

RUSSIAN FIRES CAPABILITY GAP: A UNITED STATES NORTH
ATLANTIC TREATY ORGANIZATION COALITION ANSWER

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General Studies

by

RODERIC J. O'CONNOR, MAJOR, U.S. ARMY
B.S., Appalachian State University, Boone, NC, 2007
M.S., University of Tennessee, Knoxville, TN, 2017

Fort Leavenworth, Kansas

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Name of Candidate: Roderic J. O'Connor

Thesis Title: Russian Fires Capability Gap: A United States North Atlantic Treaty
Organization Answer

Approved by:

_____, Thesis Committee Chair
Herbert F. Merrick, M.A.

_____, Member
Lieutenant Colonel Timothy H. Draves, M.A.

_____, Member
MG (R) William D.R. Waff, D.Min.

Accepted this 14th day of June 2019 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

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ABSTRACT

RUSSIAN FIRES CAPABILITY GAP: A UNITED STATES NORTH ATLANTIC TREATY ORGANIZATION COALITION ANSWER, by MAJ Roderic J. O'Connor, 125 pages.

After 17 years of conducting counter-terrorism operations, the U.S. and its NATO partners have divested and reduced their ability to support maneuver operations with effective and lethal field artillery in Large Scale Combat Operations (LSCO). While we have focused on the Global War on Terrorism, our adversaries have continued to invest in and develop sophisticated fires and Anti-Access/Area Denial (A2/AD) capabilities. This thesis examines U.S., NATO, and Russian ground-based indirect fires by analyzing current doctrine, organizations, and material in the fires warfighting function. To further define the problem, this thesis analyzes current U.S. Army, U.S. joint, multinational, and Russian doctrine, as well as, periodical journals, academic works, and open-source published articles. To address the problem, this thesis identifies current capabilities and interoperability gaps, impediments to effective joint-multinational fires employment, the importance of combining capabilities, and provides recommendations to improve U.S.-NATO fires capability.

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ACRONYMS

ASCA	Artillery Systems Cooperation Activities
AJP	Allied Joint Publication
ATACMS	Army Tactical Missile System
ATP	Army Training Publication
BCT	Brigade Combat Team
DIVARTY	Division Artillery
ERCA	Extended Range Cannon Artillery
FA	Field Artillery
FCoE	Fires Center of Excellence
FM	Field Manual
GDP	Gross Domestic Product
GPS	Global Positioning System
GMLRS	Guided Multiple Launch Rocket System
HIMARS	High Mobility Artillery Rocket System
ICM	Improved Conventional Munition
INF	Intermediate-Range Nuclear Forces
JMRC	Joint Multinational Readiness Center
JTF	Joint Task Force
LSCO	Large-Scale Combat Operations
LSGC	Large-Scale Ground Combat
MLRS	Multiple Launch Rocket System
MMAS	Master in Military Art and Science
MRL	Multiple Rocket Launcher

NATO	North Atlantic Treaty Organization
PGM	Precision Guided Munition
PIM	Paladin Integrated Management
SUAV	Small Unmanned Aerial Vehicle
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle

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CHAPTER 1

INTRODUCTION

We can't know with absolute certainty what the future of warfare will hold, but we do know it will be exceedingly complex, unpredictable, and – as they say in the staff colleges – “unstructured.” Just think about the range of security challenges we face right now beyond Iraq and Afghanistan: terrorism and terrorists in search of weapons of mass destruction, Iran, North Korea, military modernization programs in Russia and China, failed and failing states, revolution in the Middle East, cyber, piracy, proliferation, natural and man-made disasters, and more.

— Hon. Robert M. Gates, *Department of Defense Archive*

Overview

The United States military and its multinational partners-allies are in the crux of a warfighting function challenge. Studies such as the Russian New-Generation Warfare Study and recent activities in Ukraine show that the last 17 years of conflict and shifting fiscal policies have left gaps in the nation's large-scale ground combat (LSGC) capability. In direct terms, the U.S. is out-gunned, out-ranged, and out-manned in the surface-to-surface fires realm. As a field artillery officer, and more broadly a fire supporter, this reality is troublesome. This thesis will further address how the U.S. military and its multinational partners at large, are inadequately prepared for future armed conflict in the fires warfighting function by analyzing relevant material, doctrine, and organizations.

Though capable, U.S. fires platforms, do not match the current threat, nor the projected threat 10-15 years into the future. U.S. 155mm cannon systems (M777A2, M109A6) are currently outranged by our strategic competitors by nearly twice the maximum range. U.S. rocket systems (M270A1, M142) face a similar mismatch. In order

to match our competitors, we must increase the number of systems (formations), range, and rate of fire.

Capable platforms are essential, but are they are only as capable as the munitions they deliver. I will delineate munition characteristics into two primary categories, range and lethality. In the short term, the U.S. can develop munitions (shells, rockets) with enhanced ranges to maximize the capabilities of our current platforms. The Army's Fires Center of Excellence and long-range precision fires Cross Functional Teams are testing new technologies. Burgeoning technologies such ramjet, hypervelocity rounds, and more powerful propellants are on the horizon. But the threat is here and now, it is critical, stop gap measures such as longer-range munitions must be employed.

Finally, and perhaps most importantly, are systems. The systems our military designs and implements to control fires, are as important as the platforms and munitions themselves. In order to counter our peer and near-peer threats, we must refine our systems to best fight LSGC. A key component of this, is joint and multinational interoperability. In the conduct of LSGC, the U.S. military must be able to, with and through, leverage the assets brought to bear by our friends and allies. A key element of our strength lies in our coalitions and alliances. However, a disjointed or ineffective coordination system (in this instance fires) degrades the threat and deterrence capability of our combined force.

While the U.S. and western military forces spent the last 17 years fighting extremists and the Global War on Terrorism, our adversaries have analyzed our weaknesses and developed systems to mitigate our capabilities. The ability to conduct surface-to-surface fires is a critical arm of the U.S. Army's unified land operations

construct specifically. The U.S. military must work quickly to enhance existing platforms, introduce new ones, and invest in the latest technologies. Our country's ability to execute LSGC and protect and support ground forces is in the balance.

Thesis Intent

The intent of this thesis is to broadly analyze the fires capabilities of the U.S. and NATO partners in comparison to our Russian competitors. The U.S. and its NATO partners face a fires capability gap. By analyzing key material, organizational, and doctrinal elements this thesis will attempt to quantify the size and significance of that capability gap, highlight current discussion on the topic, and finally propose protentional solutions and areas of future investment and research. To accomplish this task, this thesis will use a blended compare and contrast, descriptive research, and case study methodology to evaluate proposed solutions for validity.

Primary Research Question

How can we use multinational-joint fires to bridge the coalition fires capability gap?

Secondary Research Questions

1. What are the current coalition fires capabilities?
2. What are the current Russian centric fires capabilities?
3. Why do the U.S. and its coalition partners need to combine fires efforts?
4. What are the current impediments to the use of joint-multinational fires?
5. What upgrades and modernization efforts are the U.S., NATO, coalition, and partners making??

Qualifications

I am a Field Artillery Officer that has served in a variety of assignments from the team to Division Artillery (DIVARTY) level with over ten years of operational experience. I have deployed three times in support of Operation Enduring Freedom. Throughout my operational deployments and tactical level experience I have primarily worked with the U.S. Army's towed howitzer systems.

Bias

I came to the realization, that when presented with the idea that the United States, and by our extension our allied partners, do not have complete dominance in a discipline, there must by default, be a capability gap. Despite actively attempting to have a much more open and "joint" perspective, I found myself relying on the United States as the true litmus test of capability. I neglected to truly incorporate and respect the capabilities and investment many of our international partners bring to the table. It is easy to assume that if the U.S. does not have it, no one does; but this is not the case. Many of our friends and allies in NATO have made continued and significant strides in developing and investing in fires technologies and systems, often surpassing that of the U.S. To truly present analysis on how to bridge the capability gap, I need to better appreciate the tools of the greater team.

Assumptions

The dominate assumption throughout this thesis is that the U.S. military and its NATO partners acknowledge a coalition fires capability gap. This thesis assumes aggregately, a fires capability gap exists that is not negated by peripheral factors such as

superior command and control or special munition. A second assumption is the U.S. military and its NATO partners are able and willing to cooperatively, through mutual investment and interest, address this strategic problem set. The third assumption is that Russian forces abided by their current fires doctrine demonstrated during their activities in Ukraine. Limited information exists, particularly in the unclassified or open-source arena, regarding Russia's current fires doctrine and posture. Though actions in Ukraine were limited in scope, they provide the best and most recent example western analysts can use to analyze Russian warfighting doctrine and will be used in this thesis. This third assumption is founded on the theory that armies generally follow their doctrine, allowing for accurate analysis and study.

In the course of my research I was presented with the idea that the “gap” may not be so much a “capability” gap, but more precisely an “interoperability” gap. As mentioned in the presenter's biases, we can easily jump to the conclusion that a lack of superiority in a discipline equates to a capability gap. This however, neglects the capabilities provided by our fellow NATO members. Thus, the problem may lie in our ability to effectively operate together, hence an “interoperability” issue.

Definitions

Alliance. A relationship that results from a formal agreement (e.g., treaty) between two or more nations for broad, long-term objectives that further the common interests of the members. Operations conducted with units from two or more allies are referred to as combined operations.¹

Coalition. An ad hoc arrangement between two or more nations for common action. Coalitions are formed by different nations with specific objectives, usually for a

single occasion or for longer cooperation in a narrow sector of common interest.

Operations conducted with units from two or more coalition members are referred to as coalition operations.²

Fires. The use of weapon systems or other actions to create specific lethal or nonlethal effects on a target.³

Fire Support. Fires that directly support land, maritime, amphibious, and special operations forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives.⁴

Joint Fires. Joint fires are those delivered during the employment of forces from two or more components in coordinated action to produce desired results in support of a common objective.⁵

Partner Nation. A nation that the United States works with in a specific situation or operation.⁶

Unified Action. The synchronization, coordination, and/or integration of the activities of governmental and nongovernmental entities with military operations to achieve unity of effort.⁷

Unified Land Operations. How the Army seizes, retains, and exploits the initiative to gain and maintain a position of relative advantage in sustained land operations in order to prevent or deter conflict, prevail in war, and create the conditions for favorable conflict resolution.⁸

War Fighting Functions. A group of tasks and systems united by a common purpose that commanders use to accomplish missions and training objectives.⁹

Scope

This thesis will center on the U.S. Army as the mechanism in the multinational-joint fires discussion. The fires warfighting function is a vast enterprise. The inclusion of every service's fires systems and capabilities would result in a capabilities overview rather than keep the study focused on addressing the research question.

Limitations

The subject of fires capability and interoperability is a continually burgeoning topic, ability to pull data from international partners perspective is more limited. New technologies, processes are classified beyond the reach of this project. This thesis will discuss projected coalition equipment and technologies. On the contrary, information on future Russian systems, potentially poised to further develop the coalition fires capability gap in the new future, is not available and will not be analyzed. Accurate and comprehensive Russian fires and operational doctrine is limited in availability. For the purposes of doctrinal comparison, Russian focused doctrine will be in limited detail and developed partly through deduction based off of Russian capabilities and strategic focus. The Russian-Ukraine case study (presented in chapter four of this study) will assist in uncovering Russian fires doctrine.

Delimitations

The fires warfighting function is very diverse and includes numerous activities. This thesis will not explore, but may mention, areas such as electronic warfare, cyber, and aviation support. For several decades now, the U.S. and by extension its NATO partners, have heavily invested and relied on air superiority to offset and mitigate any

conventional fires capability gaps. The topic of air superiority-supremacy and fires mitigation, deserves its own extensive research and will not be included. This thesis will also avoid discussing other non-lethal fires, maneuver company-battalion mortar systems, and air defense.

Analyzing joint capabilities can be extensive and could easily dominate the study. There are too many competing and interwoven systems and capabilities to be segregated and analyzed in required detail to provide an accurate system by system, force by force technical comparison. The capabilities of U.S. joint military community will be focused at the JFLCC level, with predominant emphasis on the conventional surface-to-surface fires.

Similarly, to joint focused capabilities analysis, multinational capability analysis and assessment is a vast and complex an area of study. This thesis will not thoroughly analysis the capabilities of every NATO partner. Rather this study will look comprehensively at the United States' multinational partners' combined fires capabilities. To look at each country individually is not a practical approach for this study and would more likely result in a country encyclopedia of capabilities.

Significance of Study

The topic of a coalition fires capability gap is of significant concern to current and future operations. It is significant because of its strategic importance. A fires capability gap affects our ability as western military forces to project land combat power and protect and enable the employment of air power.

A significant fires capability gap denies us the strategic reach (range) to close with and destroy enemy ground forces. Partnerships, coalitions, and alliances inherently

rely on combined and joint efforts to achieve their common objective, hence creating such relationships. Combined efforts rely on effective interoperability. The inability of such relationships to interoperate effectively undermines the purpose, lethality, and threat deterrence of the greater organization.

Summary

This study analyzes the current state of affairs of the joint-fires warfighting function. Chapter one sets the stage for the analysis and findings to follow throughout this thesis. The chapter also introduced a defining problem and subsequent questions in the fires warfighting function. Chapter two further analyzes by examining the available literature and current discussion of the topic. The literature review will focus on four major areas. The first is the U.S. field artillery's primary professional publication, the *Fires* journal. The second area is outside analysis consisting of online published materials such as "think-tanks" articles. The third focus area is published research papers from the Command and General Staff College. The final areas of analysis are multinational, joint, and U.S. Army doctrinal publications and how they are prepared and aligned to address the current state of fires.

Chapter three presents the research methodologies used to support the thesis. It describes the evaluation methods and evaluation criterium used to evaluate validity of proposed solutions. Chapter four, using the aforementioned methodologies, will present the findings and analysis from this project. Finally, chapter five will present a conclusion and recommendations for further action and research in the subject area.

¹ Joint Chiefs of Staff (JCS), Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States* (Washington, DC: Government Printing Office, March 2013), II-21.

² Ibid.

³ Joint Chiefs of Staff (JCS), Joint Publication (JP) 3-09, *Joint Fire Support* (Washington, DC: Government Printing Office, December 2014), 122.

⁴ Ibid.

