the AWA will need to own the concept in order to integrate it into the next AWA. At that point, the trainers will be given the latitude to refine the recommendations so that they are complete and can be implemented within existing systems. They will continue to retain this authority as the concept moves from the AWA to CTC rotations.

Generate short-term wins. Short-term wins begin during phase three testing. This phase is the AWA, where the ideas are tested with a live unit for the first time. Having CTC and maneuver division representatives attend to see the value of the concept first-hand should be enough to generate momentum. Once the AWA is complete, AAR comments would need to be distributed as widely as possible.

Consolidate gains. Following the evaluation of the AWA (phase four), implementation would begin at the CTCs. This is a 12-month goal, owing to the length of time to the alignment of CTC rotations with division warfighter exercises. These rotations need to be closely monitored with AAR results published and disseminated as widely as possible.

Institutionalize change in the organization. This begins when the implementation phase starts. In order to consider the change anchored in the Army's culture, it must be both codified and repeated. These recommendations meet that criteria once they are included in the CTC program way ahead and reflected in the FORSCOM training guidance. The final measure of effectiveness will be seen with the repeated use of this

training model. A second fiscal year of distributed multi-echelon is a strong indicator of the success of this change in training methodologies.

Ideas for the Future Researcher

Several topics were not explored due to the delimitations placed on this research by the author. Absolutely no material solutions were considered for the problem, nor were potential material approaches and/or capability gaps. This was owed largely to the classification of ongoing material solutions and associated testing and evaluation programs. A researcher willing to conduct a classified study can investigate the effectiveness of artillery against armor in order to refine material approaches, and to determine if the current approaches are appropriate to the threat.

A second potential topic is how can the Army achieve material overmatch. Considering the cost of current programs of record, the cost of current acquisitions efforts and the stock of materials, significant material change might be cost prohibitive. Allied nations possess 155mm indirect fire capability that could close the capability gap, or could even provide overmatch of Russian systems. Additionally, are there low-cost material modifications to programs of record that could mitigate the overmatch, such as increasing the tube length for existing howitzers? This research topic could find rapidly acquired, low-cost solutions for the gap.

Personal Lessons Learned

This study has truly been a formative experience. As a professional officer, the lessons learned are readily apparent and will be extremely valuable in future assignments and personal endeavors alike. This project began with a desire to learn about the

challenges facing the Field Artillery, and ended with a real appreciation of the power and depth of the professional body of knowledge. It has also been a lesson on where to find the professional dialogue and how to use it to answer challenging questions. Even more significantly though, was learning how to manage the process.

Understanding not only what the professional body of knowledge is, but also how to use it, will be a valuable skill as a field grade officer. There are few problems a soldier might encounter that someone hasn't already faced, found a potential solution for, and written about. This is the intellectual foundation of the profession, with career practitioners asking difficult questions and working hard to find answers. To have the opportunity to contribute to that effort is deeply and personally rewarding.

GLOSSARY

Counter Fire. Fire intended to destroy or neutralize weapons.⁷⁹

Decisive Action: “the continuous, simultaneous combination of offensive, defensive, and stability or defense support of civil authorities tasks.”⁸⁰ Decisive action will be used to describe conventional, force-on-force combat operations involving division-level units and above. It is intended to differentiate between the counterinsurgency and contingency operations that have dominated the last two decades of U.S. conflict and high-intensity Warfare upon which this study is based.

Degraded Operating Environment. The environment in which NATO formations are expected to operate, created by the threat area-denial/ anti-access network. In a degraded operating environment, the threat force is expected to significantly limit friendly ability to use Global Positioning System (GPS), electronic communications, unmanned aerial surveillance systems, guidance systems, and even electronic fuses.

Fires. “The use of weapons systems to create specific lethal or non-lethal effects on a target.”⁸¹

Fire Support. “[joint] Fires that directly support land, maritime, amphibious, and special operations forces, combat formations, and facilities in pursuit of tactical and operational objectives.”⁸²

Force Field Artillery Headquarters. provides centralized control for all organic, attached, reinforcing and general support reinforcing artillery in a maneuver unit, and acts as the counter fire headquarters for the supported maneuver unit.⁸³

⁷⁹ Headquarters, Department of the Army (HQDA), Army Doctrine Reference Publication (ADRP) 1-02, *Terms and Military Symbols* (Washington, DC: Government Printing Office, 2016), 1-23.

⁸⁰ HQDA, FM 3-0, G-1.

⁸¹ Headquarters, Department of the Army (HQDA), Field Manual (FM) 3-09, *Field Artillery Operations and Fire Support* (Washington, DC: Government Printing Office, 2014), G-7.

⁸² Ibid.

⁸³ Ibid., 1-25.

Joint Fires. “Joint fires are fires delivered during the employment of forces from two or more components in coordinated action to produce desired effects in support of a common objective. Developing policy, guidance and plans to employ operational and strategic fires are primarily joint activities.”⁸⁴

Joint Fire Support. “Joint fire support is joint fires that assist air, land, maritime and special operations forces (SOF) to move, maneuver and control territory, populations, airspace, and key waters. Effective integration, synchronization, and employment of joint fire support and joint targeting is essential to creating conditions that provide the supported commander freedom of action.”⁸⁵

Near-Peer Competitor. This phrase is frequently in this study. It is used to describe an adversary whose tactical, operational and/or strategic capabilities match or exceed those of the United States.

⁸⁴ Chairman, Joint Chiefs of Staff (JCS), Joint Publication (JP) 3-09, *Joint Fires* (Washington, DC: Government Printing Office, 2014), vii.

⁸⁵ *Ibid.*, vii-viii.

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