⁵ Joint Chiefs of Staff (JCS), Joint Publication (JP) 3-0, *Joint Operations* (Washington, DC: Government Printing Office, December 2014), 209.

⁶ JCS, JP 1, 168.

⁷ Ibid., 170.

⁸ Headquarters, Department of the Army (HQDA), Army Doctrine Publication (ADP) 1-02, *Terms and Military Symbols* (Washington, DC: Government Printing Office, August 2018), 1-101.

⁹ Headquarters, Department of the Army (HQDA), Army Doctrine Publication (ADP) 3-0, *Operations* (Washington, DC: Government Printing Office, August 2018), 15.

CHAPTER 2

LITERATURE REVIEW

Long-range precision Fires is the number one priority on the Army's list. Fires provides the ability to destroy, neutralize or suppress artillery targets at extended ranges, thereby shaping the close fight to a time and place of our choosing.

— MG Wilson Shoffner, *Fires*

This thesis addresses a burgeoning area of warfighting function inadequacy. Nearly two decades of counter-insurgency focused warfare as well as the inherent instability of international relations have degraded our joint-multinational fires capabilities. The shift away from LSGC focus, not only resulted in a weapons capability gap, but also a gap in supporting modern joint fires doctrine. In decades past, U.S. military doctrine (more specifically U.S. Army doctrine) centered on LSGC, heavily reliant on massed fires at every echelon across the various services. This chapter will work to examine the availability and relevance of current literature, look back to older materials-doctrine for answers, analyze current schools of thought, and search for relevant gaps.

As mentioned, the United States and its NATO partners are out-gunned, out-ranged, and out-manned in the surface-to-surface fires realm. This thesis will further address how the U.S. military and its NATO partners have inadequately prepared for future armed conflict in the fires warfighting function by analyzing the current situation and potential solutions.

Does doctrine provide adequate guidance for the joint force commander and subordinate fires and maneuver commanders? To fill that gap, this thesis will look to one primary and five secondary questions.

This thesis aims to add to the body of literature on the topic by pulling together current doctrine and schools of thought, analyzing their strengths and weaknesses, and finding gaps. These gaps are windows of opportunity for future research and investment by national, military, industrial authorities to shorten and eventually bridge the U.S.-NATO fires capability gap. Across the categories of literature on the research topic, there is a common missing component which would advance the problem set. No significant attention has been paid to providing short-term solutions, or workarounds, with current capabilities available. This is a serious gap in the relevant literature.

A capability gap is commonly acknowledged, specifically in professional publications and outside, independent articles, but interim solutions are rarely offered. Solutions focus primarily on future technologies and procurement. Commanders and formations in the field are left without viable doctrinal solutions on how to fight and win with current capabilities against peer and overmatching threats. The planning factor of air supremacy as a capability gap mitigation is too often assumed by default. In review of the literature available, more attention needs to be applied to short-term solutions.

Fires Professional Publications

Professional publications highlight the preponderance and most relevant literature available on the topic. The most notable publication, *Fires*, is a bi-monthly journal published by Fires Center of Excellence (FCoE) at Fort Sill, Oklahoma. *Fires* is the primary forum for joint U.S. fires professionals. The journal is a current repository for the latest thoughts, trends, and analysis. It regularly publishes the insights and research of fire support professionals from across the U.S. military. Being such, it is an invaluable resource and forum to address the research questions. *Fires* is where the minds of the fire

support community advance the field. Review of the *Fires* journal archives, reaching back to 2015, showed to be extremely fruitful. Fires professionals have extensively addressed the topic of a capability gap from a variety of angles and have offered numerous solutions.

Fires contributors have presented numerous analysis and solutions. Topics range from acknowledging gaps in current capabilities, multinational interoperability, to future technology development. In a break from the predominance of the literature available on the research topic, some *Fires* contributors have offered short-term solutions and workarounds. These contributors have worked to provide practitioners in the field with solutions for the here and now.

In order to extensively review the characteristics of this, and the following categories of the literature, elements of the DOTMLPF framework will be utilized. Most specifically, the dimensions of doctrine, material, and organization will be used. To include general schools of thought, numerous *Fires* contributors have written poignantly on related topics. The work of some of these contributors will be further reviewed for the reader.

The prevalence of articles related to the research question have continued to increase in recent years. *Fires* has shown increased focus on the subject of capability gaps and force modernization. This increase shows a shifting focus of leaders in the fire support community. Leaders are continuing to raise awareness and offer solutions, driving the problem set forward. This study will focus on a few of the most pertinent articles for analysis.

Fires, September-October 2016, poignantly addresses a multinational training imperative.¹ Using trends observed during rotations at the multinational training center Joint Multinational Readiness Center (JMRC) Hohenfels, Germany, the authors stress key influencers in the realms of doctrine and organization. The authors discussed the relevance of true interoperability in a combined force, both in a singular and multinational force, “key to achieving true interoperability is to train Soldiers and leaders in an environment at the JMRC by task organizing multinational units under and adjacent to forces different from their own.”² The running theme of the article is a force, in particular the fire warfighting function, that is technically competent but tactically isolated.³

The authors assert that our fire’s formations and personnel are increasingly proficient in the doctrinal skills of the profession but lack cohesion and interoperability. They make an interesting observation that a lack of interoperability in the joint force is one thing, but when that dysfunction is brought to the multinational force it is exponentially more difficult.⁴ The safety net of a common language, culture, and national identity to work through friction points does not exist in the multinational force. Continued emphasis on joint doctrine and organizational exposure is key to reducing friction.

The authors highlight a key analysis point of this study, the multinational task organization of the joint force. An inherent attribute of the artillery is its aptitude for use in varying support relationships (see figure 4). It can be expected to see multinational formations, brigades or divisions, consisting of U.S. field artillery organizations and vice versa. This cross-pollination of organizations runs deeper than whole units, but also

technical capabilities. Carter and Auletta remind practitioners that a task-force could receive direct support from one county or service, targeting or acquisition data from another, and clearance and approval from yet another. The evidence of the fire support network is ever more apparent in the multinational context..⁵

A second point the authors highlight, is the need for leaders and fire support personnel to gain more knowledge of capabilities and a greater shared understanding of fires in the direct-action training environment..⁶ JMRC address these knowledge and doctrinal gaps by hosting a Joint Combined Academics Program. This multi-day program is held prior to each multinational rotation and focuses on: shared understanding, defining roles and responsibilities at all levels (reporting, rehearsing, relationships), developing the tactical architecture, delineating roles at echelon, and defining terminology to name a few..⁷ This article mentions the occurrence of “dual-hatting” (performing the duties of two or more jobs simultaneously) in order to facilitate the success of multinational operations. This addresses some of the doctrinal and organizational dynamics of multinational operations. A solution provided includes a multinational firing battery commander who also served as a battalion fire support officer, a relationship more common in some NATO forces..⁸

A third point the authors highlight is the changing mindset to expeditionary unified land operations..⁹ As mentioned in chapter one, the move to LSGC is a significant shift. The days of multinational forces able to arrive in an uncontested point of debarkation, establish relationships, and move into a counter-insurgency theater are the exception. This requires a shift in mindset and doctrine that must be practiced. The authors discuss JMRC’s efforts to expedite the multinational interoperability phase and

push formations directly into the fight, rapidly stressing their systems and relationships. Units are in contact with the opposition quickly and forced to maximize the capabilities of the combined force to shape and attrite the enemy. The lessons learned during Joint Combined Academics Program are reinforced and resonate as the multinational force is quickly faced with adversity. The authors continue to emphasize the importance of shared understanding and mention the availability of systems such as the Artillery Systems Coordination Activities (ASCA). With further investment and refinement systems like ASCA could revolutionize the fires effectiveness of the multinational force.¹⁰

Carter and Auletta in *Fires*, September-October 2016, highlight the importance of doctrinal and organizational solutions and synergy to the joint and combined force. They mentioned a few ongoing initiatives at JMRC such as the Joint Combined Academics Program and provided insight into systems for continued development like the ASCA. They showed the need for increased commonality in roles and responsibilities (doctrine) and organizational interoperability (organizations).¹¹

Fires, November-December 2016, further addresses a multinational training imperative. Carter, Severs, and Auletta, in Part II of their series, *Keeping The King On His Throne*, continue to examine the multinational interoperability gap. They focus in Part II on battle command systems and leaders' abilities to tie systems together. They bring to attention here, instances of a U.S. division, acting as the Joint Task Force Headquarters (JTF), with two subordinate brigade combat teams (BCT), one U.S BCT and one multinational BCT. The JTF found itself constrained and its airspace clearance efforts impaired. U.S. headquarters at the division and brigade levels used the U.S. based

system known as Tactical Airspace Integration System, while the multinational brigade used the Integrated Command and Control system.¹²

The authors elaborate on how the inability of the Tactical Airspace Integration System and Integrated Command and Control systems interoperate significantly impaired the greater fires fight of the JTF (see figure 1). They showcase that this compatibility error left the JTF with no single airspace picture, forcing the JTF to control all airspace from surface to 12,000ft mean sea level (MSL).¹³ The JTF in this instance, was forced to clear the employment of every indirect-fire system, even company-level 60mm mortars. Temporary solutions were created such as routing air corridors between brigade boundaries, delegating airspace control to the brigades up to 2,500ft MSL (eventually to 10,000ft MSL), establishing artillery mission areas, and manual data input between systems.¹⁴ These temporary solutions worked to a point, but highlighted the dangers and inefficiencies of digital and systems interoperability. The chance for catastrophic occurrence is greater as the likelihood of user input error and fatigue is increased. The enemy also does not adhere to friendly designated boundaries and airspace corridors. Cross-boundary fires must be executable in an efficient, timely manner.¹⁵

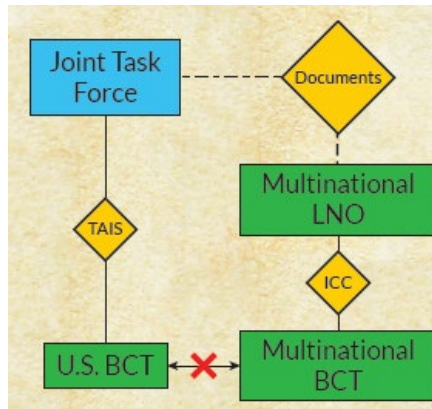


Figure 1. Joint Task Force Airspace Control System

Source: Jason Carter, Joshua Severs, and Robert Auletta, “Keeping the King on His Throne, Part II: The Timely Delivery of Multinational Fires,” *Fires* (November-December 2016): 40.

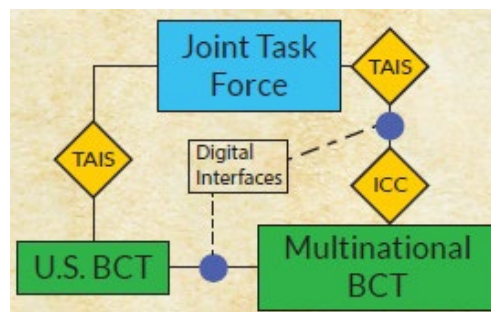


Figure 2. Joint Task Force Airspace Control System with ASCA

Source: Jason Carter, Joshua Severs, and Robert Auletta, “Keeping the King on His Throne, Part II: The Timely Delivery of Multinational Fires,” *Fires* (November-December 2016): 42.

The authors provided lessons learned and further temporary solutions which enabled the JTF in this instance, to complete its mission. They made an important assertion which supports the significance of this study; “if the premise is true that the United States will never fight alone again and will always commit to collective defense in support of NATO Article V, then NATO airspace doctrine should be updated to spell this

decentralization out. Additionally, there must be a digital solution to optimize interoperability for multinational airspace management”¹⁶ (see figure 2).

The authors briefly discuss ASCA, a multinational initiative, to streamline digital operations. The ASCA is a commonly discussed interoperability system which appears to be growing in use and popularity. They also mention the use of the U.S. Army Joint Support Team as a supplement to the ASCA initiative.

Carter, Severs, and Auletta concluded Part II of their series with a look at the risks of suboptimal interoperability. The authors assert that suboptimal interoperability leads to untimely fires which creates opportunities for the enemy.¹⁷ This article further supports the premise of this study of a joint-multinational fires capability gap. The authors’ primary focus is a lack of interoperability. One could argue that a lack of interoperability and the systems that support it, is in itself, a capability gap, especially when one’s force is aligned with multinational operations.

Carter, Eickbush, and Auletta, in Part III of their series, *Keeping The King On His Throne*, complete their examination of the multinational interoperability gap. They focus in Part III on what they refer to as “the lost space.” This space, as they describe, is “the area between the maximum effective range of a brigade’s organic capabilities and their boundary established by the division.”¹⁸ The authors’ contribution to the body of literature here, is less about specific weapons capabilities, but more aligned to units (in a multinational operation or otherwise) to shape their respective deep operations.

Carter, Eickbush, and Auletta assert a lack of doctrinal understanding of the close-deep fight framework. This lack of understanding, perhaps due to multiple causes; doctrinal knowledge, friction of war, to name a few, inhibits commanders’ success in

shaping the fight for the best outcome. When put in the context of multinational operations, shaping the deep fight (a fire's laden task) is increasingly complex. The synthesis of varying doctrines, battle command systems, and battlefield frameworks culminates the *Keeping The King On His Throne* series. Carter, Eickbush, Severs, and Auletta's work in their three-part series in the *Fires* journal was very beneficial and productive in helping to shape the body of literature and the direction of the study.

McGillen in *Fires*, November-December 2016, writes on the topic of, bridging multinational joint fires interoperability with competent fire support liaisons. He writes that NATO is changing from an operational-level, multinational corps focused organization, to interoperability at the brigade-level, allowing for more rapid adaptation, but is facing some issues.¹⁹ He elaborates NATO is facing a related deficiency in its "doctrine, standardization agreements, standard operating procedures, and disproportionate capabilities and capacities at the battalion level that make multinational interoperability challenging."²⁰

McGillen states that differences in doctrine nationally, and in particular between eastern and western European militaries, causes dysfunction. The diversity of this doctrine requires fire support liaison officers (LNO) packages sourced and placed in maneuver task forces to bridge barriers.²¹ The referenced shortfalls are supported by JMRC observers. These organizational changes are recommended to enhance the effectiveness of multinational battalion and brigade task forces. McGillen brings to attention to a need for increased focus and modernization of multinational doctrine effective for combined operations. The author's observation supports a trend of

professionals who see a lack of doctrinal publication supporting commanders in the field and addressing methods to overcome multinational operations and capability gaps.

Fires, July-August 2017, continues to expand in great detail, relevant literature on the research topic. Marie Berberea, in her piece, *Interoperability is aim of US, UK armies*, highlights the recognized need for increased multinational interoperability to bridge gaps. Her article focuses on a memorandum of understanding, signed by MG Brian McKiernan, Fires Center of Excellence Commanding General, and his U.K. equivalent, BG Simon Humphrey, Head of Combat Support. The memorandum outlined joint training efforts and mutual training investments to be shared by the two militaries.²²

Berberea's article highlights the ongoing effort of NATO nations to increase focus on interoperability and resource cooperation initiatives. Two supporting quotes in Berberea's article summarize well the efforts of these two militaries; first by a British officer, COL Mark Pullen: "there's a lot of exciting changes in the fires world. From structural changes, [divisional artillery] and development, to the move back to fighting in divisional fire, deep battle. We're doing exactly the same thing in the U.K."²³ A second quote, by U.S. Army officer, COL Nicholas Sargent, Army Targeting Center, Joint Integration Chief, further supports the focus; "we're all resource constrained, whether that is money, people, or time because the enemy has a vote and time isn't a luxury we have in many cases. If we can identify where our needs are common and we can exploit those commonalities, that will make us better in the future."²⁴

Berberea's article also reinforces the premise put forth by McGillen in his discussion on the need for competent liaisons in multinational operations. Berberea outlines the U.K. Army's desire to move away from the need for liaison officers which

they see as an “inefficient way of doing business.”²⁵ The preference here, is to get away from the need for liaison officers by continuing to invest in digital integration and intelligence sharing initiatives, streamlining operations. This move is in line with the premises supported by earlier mentioned authors such as McGillen, Carter, and Auletta, and shows a trend in analysis.

Centola and Alexander, in their article, *Preparing for an Artillery Systems Cooperation Activities Exercise*, expand upon the values of the ASCA system. They highlight the Fourth Battalion, 319th Airborne Field Artillery’s participation in seven NATO exercises and 22 training events that incorporated ASCA.²⁶ Englis, in his complementary article, *Employment of NATO Tactical Fires*, reinforces the urgency behind the ASCA program.²⁷ As the U.S. Army NATO Rapid Deployable Corps-Spain Targeting Officer, LTC Englis was in a prominent position to see first-hand, the value of ASCA. Englis further elaborates on the development of the program and the desire to create a NATO land component fires headquarters and NATO fires center of excellence.

Numerous authors have advocated for the advancement of the ASCA program, showing a sizeable trend. A significant amount of *Fires* contributions have been allocated to ASCA and its applicability to removing digital barriers. Doctrinal answers are not the only ones provided in *Fires*. Increasing analysis and recommendations have been offered in the realms of material and organizational changes.

Online Articles

The second most productive literary resource on the study topic are online articles. These articles and publications are generally provided by independent authors, former military members, think-tanks, and for-profit or commercial agencies advocating

future investment or military reorganization. Though the motivation and justifications of some of these articles should be questioned and reviewed, they do provide critically evaluated opinions on the current state of friendly and enemy capabilities. The lack of professional or employment ties to a government agency allows these authors increased latitude to question and contradict current and future policies in ways uniformed or civilian servicemembers may reserve. Literature provided by outside sources proved to be predominately focused on organizational and material problems and solutions. Wikipedia was a helpful tool in finding aggregated data throughout this thesis. Entries were well cited and provided extensive citation lists for further reference and research.

This prevalence falls in line with potential industrial emphasis and future investment. In a slightly different vein than other portions of this chapter, this one will focus on schools of thought and contemporary consensus. Thorough review of online articles has provided three main trends. The first is renewed emphasis on new weapons technology and investment to obtain overmatch. The second trend is analysis of the Russian fires threat and capabilities. Lastly, the third trend focuses on NATO preparedness and training readiness.

A significant number of current articles, such as, *“Return of Fires: How the Army is Getting Back to its Big Guns as it Prepares for the Near-Peer Fight,”* by Todd South and *“4 New Weapons the US Army is Developing to Blow a Hole in Russian Defenses From Incredible Distance”* by Ryan Pickrell, focus on the development and investment of advanced technologies to regain friendly overmatch. New weapons platforms and munitions discussions overshadow simply increasing the number of current systems or formations to achieve overmatch. Hypersonic technology and employment is a very

popular trend among contemporary authors. Hypersonic advancements are being championed for each of the armed services. This advancement provides a new range of capabilities that may completely revolutionize the fires construct. This burgeoning reality is likely why hypersonic development has garnered so much attention.²⁸

Further attention has been paid to the development of longer-range fires platforms and munitions. The general consensus that western forces are out-ranged and out-gunned has prompted developers and authors to devote attention to new ideas for increased range and capacity.²⁹ The U.S. Army's extended range cannon artillery (ERCA) program and enhanced conventional munitions and propellant initiatives, to name a few, are popular topics for authors.³⁰

The second trend of contemporary authors is analysis the current Russian fires threat and capabilities. Recent activities in Ukraine have proved to be popular discussion points and ignited this school of thought. The effectiveness and lethality Russian fires forces displayed in eastern Ukraine are a primer for increased literary contribution throughout the fires community.³¹ Numerous articles were discovered that closely analyzed Russia's Ukraine activity and its relevance to western military readiness. Additional attention has been paid to the tactics, new generation doctrine, and weapons systems the Russians are using in Ukraine. Similarly, the capabilities and advancements the Russians are making has driven significant comparison.

As stated in chapter one, Russian fires capabilities play an essential role in the conduct of this study. The abundance of articles and contributions on the topic, played a significant role in shaping this study and developing the research questions. There proved to be no shortage of analysis. Russian activities are a fruitful source of information for

this study and for future research. A growing change in the Russian way of war doctrine has also garnered renewed attention. Russia's recent activities has spurred critical observation and analysis. This is likely to be a sustained and growing source of information and driver of U.S. and NATO focused contributions.

The third trend of contemporary authors centers around NATO preparedness and readiness. As stated above, recent Russian activities have spurred renewed discussion regarding NATO's state of preparedness and readiness. Debates have ranged from NATO member defense gross domestic product spending,³² training exercises, deployments, and a detailed comparison of capabilities.³³ In response to Russia's latest activities, NATO members have increased training and deployment exercises geared at enhancing interoperability and effectiveness. Large NATO movements naturally attract media and observer attention.³⁴ Contributors have used NATO's recent response and posturing to write about shifting policies and the agenda of the treaty organization.

Research Papers

A similar, but perhaps less current library of advancement in the field are the collections of Command and General Staff College master of military arts and sciences (MMAS) thesis's and School of Advanced Military Studies monographs housed at the Combined Arms Research Library. These academic works form a collection of dedicated research and analysis spanning a breadth of topics and many years. They are thoroughly reviewed and referenced, as well as written by professionals in their respective fields. Countless authors have written and published papers focused on the fires warfighting function. These works are an invaluable research tool as well as a poignant window into past doctrine.

Surprisingly there is little emphasis or focus on the U.S.-NATO fires capability gap among fellow thesis authors. In the course of research for this study, numerous thesis's and monographs were discovered and referenced. The majority of these authors focused more specifically on elements at the division echelon and below, centering on the direct support battalion. They remain generally technical in nature, focusing on specific tactics and techniques within the fires warfighting function. This thesis breaks from convention, in that it looks more broadly at the operational and strategic implications and implementation of fires joint-multinational fires.

Searching the Combined Arms Research Library database resulted in four MMAS thesis's and one SAMS monograph which were found to be most relevant to this study. This section will provide a synopsis of the insight and analysis provided by these studies.

A 2017 MMAS thesis titled, *ICM: Bridging the Capability Gap Between 1 January 2019 and the Replacement Munition*, by MAJ Shawn Mains proved to be very beneficial to this study. Analyzing a similar topic, fires capability gaps, Mains' presentation of Russian centric fires capabilities was of considerable resource. Mains' primary focus were mitigation strategies the U.S. Field Artillery should undertake to bridge the capability gap between the use of improved cluster munitions (ICM) and an ICM replacement. This requirement was set forth by UN under the Convention of Cluster Munitions treaty. This treaty, set to become active on 01 January 2019, has since been suspended in the U.S.³⁵

Mains in the course of his study, provided an extensive review of U.S. and Russian, equipment, munitions, and organizations. An important piece of this study was the comparison and contrast of U.S. and Russian fires capabilities. Mains' work provided

extensive detail on key systems including: technical specifications, tactical employment, and doctrine. Mains' proved to be a library of reference material and an excellent resource for future research.

He proposed several changes to bridge his capability gap:

1. The acquisition of additional cannon artillery pieces to allow for larger quantities of massed fires to mitigated loss of the ICM.
2. Development of extended range capability cannons to increase the reach of the BCTs.
3. Acquisition of the Smart 155 round.
4. BCT training for conventional operations should be augmented with MLRS or HIMARS, preparing them for deployment.
5. Larger planned positional artillery areas in order to provide artillery units increased room to conduct survivability moves, mitigating risk of loss due to adversarial overmatch and unmanned aerial system (UAS) overflight.³⁶

Mains' concluded his study by confirming that the U.S. could indeed bridge the ICM capability gap he set out to examine.³⁷

Another MMAS thesis, written by MAJ Ryan Johnson in 2016 titled, *Fires Readiness: The State of US Army Fires in Support of Combined Arms Maneuver at the Division Level*, examined whether or not the U.S. Army is capable of supporting combined arms operations in high intensity conflict. This thesis' focus on fires in support of the greater combined arms effort at the division level directly correlates with the research topic. Johnson discusses the results of 15 years of counter-insurgency focused warfare and its effects on the fire support community.

Johnson thoroughly analyzes ATP 3-09.90 “Division Artillery (DIVARTY) Operations and Fire Support for the Division” as his cornerstone reference. This study will also examine ATP 3-09.90. The author uses the force management process, consisting of a functional needs analysis and functional area analysis, to complete a comprehensive assessment of fires at the divisional level. Johnson concludes that “the fires community has lost proficiency at certain core competencies and is only marginally effective at providing fires in support of combined arms maneuver in high intensity conflict.”³⁸

In his 2014 thesis titled, *United States Army Field Artillery and the Hybrid Threat: Is It Time to Get Smart?* MAJ Jeffery Fuller addresses the U.S. Army’s readiness for the hybrid level of warfare. Included in this study, hybrid warfare has shown to be the current strategy of many of our adversaries. Because of this relevance, Fuller’s thesis proved to be very beneficial to this study and led to the inclusion of the Russian hybrid threat. Fuller focuses on the role of smart munitions in countering the hybrid threat. He determined whether or not doctrinally employed field artillery is capable of addressing the hybrid threat as described in current U.S. military doctrine.³⁹

Fuller used the same portions of the DOTMLPF framework (doctrine, organization, and material) as this study, to determine the presence of capability gaps in the U.S. Army field artillery. Fuller concludes that capability gaps do exist and that “the reintroduction of precision smart munitions provide a solution for, but they are narrowly defined and identified, and they primarily concern the USAFA’s ability to deliver destructive effects on moving armored targets.”⁴⁰ He further concludes that current

USAF doctrine, organizations, and material capabilities can adequately deliver effects against a conventional threat and are generally acceptable.⁴¹

MAJ Jonathan Harvey, in his 2012 MMAS thesis titled, *Timely Effects: Organic Surface Fires and Airspace Doctrine in the 21st Century Joint Fight*, examines the available doctrine available to maneuver commanders to enter and shape the airspace discussion with joint force commanders.⁴² The study evaluates U.S. Army and joint airspace doctrine and whether or not it supports a brigade commander's ability to employ organic surface fires. The point of deconfliction between organic surface fires and aerial platforms is a key point where the U.S. Army and joint and multinational communities meet.

Harvey's work proved to be very beneficial to this study. His focus on bringing brigade organic surface fires and joint capabilities closer together is an important dimension of the joint-multinational fires capability gap. Harvey's key points center on the best coordinating level and altitude, defining fire support coordination measures, and how brigade commanders can enter the airspace conversation. Harvey concludes his thesis by stating, "maneuver commanders are faced with considering airspace when employing fires from this point well into the 21st century. There are two knowns; artillery and mortars are users of airspace, and the commander's desire to employ these assets must be counterbalanced with the need of the JFACC to support their fight and meet the JFC's objectives outside their AO."⁴³

MAJ Alex Aquino, in his 2015 SAMS monograph titled, *Force Structure Matters: The US Field Artillery in Operational Art*, examines the effectiveness of U.S. military surface-to-surface fires enabling operational art and unified land operations.

Aquino utilizes two case studies to analyze fires in operational art and addressing limitations and planning considerations. His expansion on the elements of operational art provides a well-thought-out synopsis of U.S. doctrine. Aquino's study proved helpful in defining the purpose and mission of the newly reintroduced DIVARTYs to U.S. Army divisions.⁴⁴

Aquino asserts that the U.S. possesses the necessary equipment, but lacks the fires force structure to sufficiently support requirements and exercise operational art. He recommends division artilleries gain the addition of organic fires assets, enabling divisions to better shape their fight. Furthermore, he recommends a reorganization of fires assets at the brigade level. Aquino proposes the expansion of composite field artillery battalions, provided infantry, Stryker, and armored brigade combat teams more flexible array of options. MAJ Aquino's analysis advocates organizational changes to the current U.S. Army fires structure to meet future threats.⁴⁵

The research papers reviewed for this project primarily analyzed doctrinal, organizational, and material needs inside the U.S. Army. No authors were found who addressed the greater joint-multinational community or ways to more effectively combine efforts. Fires interoperability and cooperation are not currently active themes among Command and General Staff College thesis authors.

U.S. Army Doctrinal Publications

U.S. Army doctrine provides the knowledge and standards the force needs to operate. Three U.S. doctrinal publications that most influenced this study are FM 3-0, FM 3-09, and ATP 3-09.90. These publications address the broader integration of fires and operations. As a foundational framework, U.S. Army doctrine provides standards and

offers guidelines on how actions can be completed. The doctrine is less prescriptive, but more advisory in nature.

FM 3-0, *Operations*, is the U.S. Army's capstone publication for how the force works in its primary role of conducting unified land operations. Combined with ADP 3-0 and ADRP 3-0, FM 3-0 "describes how Army forces, as part of a joint team, shape operational environments, prevent conflict, conduct large-scale ground combat, and consolidate gains against a peer threat."⁴⁶ FM 3-0 is most applicable to commanders and staffs in brigades through theater armies. Its chapters five through seven offer the most relevance to this study.

Chapter five of FM 3-0, presents the U.S. Army's role in joint large-scale combat operations. In support of the Joint Force Commander and the joint operations area, the U.S. Army generally provides the preponderance of land forces. Because this thesis focuses on U.S.-NATO surface-to-surface fires, FM 3-0 is a critical publication. Chapter five mentions the need for airspace coordination between the Joint Force Land Component Commander and Joint Force Air Component Commander, allowing for the use of deep fires. Beyond this, chapter five does not address a fires capability gap or the process of incorporating joint-multinational fires.⁴⁷

FM 3-0 chapter six describes large-scale defensive operations. The defensive functions as a time to allow for the building of combat power and set the conditions for the transition to the offense. Chapter six mentions a few points pertinent to this study and lists a range of assets that should be considered for use in the defense. It highlights the likelihood a defending commander will initially be in a position of relative disadvantage

as combat power is generated. In particular, significant capability gaps may exist in fires and air and missile defense, hindering the full use of joint fires.⁴⁸

Chapter six informs readers that the headquarters fires cell is responsible for the employment of U.S. Army and joint fires. It makes the first pertinent mention of joint-multinational fires; it states, “complementary and reinforcing joint and multinational fire capabilities provide redundancy to mitigate organic fires shortcomings.”⁴⁹ This statement indirectly acknowledges the presence of an organic U.S. Army fires gap, but offers no solution beyond leveraging joint and multinational assets.

FM 3-0 chapter seven, describes large-scale offensive operations. The offense is conducted to “defeat and destroy enemy forces and seize terrain, resources, and populations centers. Offensive tasks impose the commander’s will on the enemy.”⁵⁰ This chapter describes how the enemy is likely to conduct their opposing defense and various approaches to defeat that defense. Chapter seven does not address or offer doctrinal solutions to overcome the fires capability gap.

In summation, FM 3-0, the U.S. Army’s operations manual, states regarding the employment of fires: “...multinational coalition is even more challenging, and use of fires should be rehearsed during operations to shape as often as possible. Integration of fires systems with unified action partners can be time consuming, but it is vital to success during multinational operations.”⁵¹ FM 3-0 does not directly acknowledge a fires capability gap and does not provide leaders with commensurate doctrinal solutions or recommend a change to offensive or defensive operations to mitigate for that gap. Its closest acknowledgement is the following:

some peer threats can deliver fires over an extended range and at a sustained volume. Threat forces also have the equipment and tactics to execute effective

counterfire. Training requirements for counterfire and the displacement of weapons locating radars and sequencing are integrated into all combined arms training exercises. If acquisition radar systems are continuously radiating, they will be targeted by the enemy. Sensor management must be planned and rehearsed, and cueing schedules developed and actively pursued. Training for timely displacements of field artillery units is essential for successful operations. Field artillery units move well forward prior to an attack, with synchronized plans to displace by echelon to provide continuous fires to the supported force. Displacements should maximize continuous delivery of fires, and they should be completed as rapidly as possible.⁵²

FM 3-09, *Field Artillery and Fires support*, provides guidance to brigades, divisions, and corps for the employment of field artillery and the planning, preparation, and execution fire support. It stresses the need to plan for and utilize the full range of joint-multinational capabilities to maximize effectiveness. This publication depicts how the fires warfighting function enables operations listed in FM 3-0. The below listed items are selected throughout FM 3-90 and most closely relate to the study topic. They are valid points and offer a synopsis of the language used in the publication.⁵³

1. A field artillery brigade, U.S. Marine Corps, or multinational artillery units may reinforce a BCT field artillery battalion.⁵⁴
2. An automated (digital) capability must be provided to non-automated multinational field artillery units.⁵⁵
3. Interoperability will also be key, as well as the ability to attack targets and threats identified and located by organic and nonorganic sensors. This interoperability includes the ability to successfully targets off to other organizations throughout the area of operations.⁵⁶
4. Army fires combine with joint and multinational assets via an integrated fire control capability to recommend the best weapon to counter evolving threats from land, sea, air and space.⁵⁷

5. Consider the Use of All capabilities. The fire support planners consider the full range of fires and other capabilities available at all levels. This includes fires and other assets from available joint and multinational forces.⁵⁸
6. The supported FA battalion may have to provide liaison with multinational units.⁵⁹
7. To maximize fire support, the multinational force must integrate joint and multinational systems and procedures. Special arrangements can include communications, language requirements, liaison personnel, multinational transition teams, and interoperability procedures.⁶⁰
8. Varying capabilities for acquisition and engagement may exist among adjacent commanders in a multinational operation.⁶¹

FM 3-09 arms professionals with important planning and employment considerations. It mentions numerous times, the importance of joint-multinational fires. Though helpful, FM 3-09 lacks comprehensive guidance on the employment of the joint-multinational fires.

ATP 3-09.90, *Division Artillery Operations and Fire Support for the Division*, outlines operations and fire support U.S. Army divisions. The primary audience for this publication are field artillery leaders, commanders, staffs, and supported units in the division. The division artillery (DIVARTY) is a brigade level command that directly supports the division. It plans, prepares, executes, and assesses fires assets in the division. The DIVARTY commander acts as the fire support coordinator for division commander.⁶² This command is the primary element responsible for the coordination and synchronization of fire support assets in the division. In the context of LSGC, the division

is a crucial tactical headquarters. Its use of its DIVARTY and joint-multinational fires are vital to the success of LSGC operations, “the DIVARTY commander as the division fire support coordinator is responsible for integrating all forms of Army, Joint and Multinational fires to include nonlethal capabilities.”⁶³

ATP 3-09.90 focuses a lot of its attention to the DIVARTY’s role in the military decision making and routine operations processes and the key inputs it provides. It goes into great detail the tactical and technical requirements of DIVARTY to include: division targeting, sensor integration, fires planning, counterfire, and orders production. ATP 3-09.90 makes minimal mention of multinational fires;

fires planned or executed for or by multinational forces are typically enabled by the exchange of liaison officers. An automated capability may be provided to non-automated Multinational units to maximize communications with the fires cell. If available, the fires cell should provide an automated capability with operators to the multinational unit. The DIVARTY must provide support to help integrate multinational artillery units into the division.⁶⁴

ATP 3-09.90 instructs leaders and staffs on what the DIVARTY offers the division and detailed lists of tasks to be accomplished. Like FM 3-09, it mentions the importance of joint-multinational fires but again lacks comprehensive guidance on the employment of the joint-multinational fires.

U.S. Army doctrine provides limited guidance for the employment of joint or multinational fires. It often acknowledges the presence and necessity of their use, but does not go much further. In FM 3-0, it indirectly mentions a fires capability, but fails to elaborate beyond one sentence. U.S. Army operations as defined in doctrine do not account for this gap and the issue seems largely ignored. The U.S. Army doctrine analyzed for this study also did not offer any temporary work arounds or propose future

solutions or publication edits pending. See Appendix A for a comprehensive list of U.S. Army doctrinal publications pertinent to the research topic.

U.S. Joint Doctrinal Publications

U.S. Joint doctrine provides the knowledge and standards the joint force needs to operate. It also provides common terms and language all services can understand. The U.S. joint doctrinal publications that most influenced this study are: JP 3-0, JP 3-03, JP 3-09, and JP 3-16. These publications address the broader integration of fires and operations. As a foundational framework, U.S. joint doctrine provides standards and offers guidelines on how actions can be completed. Similar to U.S. Army doctrine, joint doctrine is less prescriptive and more advisory in nature.

JP 3-0, *Joint Operations*, establishes the doctrinal foundation and fundamental principles that guide U.S. armed forces in all joint operations. The principal audience for JP 3-0 is the Joint Staff, combatant command commanders, subordinate unified commands, joint task forces, subordinate components of these commands, the services, and combat support agencies. It sets for guidance for the operations of joint force commanders.⁶⁵

JP 3-0 defines general fires and targeting terminology. It outlines the purpose of joint fires as a warfighting function and how it supports the joint force commander and relates to the other warfighting functions. Besides stating what “types” of missions or support might be provided by joint fires, JP 3-0 does not provide specific guidance for their employment. This publication does not acknowledge a fires capability gap, nor does it provide any work arounds for the joint warfighting community to consider or future solutions.

JP 3-0 does introduce the importance unified action and unity of effort in joint warfighting. These terms are defined in JP 3-0 as: “unified action refers to the synchronization, coordination, and integration of the activities of government and nongovernmental entities to achieve unity of effort. Failure to achieve unity of effort can cost lives, create conditions that enhance instability, and jeopardize mission accomplishment.”⁶⁶ Unified action and unity of effort are crucial to the success of joint-multinational fires. Synchronization and complimentary actions are the key. Forces and nations in the joint-multinational force must act with a common purpose and objective to ensure their actions achieve a unity of effort or disorganization and disruption can occur.

JP 3-03, *Joint Interdiction*, outlines interdiction operations in the joint force. Interdiction is defined as, “operations to prevent adversaries from employing surface-based weaponry and reinforcing units at a time and place of their choosing.”⁶⁷ JP 3-03 provides more detailed information on the capabilities and options available to the joint force commander for the employment of joint fires than JP 3-0. More attention is paid to fires terminology, integration systems, coordinate measures, and tactical and technical measures to increase effectiveness. Despite the increased emphasis in JP 3-03, it also does not address a joint-multinational fires capability gap or provide solutions to mitigate those gaps.

JP 3-09, *Joint Fire Support*, is a markedly important publication for this study. Joint Fire Support describes the planning and employment of fires in support of the joint force. This publication delves significantly further into the fires war fighting function than previously mentioned joint publications. It presents a more comprehensive joint fire

support overview, covers joint fire support command and control, addresses joint fire support planning, and explains execution and assessment.⁶⁸

JP 3-09 provides a thorough summary of the assets and capabilities maintained by the joint force. It further defines and delineates the differences between the services' respective fire support structures. JP 3-09 is the first joint publication to depict how joint fires are employed in support of the joint force commander and defines structures and systems for the proper employment and coordination. It extensively describes tactical and technical details and fire support coordination measures. JP 3-09 illustrates the employment of surface-to-surface and air-to-surface fires. However, like the beforementioned joint publications, JP 3-09 does not acknowledge a fires capability gap, nor does it provide any solutions or guidance on the matter.

JP 3-16, *Multinational Operations*, concludes the joint publication review portion of this study. JP 3-16 establishes guidance for the joint force in the conduct and coordination of multinational operations. These operations contain their own unique characteristics and considerations. Multinational operations are defined as, "operations conducted by forces of two or more nations, usually undertaken within the structure of a coalition or alliance. Other possible arrangements include supervision by an intergovernmental organization such as the United Nations, or North Atlantic Treaty Organization (NATO)."⁶⁹ The tenets of multinational operations: respect, rapport, knowledge of partners, patience, mission focus, and trust and confidence, are important factors listed in JP 3-16 describing keys to multinational success.⁷⁰

JP 3-16 provides the broad operational and strategic concepts and keys to multinational operation planning and execution. It thoroughly illustrates the command

and control networks, command relationships, and authorities necessary for multinational forces to operate. The employment of a multinational force requires clear understanding of the force's structure and organization. JP 3-16 discusses "interoperability," a term, key to successful multinational force operations and this study. "Interoperability greatly enhances multinational operations. Nations whose forces are interoperable across material and nonmaterial capabilities can operate together effectively in numerous ways. Although frequently identified with technology, important areas of interoperability may include doctrine, procedures, communications, and training."⁷¹ Interoperability allows the joint and multinational force to operate in concert, maximizing the respective capabilities brought to the fight. It is essential to the successful employment of the fire support network.

As a whole, the U.S. joint publication series does not address a fires capability gap. The publications, by default, assume a position of capability superiority as a starting point. Though comprehensive and thorough in nature, they do not inform commanders and staffs of a capability gap, nor provide guidance on how to overcome or mitigate any gaps. See Appendix B for a comprehensive list of joint U.S. doctrine pertinent to the research topic.

Multinational Publications

Multinational doctrine provides the knowledge and standards the NATO multinational force needs to operate effectively. It also provides common terms and language each armed force can understand. NATO doctrinal allied joint publications proved difficult to find with limited open-source availability. Publications listed here were found on the United Kingdom Ministry of Defence website. The three multinational

doctrinal publications that most influenced this study are AJP-3.2, AJP-3.9, AJP-5.

NATO doctrine proved hard to access through opensource means. The unavailability of multinational doctrine greatly limited the size and scope of literary review for this section and likely affected its accuracy.

AJP-3.2, *Joint Doctrine for Land Operations*, is very similar to JP 3-0, JP 3-30, and FM 3-0. AJP-3.2 sets the basic framework for NATO land operations. It outlines the range of military operations and the array of options available to the land component commander. AJP-3.2 outlines key terminology and conceptual and operational frameworks for use by planning staffs. It is not tactical or technical in nature. AJP-3.2 does mention fires as a component of land warfighting but does not acknowledge a fires capability gap, nor provide solutions for the combined force to employ.

AJP-3.9, *Joint Targeting*, addresses the roles, responsibilities, processes, and products from the strategic, operational, and tactical commands, and the political guidance and oversight inherent in the multinational targeting process.⁷² It is written at the operational level and explains how joint targeting is planned, conducted, and assessed using the full range of military capabilities against a wide range of adversaries or opponents.⁷³ As with all multinational publications in this study, AJP-3.9 defines common terms and processes.

AJP-3.9 discusses the importance of targeting at the national level, leveraging diplomatic, military, and information efforts. It highlights various coalition targeting methodologies such as D3A (decide, detect, deliver, assess) and F3EAD (find, fix, finish, exploit, analyze, disseminate), political and legal considerations, intelligence sharing, and the roles and responsibilities of commanders and staffs. AJP-3.9 does mention fires as a

component of land warfighting but does not acknowledge a fires capability gap nor, provide solutions for the combined force to employ.

AJP-5, *Operational Level Planning*, addresses the fundamentals of planning at the operational level. Planning at the operational level and in a multinational context has different considerations than found at the lower tactical levels. AJP-5 contains a very similar planning process to that of the U.S. Army's military decision-making process (MDMP). In regards to fires, this publication focuses the least amount of the beforementioned multinational publications. AJP-5 mentions the important nature of including and coordinating joint fires into the planning process, "a major coordinated effort by specific members of the JOPG will be required to synchronize joint targeting and the use of lethal and non-lethal means to generate the desired effects and resulting decisive points."⁷⁴ Beyond this limited point, AJP-5 does not acknowledge a fires capability gap nor provide solutions at the operational level for the combined force to employ. See Appendix C for a comprehensive list of multinational doctrine pertinent to the research topic.

The below listed figures provide further context which will become more important in chapter four. Use the area of operations illustrations to provide better visual context of what a large-scale operation framework looks like. Also, provides reference to division and corps, close and deep fires areas which is the most relevant terrain to this study.

If Army Command Relationship is-		Then Field Artillery Inherent Responsibilities are-			
		Answers Calls for Fire in Priority From:	Has as Its Zone of Fire:	Is Positioned By:	Has Its Fires Planned By:
Army Command Relationship	Organic	1. Parent unit. 2. Own observers. ¹ 3. Force field artillery headquarters. ²	Area of operations of parent unit.	Organic headquarters	Parent unit.
	Assigned	1. Parent unit. 2. Own observers. ¹ 3. Force field artillery headquarters. ²	Area of operations of parent unit.	Assigned headquarters	Parent unit.
	Attached	1. Gaining unit. 2. Own observers. ¹ 3. Force field artillery headquarters. ²	Area of operations of gaining unit.	Gaining unit	Gaining unit.
	OPCON	1. Gaining unit. 2. Own observers. ¹ 3. Force field artillery headquarters. ²	Area of operations of supported unit.	1. Supported unit 2. Force field artillery headquarters. ²	1. Supported unit 2. Force field artillery headquarters. ²
	TACON	1. Gaining unit. 2. Own observers. ¹ 3. Force field artillery headquarters. ²	Area of operations of supported unit.	1. Supported unit 2. Force field artillery headquarters. ²	1. Supported unit 2. Force field artillery headquarters. ²
Note: (1) Includes all target acquisition means not deployed with the supported unit (such as radars or unmanned aircraft systems), vehicles, air observers, survey parties. In the NATO, the gaining unit may not task-organize a multinational unit (see TACON). Note: (2) If designated by the supported commander.					
OPCON – operational control NATO – North Atlantic Treaty Organization TACON – tactical control					

Figure 3. Army Command Relationships

Source: Headquarters, Department of the Army, Field Manual 3-09, *Field Artillery Operations and Fire Support* (Washington, DC: Government Printing Office, 2014), 1-32.

This figure depicts the inherent field artillery responsibilities in army command relationships. These command relationships define superior and subordinate relationships between commands. They enable unity of effort and provide commanders with flexibility and options. Each relationship is of varying time and permanency and requires different level of support. Organic and assigned are the most permanent while TACON (tactical control) is the most limited. The movement of fires units between commands to support the joint force commander, requires a thorough understanding of command relationships..⁷⁵

If Army Support Relationship is –		Then Field Artillery Inherent Responsibilities Are –			
		Answers Calls for Fire in Priority From:	Has as Its Zone of Fire:	Is Positioned By:	Has Its Fires Planned By:
Army Support Relationship	Direct Support	1. Supported unit. 2. Own observers. ¹ 3. Force field artillery headquarters. ²	Area of operations of supported unit.	Supported unit.	Supported unit.
	Reinforcing	1. Reinforced field artillery. 2. Own observers. ¹ 3. Force field artillery headquarters. ²	Zone of fire of reinforced field artillery unit.	Reinforced field artillery unit HQ.	Reinforced field artillery unit HQ.
	General Support-Reinforcing	1. Supported unit. 2. Force field artillery headquarters. ² 3. Reinforced unit. 4. Own observers. ¹	Area of operations of supported unit to include zone of fire of reinforced field artillery unit.	1. Supported unit. 2. Force field artillery headquarters. ²	1. Supported unit. 2. Force field artillery headquarters. ²
	General Support	1. Supported unit. 2. Force field artillery headquarters. ² 3. Own observers. ¹	Area of operations of supported unit.	1. Supported unit. 2. Force field artillery headquarters. ²	1. Supported unit. 2. Force field artillery headquarters. ²
Note: (1). Includes all target acquisition means not deployed with the supported unit (radar, unmanned aircraft systems), vehicles, air observers, survey parties. In the NATO, the gaining unit may not task-organize. Note: (2). If designated by the supported commander.					
NATO – North Atlantic Treaty Organization					

Figure 4. Army Support Relationships

Source: Headquarters, Department of the Army, Field Manual 3-09, *Field Artillery Operations and Fire Support* (Washington, DC: Government Printing Office, 2014), 1-34.

This figure depicts the inherent field artillery responsibilities in army support relationships. These support relationships are not a command authority, rather they allow commanders to assign support relationships when subordination of one unit to another is unnecessary. Support relationships provide options and flexibility to commanders, allowing them to leverage specific capabilities at specific times, places, and under predetermined conditions. This system is commonly used in the fires community where one organization may be called to support multiple other organizations in different capacities simultaneously and provide priority.⁷⁶

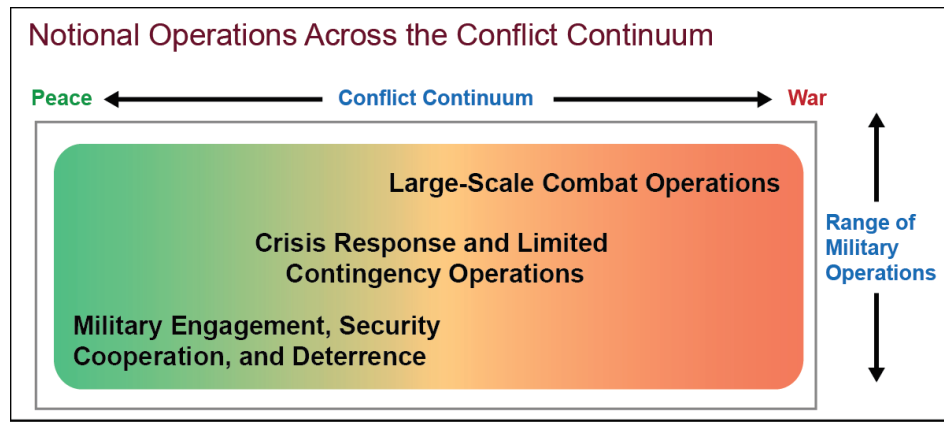


Figure 5. Conflict Continuum

Source: Headquarters, Department of the Army, Field Manual 3-0, *Operations* (Washington, DC: Government Printing Office, 2014), 1-1.

This figure depicts the range of military operations and conflict continuum. This scale shows the path conflict may travel as it escalates from peace to war and deterrence to large-scale combat operations and back down again. When discussing LSGC, this scale is important to understand all military operations fall along this scale.

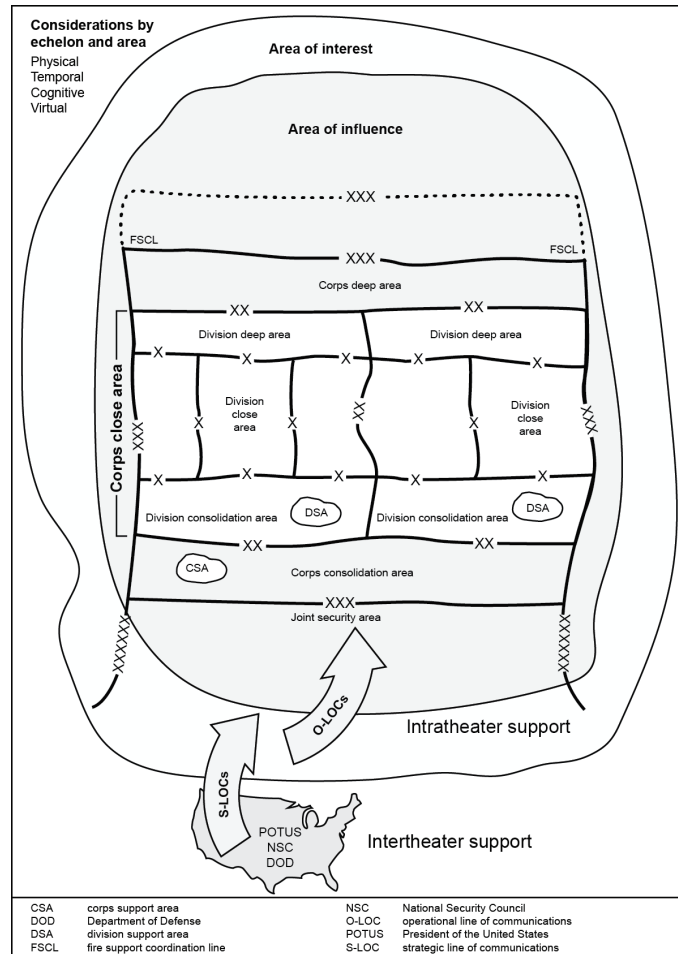


Figure 6. Contiguous Corps Area of Operations

Source: Headquarters, Department of the Army, Field Manual 3-0, *Operations* (Washington, DC: Government Printing Office, 2014), 1-32.

This figure further depicts a corps headquarters area of operations. It depicts a corps area of operations in relation to its subordinate divisions and the joint force.⁷⁷

Summary

This chapter aimed to add to the body of literature on the subject of the U.S.-NATO fires capability gap by pulling together current doctrine and schools of thought,

analyzing their strengths and weaknesses, and finding gaps. These gaps proved to be fruitful in the conduct of this study. It also found windows of opportunity for future research and investment by national, military, industrial authorities to shorten and eventually bridge the U.S.-NATO fires capability gap.

Across the categories of literature on the research topic, the common missing component, a lack of doctrinal answers, was confirmed. There is a general lack of doctrine discussion amongst authors and contributors and a gap in fires doctrine as a whole. As earlier mentioned, a capability gap is commonly acknowledged, specifically in professional publications and outside, articles, but workaround solutions are rarely offered. Solutions focus primarily on new technologies and investment.

For the purposes of joint and multinational operations, the respective doctrine available is severely lacking. These two sources, key to effective joint-multinational efforts do not provide the necessary guidance to operate as a combined fires force. Fires leaders are left without viable doctrinal solutions on how to fight and win with current capabilities against peer and overmatching threats. Air supremacy as a capability gap mitigation seems to remain as the prevailing standard. Chapter three will describe the methodology used in this thesis to process the available information and literature on the research topic. This methodology shapes the analysis found in chapter four and formulate conclusions and recommendations found in chapter five.

¹ Jason Carter and Robert Auletta, “Keeping the King on His Throne: The Purpose of Multinational Fires in Unified Land Operations,” *Fires* (September-October 2016): 28.

² Ibid., 29.

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- ³ Ibid.
- ⁴ Ibid.
- ⁵ Ibid.
- ⁶ Ibid.
- ⁷ Ibid., 30.
- ⁸ Ibid.
- ⁹ Ibid., 31.
- ¹⁰ Ibid.
- ¹¹ Ibid.
- ¹² Jason Carter, Joshua Severs, and Robert Auletta, “Keeping the King on His Throne, Part II: The Timely Delivery of Multinational Fires,” *Fires* (November-December 2016): 39.
- ¹³ Ibid., 40.
- ¹⁴ Ibid.
- ¹⁵ Ibid.
- ¹⁶ Ibid.
- ¹⁷ Ibid., 42.
- ¹⁸ Jason Carter, Andrew Eickbush, and Robert Auletta, “Keeping the King on His Throne, Part III: The Timely Delivery of Multinational Fires,” *Fires* (January-February 2017): 16.
- ¹⁹ Carter, Severs, and Auletta, “Keeping the King on His Throne, Part II,” 67.
- ²⁰ Ibid.
- ²¹ Ibid.
- ²² Marie Berberea, “Interoperability is Aim of US, UK Armies,” *Fires* (July-August 2017): 4.
- ²³ Ibid.
- ²⁴ Ibid.

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- ²⁵ Ibid., 5.
- ²⁶ Michael Centola and Nicholas Alexander, “Preparing for an Artillery Systems Cooperation Activities Exercise,” *Fires* (July-August 2017): 7.
- ²⁷ Michael Englis, “Employment of NATO Tactical Fires,” *Fires* (July-August 2017): 10.
- ²⁸ Ben Werner, “Raytheon Sees Future Business in Hypersonic Defense Technology,” *USNI News*, February 1, 2019, accessed February 01, 2019, <https://news.usni.org/2019/02/01/40831>.
- ²⁹ Todd South, “Army Lessons on Scientists to Push the Boundaries of Munitions Range, Precision, Lethality,” *Army Times*, October 8, 2018, accessed March 15, 2019, <https://www.armytimes.com/news/your-army/2018/10/08/army-leans-on-scientists-to-push-the-boundaries-of-munitions-range-precision-lethality/>.
- ³⁰ Todd South, “Return of Fires: How the Army is Getting Back to its Big Guns as it Prepares for the Near-Peer Fight,” *Army Times*, August 27, 2018, accessed March 15, 2019, <https://www.armytimes.com/news/your-army/2018/08/27/return-of-fires-how-the-army-is-getting-back-to-its-big-guns-as-it-prepares-for-the-near-peer-fight/>.
- ³¹ Robert Beckhusen, “Russia Unleashes Artillery in Eastern Ukraine,” *War Is Boring*, accessed March 15, 2019, <https://medium.com/war-is-boring/russia-unleashes-artillery-in-eastern-ukraine-fba04677463d>.
- ³² Talal Hussein, “NATO to Increase Defence Spending by \$100bn Amid US Criticism,” *Army Technology*, accessed March 15, 2019, <https://www.army-technology.com/news/nato-defence-spending-100bn/>.
- ³³ Jonathan Hill, “NATO – Ready for Anything?” *NATO Review Magazine*, 2019, accessed March 15, 2019, <https://www.nato.int/docu/review/2019/Also-in-2019/nato-ready-for-anything-military-force/EN/index.htm>.
- ³⁴ Martin Egnash, “US, Allies Conduct Biggest Artillery Event in Europe Since Cold War,” *Stars and Stripes*, March 7, 2018, accessed March 15, 2019, <https://www.military.com/daily-news/2018/03/07/us-allies-conduct-biggest-artillery-event-europe-cold-war.html>.
- ³⁵ Shawn A. Mains, “ICM: Bridging the Capability Gap Between 1 January 2019 and the Replacement Munition” (Master’s thesis, U.S. Army Command and General Staff College, June 2017), 1.
- ³⁶ Ibid., 70.
- ³⁷ Ibid., 66.

³⁸ Ryan Johnson, “Fires Readiness: The State of US Army Fires in Support of the Combined Arms Maneuver at the Division Level” (Master’s thesis, U.S. Army Command and General Staff College, June 2016), 81.

³⁹ Jeffery R. Fuller, “United States Army Field Artillery and the Hybrid Threat: Is it Time to Get Smart?” (Master’s thesis, U.S. Army Command and General Staff College, June 2014), ii.

⁴⁰ Ibid., 63.

⁴¹ Ibid., 64.

⁴² Jonathan L. Harvey, “Timely Effects: Organic Surface Fires and Airspace Doctrine in the 21st Century Joint Fight” (Master’s thesis, U.S. Army Command and General Staff College, June 2012), ii.

⁴³ Ibid., 67.

⁴⁴ Alex A. Aquino, “Force Structure Matters: The US Field Artillery in Operational Art” (Monograph, School of Advanced Military Studies, U.S. Army Command and General Staff College, May 2015), 1.

⁴⁵ Ibid., 39.

⁴⁶ Headquarters, Department of the Army (HQDA), Field Manual 3-0 (FM), *Operations* (Washington, DC: Government Printing Office, October 2017), vii.

⁴⁷ Ibid., 5-9.

⁴⁸ Ibid., 6-1.

⁴⁹ Ibid., 6-14.

⁵⁰ Ibid., 7-1.

⁵¹ Ibid., 2-61.

⁵² Ibid., 2-61.

⁵³ Headquarters, Department of the Army (HQDA), Field Manual 3-09 (FM), *Field Artillery and Fire Support* (Washington, DC: Government Printing Office, April 2014), vii.

⁵⁴ Ibid., 1-40.

⁵⁵ Ibid., 1-51.

⁵⁶ Ibid., 2-3.

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- ⁵⁷ Ibid.
- ⁵⁸ Ibid., 3-3.
- ⁵⁹ Ibid., 1-51.
- ⁶⁰ Ibid., 3-18.
- ⁶¹ Ibid., 4-4.
- ⁶² 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, October 2017), 1-1.
- ⁶³ Ibid., 1-3.
- ⁶⁴ Ibid., 1-5.
- ⁶⁵ JCS, JP 3-0, i.
- ⁶⁶ Ibid., I8.
- ⁶⁷ Joint Chiefs of Staff (JCS), Joint Publication (JP) 3-03, *Joint Interdiction* (Washington, DC: Government Printing Office, September 2016), vii.
- ⁶⁸ JCS, JP 3-09, vii.
- ⁶⁹ Joint Chiefs of Staff (JCS), Joint Publication (JP) 3-16, *Multinational Operations* (Washington, DC: Government Printing Office, July 2013), ix.
- ⁷⁰ Ibid.
- ⁷¹ JCS, JP 3-16, III-28.
- ⁷² North Atlantic Treaty Organization (NATO), Allied Joint Publication (AJP) 3.9, *Allied Joint Doctrine for Joint Targeting* (Brussels, Belgium: NATO Standardization Office, April 2016), VII.
- ⁷³ Ibid.
- ⁷⁴ North Atlantic Treaty Organization (NATO), Allied Joint Publication (AJP) 5, *Allied Joint Doctrine for Operational-level Planning with UK National Elements* (United Kingdom: Ministry of Defence, June 2013), 3-77.
- ⁷⁵ HQDA, FM 3-09, 1-31.
- ⁷⁶ Ibid., 1-32.
- ⁷⁷ Ibid., 1-32.

CHAPTER 3

RESEARCH METHODOLOGY

They are disrupting what we see as our capabilities, especially our stand-off capabilities where we are able to identify the enemy from stand-off lanes and conduct precision strikes and we see some of those capabilities in eastern Ukraine today.

— LTG McMaster, *Fires*

Overview

The purpose of this study was to determine how the United States and its partners can use joint and multinational fires to bridge the coalition-Russian fires capability gap. It also aims to determine the size and significance, and propose potential solutions in the doctrinal, material, and organizational solutions for the capability gap.

Methodology

To answer the primary and secondary research questions asked in this thesis, a compare and contrast and case study and construct using the DOTMLPF framework will be used. The primary research question is: how can we use multinational-joint fires to bridge the coalition fires capability gap? The secondary research questions are: 1) what are the current coalition fires capabilities? 2) what are the current Russian centric fires capabilities? 3) why do the U.S. and its coalition partners need to combine fires efforts? 4) what are the current impediments to the use of joint-multinational fires? 5) what upgrades and modernization efforts are the U.S., NATO, coalition, and partners making? The motivation for this endeavor were the activities

Data Collection

Data for this study was collected primarily through descriptive research. Research consisted of searching through U.S. Army, U.S. Joint, and multinational doctrinal, professional publications, and research paper repositories for relevant sources. Open-source and online sources were extensively searched for outside, independent articles and studies. Data collection was oriented, steered, and refined by interviews with subject matter experts. The information provided by these experts in the field, filled gaps in collection and reinforce concepts. They were extremely beneficial in helping find and uncover unknown biases in myself and others. Their expertise provided a much more accurate picture of reality.

Data Analysis

The primary component of data analysis in this study was the comparison and contrast, utilizing the DOTMLPF framework, to confirm the presence, size and significance of the joint-multinational fires capability gap. Three elements of the DOTMLPF framework were selected to narrow the focus, these are: doctrine, organizations, and material. After defining the characteristics of the capability gap, descriptive research was used to further analyze the capability gap and formulate proposed solutions. Case study to further quantify and highlight the capability gap with a recent real-world example. Doctrine, organization, and material template listed below:

DOTMLPF

Doctrine (publications)

Organization (units, by type, quantity)

Material (equipment, future technologies)

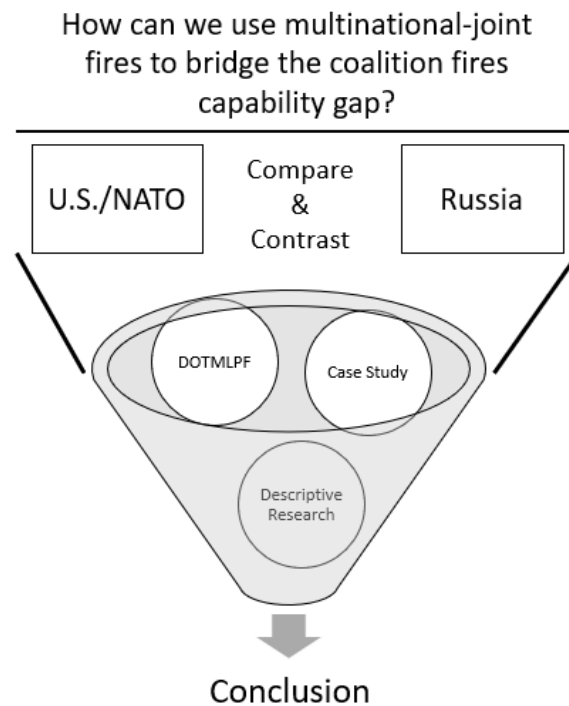


Figure 7. Thesis Methodology

Source: Created by author.

Summary

This chapter described the methodology and process used to define the problem and begin the formulation of possible solutions. It illustrated through an initial comparison and contrast, aligned with doctrine, material, and organizations, a joint-multinational fires capability gap. The comparison was supported by a brief case study, highlighting fires activities in eastern Ukraine, showcasing the most current and relevant example of the adversarial threat. After defining the threat and capability gap, descriptive

researched attempted to provide tangible solutions and recommendations for future investment.

The following chapter will present the findings and analysis of this study. Utilizing the methodology described in chapter three, chapter four will provide a thorough comparison and contrast of U.S.-NATO and Russian fires capabilities relying on doctrine, organizations, and material. Following this comparison, potential solutions will be offered and analyzed for viability.

CHAPTER 4

ANALYSIS

Jointness implies cross-service combination wherein the capability of the joint force is understood to be synergistic, with the sum greater than its parts (the capability of the individual components).

— Joint Chiefs of Staff, JP 1,
Doctrine for the Armed Forces of the United States

Overview

The purpose of this thesis is to determine how the United States and its NATO partners can use joint and multinational fires to bridge the U.S.-NATO Coalition-Russian fires capability gap. It also aims to determine the size and significance, and propose potential solutions in the doctrinal, material, and organizational solutions for the capability gap. This chapter will present the findings and analysis of this project, resulting from extensive review of available literature described in chapter two and information provided by experts in the field. The points highlighted in this chapter will set the foundation for the conclusions and recommendations found in chapter five.

This chapter begins by setting the stage for these findings through a brief case study of Russian activities in eastern Ukraine. Russian fires activities in Ukraine are useful to highlight the current state of affairs and need for continued technological advancement. This case study, though not perfect for comparison, with its limited scope and lack of a testing control, provides the best, most recent, and closest comparison available today. This chapter will also provide detailed description of the secondary research questions and the following points:

1. What are the current U.S.-NATO coalition fires capabilities?
2. What are the current Russian centric fires capabilities?
3. Why do the U.S. and its NATO partners need to combine fires efforts?
4. What are the current impediments to the use of joint-multinational fires?
5. What upgrades and modernization efforts are the U.S., NATO, coalition, and partners making??

U.S., NATO coalition, and Russian centric fires capabilities, a brief synopsis of current Russian military affairs, upcoming and anticipated equipment and organizations, current state of NATO affairs with a focus at the organizational level and military preparedness, and finally current impediments to comprehensive fires interoperability.

Russian Fires Activity in Ukraine

Russian New Generation Warfare doctrine continues to be on display in eastern Ukraine. The Russo-Ukrainian War served as a vehicle for Russia to deploy and test its generational shift in military affairs. Russian forces deployed a wide range of platforms and systems, displaying some of their recent advancements in reconnaissance and target acquisition, as well as their ability to effectively integrate and utilize older technologies, like the BM-21, on the modern battlefield. Mikhail Zhironkov, a military historian who observed the activities in Ukraine, is extensively quoted in a *Jane's International Defense* article in 2018. Here Zhironkov states that “Russian artillery mixes modern practices with older, less precise tactics...tactics by Russian artillery during the war in Donbas – in its active period in summer of 2014 to the winter of 2015 – were varied and flexible.”¹

Zhironkov reported that 152mm S219 SP howitzer, MSTA-B 152mm towed howitzers, and BM-21 MRLs (multiple rocket launcher) were used to destroy Ukrainian

units near the Russian-Ukraine border. These systems were used to mass on prescribed areas and had devastating effects on Ukraine's 30th Mechanized Brigade. He notes that as the conflict matured and Ukrainian actions adapted, so did the Russians use of artillery. More precise point targets began replacing wider area targets, requiring targeting to become more accurate and timelier. Russian use of Small Unmanned Aerial Vehicles (SUAV) proved to be a lethal addition to their fire support system. SUAVs such as the Orlan-10, Forpost, and commercial "off-the-shelf" quadcopters, were used extensively to locate and target Ukrainian formations. *Jane's* reports that Orlan-10 and Forpost SUAVs were used to direct artillery in the engagement of a Ukrainian column of the 92d Separate Mechanized Brigade in August 2014. Russian armed forces have been known to combine the use of tactical and commercial SUAVs to target enemy formations. *Jane's* supports this report by quoting an unnamed U.S. Army member who stated, "Ukrainians report that once they identify a low flying (under 1,000ft) UAS (unmanned aircraft system), they have between 10 and 15 minutes before their position will be hit with accurate artillery fire."²

Similar reports of devastating effects occurred in July 2014 when a single Russian artillery fire mission destroyed two Ukrainian mechanized battalions in a matter of minutes, in what is now called the Battle of Zelenopillya. During the battle Russian BM-21s were used to engage members of the 79th Airmobile Brigade at a Ukrainian outpost. It is assessed that in addition to SUAVs, the Russians have also used special operations forces and advanced electronic warfare assets to assist in locating and targeting Ukrainian elements.³

Russia's continued investment and practice of advanced electronic warfare techniques have given them a marked advantage of their adversaries. Tools such as the RB-301B Borisoglebsk-2 were used to jam and intercept cellular phone traffic. The Russians used the Borisoglebsk-2 to listen to Ukrainian phone conversations communicating the adjustment of Ukrainian artillery fires and exploited the breach of operational security. Using devices such as the Leer-3, the Russians were able to extract the internal GPS coordinates from Ukrainian cell phones to provide pinpoint targeting coordinates.⁴

Russia's activities in Ukraine present some interesting new dynamics and the return of some old to the modern battlefield. The era of both opponents in an operation possessing and employing UAVs has arrived. Mains in this thesis, raised the interesting point that, no longer is the use of UAVs to monitor and target adversaries solely a western capability. The U.S. and its NATO allies have employed UAVs with relative impunity and little fear of observation. Russian forces have focused on the employment of tactical and operational level drones to combine multiple sensor inputs and initiate highly effective and lethal mass area fire strikes.⁵ They have shown aptitude at using their sensors to rapidly mass fires formations on area targets, producing lethal results, and focusing less on precision strikes.

There are three critical components to the Russian method: the sensor platforms which are often used at multiple altitudes over the same target with complimentary imaging; a command-and-control system, which nets their input and delivers a strike order, and, an on-call ground-based delivery system which can produce strikes within short order.⁶

The Russian ability to mass and deliver area fires rapidly, with such intensity and speed has not been seen on the battlefield. Some weaknesses to the Russian approach

have been noted. Though fairly responsive, the Russian's ability to mass fires with such lethality does require considerable time to set the conditions for those strikes relying on pre-planned targets and UAS flight routes. In the absence of a pre-planned UAS flight route, the Russians showed difficulty responding to emerging or un-planned targets. Finally, the Russians struggled to track and target mobile targets. They compensated for this by focusing on fixed locations such as road junctures and bridges where formations have to converge and channelize.

The Donbass War has shown the increased lethality of indirect fires on the modern battlefield. High ammo expenditures combined with increasingly lethal munitions and modern targeting techniques have resulted in indirect fires being responsible for 80-85% of casualties. While western and NATO nations, including the U.S. have largely divested of advanced munitions such as Dual-Purpose Improved Conventional Munitions and Family of Scatterable Mines, both dud producing, Russia has not. The Ukraine conflict shows that Russia has closed and perhaps reversed the gap in advanced munition production. "Data from Ukraine conflict shows that artillery is producing approximately 85% of all casualties on both sides. While the Ukrainians have generally used their artillery with considerable effectiveness in the defense, it is on the Russian side that we see five trends that are important for U.S. and NATO ground forces."⁷ These trends will be analyzed further in the chapter to describe current Russian fires employment doctrine. The Ukrainian conflict is poignant example and warning of where the West (NATO-U.S.) stand against the East (Russia). The Russians have proven their renewed ability to produce advanced military technologies and compete with peer and near-peer opponents.

U.S.-NATO Fires Current State

Argument can be made that the U.S. and NATO are facing an interoperability gap, more than a capability gap. Several NATO members possess very capable systems. Countries like the U.K., Italy, Germany, and France possess long-range cannon capabilities in excess of 40km and precision munitions. Rocket capability varies throughout NATO; with guided munition ranges from 20km with the BM-21 to 90km with GMLRS, and 150km with 9A52-2 launchers in some former Warsaw Pact countries. As stated, capability varies by country with some NATO members only possessing light towed howitzers, requiring planners to more closely consider force packages. Several NATO members possess very sophisticated tactical fire direction and long-range capability. While some members have invested in sophisticated fire direction, countries like Italy have developed outstanding target acquisition and radar capabilities.⁸

Cannon

M109A7

The M109A7, “Paladin,” introduced in 2013, is a self-propelled 155mm howitzer which supports U.S. Army armored brigade combat teams. The M109 series of howitzers was first introduced in the early 1960’s and has seen numerous upgrades through the decades. Once more widely used by NATO members, the M109 series has been replaced by some European allies with the British AS-90 and German PzH 2000. The M109A7 is manned by a crew of four personnel, weighs 27.5 tons, and is equipped with a 39-caliber barrel (length). In the U.S. military, the Paladin is only used by the U.S. Army. It is fielded in batteries of six systems, with three batteries per field artillery battalion, for a total of eighteen systems in each armored brigade combat team.

The Paladin's A7 upgrade, known as PIM (Paladin Integrated Management), is the U.S. Army's latest attempt to keep the Paladin competitive on the modern battlefield. Upgrades, including the A7 PIM, have updated the Paladin's digital and fire control systems and crew survivability. Another significant upgrade of note, is the increase in electric power generation which leaves room for future updates and advanced technologies. The inclusion of the Bradley Fighting Vehicle chassis in the A7 PIM has improved reliability, maneuverability, and speed. The M109A7 is currently armed with a 39-caliber 155mm diameter barrel with the potential to upgrade to a 58-caliber barrel, allowing for significantly increased firing ranges. The Paladin's rapid mobility and digital interfaces allow it to emplace and displace quickly. It is able to fire four rounds per minute for one minute and sustain one round per minute. Its maximum ranges are the same as the M777A2, with a rocket-assisted high explosive maximum range of 30km and a range of 40km with precision guided munition (PGM) Excalibur.⁹

M777A2

The M777A2, introduced in the early 2000's, is a towed 155mm howitzer. Designed to replace older and heavier towed howitzers, the M777 series has seen extensive use in by the U.S. Army and Marine Corps in the Global War on Terrorism. In fact, it is the only howitzer maintained by the U.S. Marine Corps. Its nearly 40% weight reduction over its 155mm predecessor, the M198, increased its ability to rapidly deploy across the battlefield by air and ground. As the U.S. military's first primarily digital towed howitzer system, the M777A2 has allowed for the continued growth and expansion of advanced precision munitions such as the Excalibur which will be highlighted later in this study. The M777A2 is manned by a crew of eight and can emplace and displace in

nearly two minutes respectively. It fires the full complement of U.S. 155mm projectiles. The M777A2 provides a maximum range of 30km with rocket assisted high explosive projectiles and nearly 40km when firing Excalibur. It produces a maximum rate of fire of four rounds per minute for two minutes and a sustained rate of fire of two rounds per minute. The M777A2 is out-ranged by its competitors by an excess of 20km, putting U.S. formations at a significant disadvantage. Procurement efforts are ongoing to increase the range and lethality of the M777A2.¹⁰

M119A3

The M119A3, which began service in the U.S. military in the late 1980's, is a towed 105mm howitzer. The M119 was upgraded to its current variant, the M119A3 in 2013. The A3 model provided the M119 with digital displays, communications, fire control and GPS self-locating capabilities. The M119A3 is utilized by U.S. Army infantry brigade combat teams and is the preferred howitzer for air assault and airborne operations. It is manned by a crew of seven and weighs approximately 5,000 pounds allowing for rapid movement by a host of different platforms. The M119A3 does not provide the same PGM capabilities as its 155mm counterparts but does provide an increased rate of fire. It fires at a maximum rate of eight rounds per minute for three minutes and a sustained rate of three rounds per minute for thirty minutes. The M119A3 provides less range than the M777A2 or M109A7 with a max range of 17.5km for standard HE and 19.5km with rocket assisted projectiles. Its smaller diameter and shorter maximum ranges allow it to deliver rounds at a shorter minimum range than 155mm in indirect fire mode. The M119A3 continues to support combat operations and has been successfully utilized in the most recent conflicts. Infantry brigade combat teams are

augmented with one M777A2 battery in addition to their two M119A3 batteries to provided increased range and munition capabilities..¹¹

Rocket

M270A1

The M270A1, introduced in the early 1980's, is an armored multiple rocket launcher and commonly referred to as MLRS (multiple launcher rocket system). The M270A1 a track-based vehicle, housed on a Bradley Fighting Vehicle chassis. Designed to meet and counter Russian area target saturation with rocket munitions, suppression of enemy air defenses, and conduct counterbattery fire, the M270A1 provides ground forces with a large volume of fire in a short amount of time. Use of the M270A1 in suppression of enemy air defenses and counterbattery operations frees cannon artillery units to close supporting fires to ground units. "One M270 firing twelve M26 rockets would drop 7,728 bomblets, and one MLRS battery firing 108 rockets had the equivalent firepower of 33 battalions of cannon artillery."¹² The M270A1 fires a variety of projectiles with varying ranges, most of which will be discussed later in the chapter. Its standard high explosive rocket, the M26A1, fires a maximum range of 45km. Each launcher can carry two pods of six rockets each or two pods of one ATACM (Army Tactical Missile System Missile) each. The M270A1 has continued to see upgrades has been used extensively in recent conflicts. It is also utilized by several other nations..¹³

M142

The M142 "HIMARS" (High Mobility Rocket System), introduced the late 1990's, is a multiple rocket launcher similar to the M270A1. The key differences

between the two platforms is in the vehicle base and number of rounds each vehicle holds. The M142 is housed on a five-ton MTV (medium tactical vehicle) truck. It also only contains one rocket pod consisting of six rockets or one ATCAMS, 50% less than the M270A1. The M142 and M270A1 launchers fire the same projectiles and only differ in number of rounds they can hold. The M142's significantly lower weight and dimensions allow for it to be moved more rapidly around the battlefield. It is also transportable by the C-130 transport. It performs the same mission requirements as the M270A1 and is utilized by the U.S. Marine Corps. In 2017 the Marine Corps fired the M142 from a vessel at sea to test the delivery of precision munitions from a sea-based and moving platform. This development provides the Marine Corps with significant stand-off to engage shore defenses at sea.¹⁴ The HIMARS continues to be used extensively in combat operations with remarkable results. It is also widely utilized by several other countries.¹⁵

Munitions

GMLRS

The Guided Multiple Launch Rocket System (GMLRS) or (M30, M31, M31A1, GMLRS-ER) is a surface-to-surface rocket first introduced in early 2000's. The GMLRS family are precision, long-range rocket munitions guided by inertial navigation and GPS. The M30 rocket offers a range of approximately 60km and contains 404 M85 submunitions. The M31 is similar to the M30, but contains a 200lbs unitary high-explosive warhead. The M31A1 improves upon the M31 by adding additional fuze options.¹⁶ Finally, the GMLRS-ER, expected to enter service in 2020, provides an extended range of 150km. The GMLRS family of rockets are fired by M270A1 and

M142 launchers and employed by several other nations. They have seen extensive use in combat operations throughout the world.¹⁷

GMLRS-AW

The GMLRS-AW (Advanced Warhead) or (XM30E1) is a surface-to-surface rocket in the GMLRS family of munitions, introduced in 2015. It maintains the same guidance, control, and propulsion systems as the M31A1, fired from the same platforms and has a range of 70km. The XM30E1 carries a 200lbs high-explosive warhead containing approximately 180,000 preformed tungsten fragments. This munition meets 2008 DoD Policy on Cluster Munitions and Unintended Harm to Civilians (currently suspended) as it contains no submunitions. The XM30E1 is intended area or imprecisely located targets such as fire support and air defense assets, command posts, light armored vehicles, and high-payoff targets. GMLRS-AW is not ideal for all target sets, but provides commanders with a new, flexible, and precise long-range weapon without the concern of dud-producing submunitions. The XM30E1 has successfully completed testing and is available for employment.¹⁸

ATACMS

The ATACMS, introduced in the late 1980's, is a long-range 610mm surface-to-surface missile. First used in the 1991 Persian Gulf war, it is a GPS and inertial guided area weapon. It is available in multiple variants but is armed with either cluster submunitions or a unitary high explosive warhead. The ATACMS can be fired from the M270A1 MLRS and M142 HIMARS launchers. In its current variant, the MGM-168 has a maximum range of 300km. The ATACMS continues to be used in combat and has

proven very effective, providing commanders with a long-range surface fires option. Plans are underway to upgrade the ATACMS and find an eventual replacement.¹⁹

Excalibur

Excalibur (M982), introduced in the late 2000's, is a 155mm cannon projectile fired from the M777A2, M109A7, and several other NATO 155mm systems. Excalibur is a fin-stabilized projectile that when fired, acquires satellite signal and glides to its target and allowing it reach ranges in excess of 40km. It utilizes inertial guidance and GPS to locate targets and achieve accuracy within ten meters. Excalibur is fired solely at high-angle allowing it to achieve its maximum range and aiding in GPS guidance. It is designed to attack point targets such as personnel, light materiel, within close proximity to friendly troops, and buildings in urban terrain with minimal collateral damage. Excalibur has seen extensive use in combat operations since its arrival with great success, often achieving accuracy within five meters. It continues to see advancements upgrading its navigational systems and range. Expected upgrades include laser-designation, smart, and discriminating variants allowing it to engage moving and time-sensitive targets.²⁰ Excalibur provides BCT commanders with a large caliber, precision weapon at extended ranges, allowing them to engage targets in urban terrain and shape the deep fight.²¹

Table 1. U.S. Ground Fires Capability				
Service Component	Platform	Weapon System	Unit Structure	Number of Battalions
U.S. Army (Active Duty & National Guard)	Cannon	155mm (T)	3x6	9
	Cannon	155mm (SP)	3x6	16
	Cannon	105/155mm (T)	3x6	33
	Rocket	MLRS	2x8	8
	Rocket	HIMARS	2x8	17
U.S. Marine Corps (Active Duty & Reserve)	Cannon	155mm (T)	3x6	8
	Rocket	HIMARS	3x8	2
Total				93

Source: Created by author.

NATO Currently

The North Atlantic Treaty Organization (NATO) is an international diplomatic and military alliance of 29 nations primarily located in Europe and North America. Formed in 1949, after the conclusion of WWII and the beginning of the Cold War, NATO has been a forum to establish dialogue and peaceful cooperation. A key tenet in structure of NATO is its Article-5 statute which states that an attack on one member is an attack on all members. Because of this, NATO is the primary arm of resistance and deterrence to Russian activities and aggression in the region.²² NATO has few permanent forces of its own and relies on the cooperation and commitment of its member nations to provide military forces in response when required. NATO's military arm consists of two

strategic level commands, Allied Command Operations (ACO) and Allied Command Transformation (ACT).²³

Allied Command Operations contains: Supreme Headquarters Allied Powers Europe (SHAPE), Headquarters Allied Joint Force Command (JFC) HQ Brunssum, Headquarters Allied Joint Force Command Naples, Headquarters Allied Maritime Command (MARCOM), Headquarters Allied Air Command (AIRCOM), Headquarters Allied Land Command (LANDCOM), Rapidly Deployable Corps Headquarters, and subordinate supporting commands. The AOC is under the command of the Supreme Allied Commander Europe (SACEUR). The SACEUR, currently GEN Tod Wolters, is held by a United States flag or general officer. The SACEUR also serves as the Commander of US European Command. The ACO is responsible for the planning and execution of all NATO military operations. Its two operational level commands, JFC Brunssum and Naples are capable of deploying and serving as joint task force headquarters.²⁴ The ACO's three tactical or component level commands, AIRCOM, LANDCOM, and MARCOM provide service-specific expertise and support to the joint force commands and report directly to SHAPE.

The Allied Command Transformation contains: Headquarters Supreme Allied Commander Transformation, Joint Warfare Centre, NATO Training Group, NATO Joint Force Training Centre, NATO School, and Joint Analysis and Lessons Learned Centre. ACT is commanded by the Supreme Allied Commander Transformation (SACT) and is responsible for NATO's transformation initiatives.²⁵

Over the last twenty years, NATO has established and refined its system of graduated force readiness. This is a tiered system of readiness providing LANDCOM and

SHAPE force package options. These forces include: Allied Rapid Reaction Corps, Rapid Deployable German-Netherlands Corps, NATO Rapid Deployable Corps-Italy, NATO Rapid Deployable Corps-Greece, NATO Rapid Deployable Corps-Spain, NATO Rapid Deployable Corps-Turkey, Rapid Reaction Corps-France, EUROCORPS, The Multinational Corps' are commanded by a rotation of European commanders and highlight NATO and Europe's efforts to maintain a trained and ready combat formation capable of effective threat deterrence and response. The Corps is composed of three divisions consisting of forces from numerous NATO members.²⁶

NATO training exercises like Dynamic Front continue to build interoperability, partner capacity, and project visible adversarial deterrence.

To be sure, there is some recognition of this changing picture of Russia. Senior US and other allied officials and generals have noted this Russian conventional capacity and how it might have a negative impact on NATO and allied forces, noting, for instance, Russian anti-access/area denial (A2/AD) capabilities. Furthermore, in early 2016, the United States announced a quadrupling of its military spending in Europe over a two-year period as part of what Defense Secretary Carter stated was a "strong and balanced" approach to reassure Eastern European allies and to deter Russian aggression. "We must demonstrate to potential foes that if they start a war, we have the capacity to win," he said.²⁷

This statement and supporting quote by former Secretary of Defense, Ash Carter, speaks to the evolving nature of western-Russian relations and current state of affairs. Renewed spending and emphasis on U.S. and NATO capacity in Europe indicates the concerns held by western leaders regarding the intentions and capacity of a resurgent Russia. Interestingly it mentions not only Russia's growing conventional capacity, but also its A2/AD ability, which directly threatens NATO's ability to successfully affect military operations in Europe and in satellite areas of contention.

United Kingdom

The United Kingdom fields an impressive ground fires element. Centered around the AS-90, L118, and MLRS, U.K. field artillery is a formidable force. The AS-90 is a self-developed replacement for the U.S. M109A6, formally used by U.K. forces and introduced in the early 1990's. Like the M1096, the AS-90 is a self-propelled 155mm, 39-caliber howitzer. The AS-90 provides similar ranges as the M109A6/A7 but an increase in rate of fire. It is capable firing three rounds in ten seconds (burst), six rounds per minute for three minutes (intense), and two rounds per minute for six minutes (sustained). The L118 is a 105mm howitzer similar to the U.S. M119.²⁸

Canada

Canada provides a battle tested artillery capability to the NATO portfolio. Ground fires are focused around the M777A2 towed-howitzer. Used in a similar capacity as U.S. forces, the M777A2 provides Canadian forces with a lightweight 155mm howitzer capable of delivering conventional and precision guided munitions. The Canadian Army maintains three combat brigades with the ability to deploy one brigade at a given time. Each brigade holds one field artillery regiment (battalion equivalent). Each field artillery regiment consists of two M777A2 firing batteries, each with six howitzers, one target acquisition battery, and one headquarters battery. This number brings a total of three field artillery regiments and a maximum of 36 available M777A2 howitzers, with the ability to source additional howitzer sections from the reserve component if required. Similar to its NATO partners, Canada is exploring options for a mechanized howitzer replacement and more advanced munition options for increased range and lethality.²⁹

Russia

Russia's Strategic Focus

The last ten years have witnessed a resurgence in Russian military activity. Brief military actions in Georgia in 2008 ended with disappointing results and exposed significant capability shortfalls. Since then, Russia has paid renewed focus to overhaul its armed forces. Paired with a program of military exercises, Russia has continued its destabilization campaign. The aim of this campaign is to create instability and anxiety amongst western powers. The last decade of development, enabled Russia's 2014 Ukraine invasion and 2015 Syrian intervention.³⁰

Russia continues to flex its strategic mobilization capability through presidential mandated annual exercises. ZAPAD, VOSTOK, TSENTR, and KAVKAZ are capstone events of the Russian armed forces annual training cycle. The purpose of these exercises are to test the military's ability to transition from peace to war readiness. Upon completing the transition, these exercises are geared to test preparedness for "large-scale, high-intensity warfare against a technologically advanced peer adversary."³¹ In addition to these planned mobilization exercises, Russian President Vladimir Putin also initiates four to six no-notice exercises across various regions, echelons, and services. The context of these exercises indicates that Russia is focused on strategic capacity building and multidirectional, theatre-level conflicts in an LSCO environment.³²

VOSTOK 2018, a Russian large-scale, mobilization and training annual exercise is Russia's latest effort to flex its resurgent military prowess. Rumored to include 300,000 troops (75-100,000 combat troops), 1,000 aircraft, 80 ships, and 36,000 tanks and other vehicles, it was the largest known Russian exercise since the early 1980's.

Occurring over the span of three months, VOSTOK included Chinese and Mongolian forces. Primed for media attention, VOSTOK is largely labeled as a “show of force” by western officials. Nonetheless, it displays Russia’s continued emphasis on advancement, readiness, and rapid large-scale mobilization..³³

The capabilities developed and practiced during VOSTOK and the other exercises can be brought to bear on NATO’s flank as easily as they can be projected in any other strategic direction. Russia’s are by far the largest military exercises in Europe and are unique for their aims, size and frequency – as well as their transparency..³⁴

Russian Fires Employment and Tactics

As stated earlier, the best and most current example of Russia’s current fires capabilities and employment tactics, are its actions in the Ukraine conflict. Contrary to most western militaries, including the U.S., the Russians use maneuver forces to fix and artillery to destroy the enemy. This is a key point of this study which likely explains Russia’s significant investment in fires technologies and formations. Using their large fires capability to destroy provides for increased stand-off and protection of their maneuver forces. Russian Missile and Artillery Troops is an element in the Ground Forces branch of service. It consists of: missile, rocket, artillery brigades, high-power mixed units (tube and rocket), artillery battalions, rocket artillery regiments, separate artillery reconnaissance battalions, and artillery elements in combined arms brigades and military bases.

Russian forces use a wide variety of systems and configurations. In this instance, a motorized rifle brigade will be highlighted. Such a brigade contains two self-propelled howitzer battalions, one antitank artillery battalion, and one MRL battalion. A SP howitzer battalion consists of three firing batteries (18 howitzers each) giving each

brigade a total of 36 howitzers. The antitank artillery battalion contains one battery of antitank artillery, armed with six MT-12 “Rapira” 100mm cannons, and two antitank missile batteries. The MRL battalion contains three rocket batteries of eight launchers each, for a total of 18 launchers per brigade. This is a significant overmatch compared to a U.S. BCT. One Russian motorized rifle brigade contains more indirect fire capability than an entire U.S. armored division consisting of three BCTs.³⁵

Artillery constitutes the primary means by which Russian Ground Forces destroy the enemy, with and through, conventional and nuclear fires during the conduct of combined arms operations. Russian Missile and Artillery forces are designed to perform the following tasks:³⁶

1. Achieve and maintain fire superiority
2. Defeat of the enemy’s means of nuclear attack, manpower, weapons, military and special equipment
3. Disrupt troops and command and control, reconnaissance, and EW systems
4. Destroy permanent defense installations and other infrastructure
5. Disrupt the enemy’s operational and tactical logistics
6. Weaken and isolate the enemy’s second echelons and reserve
7. Destroy enemy tanks and other armored vehicles that breach the defense
8. Cover open flanks and junctions
9. Participate in the destruction of enemy aircraft and the amphibious assault forces
10. Conduct remote mining operations
11. Provide illumination to troops maneuvering at night

12. Provide smoke screens and blind enemy targets

13. Distribute propaganda materials.³⁷

Russian artillery forces complete these tasks through four primary methods: annihilation, destruction, neutralization, and harassment. The inclusion of annihilation supports their doctrine of using maneuver to fix and fires to destroy. The use of fires to annihilate targets requires a large expenditure of munitions. Minus the inclusion of annihilation, Russian standard methods of fire are not too dissimilar from U.S. doctrine. Artillery fire planning classifications include:³⁸

1. Fire against an individual target
2. Fire concentration
3. Standing barrage fire
4. Deep standing barrage
5. Moving barrage
6. Double moving barrage
7. Successive concentrations of fire
8. Offensive rolling barrage
9. Massed fire

These planning classifications form how Russian forces use artillery systems to annihilate, destroy, neutralize, and harass enemy formations and support combined arms maneuver. These classifications are meticulously planned, timed, and executed to halt enemy axes of advance and protect advancing forces from friendly artillery.³⁹

Five new trends were distilled by Phillip Kraber, a contributor to the Potomac Foundation, who wrote extensively on lessons learned from the conflict. These trends

will be used to describe Russia's current tactics. The first trend mentioned by Karber is the increased Russian emphasis on MRLs area fires. Later in the chapter, key Russian MRL systems used in Ukraine are described in great detail.⁴⁰ Russia's investment in MRL systems was visible in Donbass where three MRLs were found for every four cannon tubes. The extensive use of area-fire rockets and advanced munitions such as Dual-Purpose Improved Conventional Munitions, scatterable mines, top-attack, and thermobaric warheads on pre-planned targets proved incredibly lethal and effective. This method has indicated and renewed Russia's reliance on massed, heavy artillery to support ground forces and destroy enemy formations.⁴¹

The second trend of note from the Ukrainian conflict, is the use of artillery in direct-fire mode by both sides. The 2S1 Gvozdika (Carnation), a self-propelled 122mm howitzer, has been the weapon of choice for direct-fire artillery engagements. While both sides have the 2S1, the Russians have seen success using it as an assault gun to target Ukrainian bunkers and anti-tank positions at ranges of 1-6km. The effectiveness and stand-off range of the 2S1 has caused Ukrainian anti-tank teams hesitant to engage armored threats, fearful an 2S1 is in range to engage. At close range, the 122mm has proven powerful enough to have devastating effects on armored vehicles and their crews without penetrating the armor.⁴²

The third trend is the decentralization of artillery down to Russian maneuver battalions. Traditionally, artillery has been withheld at the brigade or regiment level in both the U.S. and Russian militaries. In Donbas, artillery batteries such as 2S3's and BM-21's, are not being just attached, but assigned to maneuver battalions. The range of these weapons exceeds the traditional reach of maneuver battalions. It has been assessed that

due to the size of the operating area, a low force-to-space ratio, and increased lethality wider, survivability dispersion is required..⁴³

The fourth trend is the pursuit of increased range of artillery. While the Ukrainian capability remains in line with NATO standards, they have found the increased dispersion and range of counterbattery fire has necessitated the availability of longer ranged platforms. The Russians have signified this trend by extending the range of the Grad and Smerch as well as deploying the 2S5, 2S7, and 2S35 with a reported range of 70km. The use of longer ranged artillery has been in concert with the use of UAVs to target at extended distances and reciprocal counterbattery fire from enemy long-range systems..⁴⁴

The final trend noted, is the increased emphasis on counter-battery radar. The use of counter-battery radar is linked to the previous trend discussed. Employment of longer ranged artillery systems, due to the increased use of UAVs, the need for dispersion, and use of mass area-fire strikes, has precipitated the need for counter-battery radar to mitigate. In Donbass, the Russians have introduced many of their most advanced systems: Zoopark-1, Leopard-T, and Lynx-1. The Russians have shown significant success conducting counter-battery fires with these radars. They have also proven adept at targeting U.S. radars such as the ANTPQ-35, used by the Ukrainians. Through the use of massed heavy artillery area-fire strikes, UAV targeting, long range artillery, and advanced counter-battery radar, Russian forces have been actively practicing for LSGC in a live-fire capacity..⁴⁵

Greater attention needs to be paid to what is called the “Russian Reconnaissance Strike Complex” (RYK) and the “Reconnaissance Fire Complex” (ROC). Though the

massed use of conventional munitions is the staple of Russian ground forces, the rapid employment of these munitions and more expensive precision munitions, requiring more fidelity has been a goal. “The Soviet Union, now Russia, have long worked on the development of twin concepts for the detection and assured destruction of high-value targets in near-real time.”⁴⁶ This RYK was designed for use at the operational level by, “the coordinated employment of high-precision, long rang weapons linked to real-time intelligence data and precise targeting provided to a fused intelligence and fire-direction center.”⁴⁷

The Reconnaissance Fire Complex complimented the RYK and served as the tactical equivalent. The ROC worked to link intelligence data, precise targeting, and fire-direction centers and tactical artillery to destroy high-value targets in real-time.

A new method is the employment of combined arms tactical groups, each consisting of one or two battalions, each fighting on separate axes. Alongside the offensive, the combined arms formation may conduct defensive actions primarily by delaying and blocking actions as well as by conducting a dispersed defense utilizing brigade subunits. The dispersed defense can consist of platoon strong points combined with mine-field obstacles and a preplanned system of artillery fires. Artillery will be attached to the combined arms subunits or will provide artillery support under the direction of the senior commanders.⁴⁸

Cannon

D-30

The D-30, introduced in the 1960's, is a 122mm towed howitzer. It is a widely used weapon known for its simplicity and rugged reliability. Manned by a crew of five, the D-30 can emplaced in nearly two minutes.⁴⁹ The D-30's sustained rate of fire is six-eight rounds per minute. Its maximum range for standard high explosive projectiles is 14.5km and its maximum range is 21.9km with rocket assisted projectiles. Overall, the D-

30 is a simple but highly effective howitzer popular in developing military forces throughout the world.⁵⁰

2S19

The 2S19 “Msta-S,” introduced in the 1980’s, is a 152mm self-propelled howitzer. The 2S19 is based on a T-80 chassis.⁵¹ Some variants of the howitzer achieve ranges in excess of 45km with base-bleed munitions and 62km with rocket assisted projectiles. The 2S19 can be emplaced and displaced in 1-2 minutes. It has a rate of fire of eight rounds per minute, a normal rate of fire at six rounds per minute, and a sustained rate of two rounds per minute.⁵² The 2S19 continues to be employed in operations and has used by Ukrainian forces in Donbass.⁵³

2S35

The 2S35 “Koalitsiva-SV,” introduced in 2015, is a 152mm self-propelled howitzer currently in testing for full employment in the future. The 2S35 is expected to eventually replace the 2S19. It is currently based on a T-90 chassis with the possibility of upgrading to the T-14 Armata chassis. The 2S35 is a highly automated howitzer system with ranges far exceeding current U.S. howitzers. It is reported to have a maximum range of 80km with precision-guided munitions and up to 40km with standard munitions. Its reported rates of fire at a maximum of 20 rounds per minute also greatly exceed U.S. comparable systems. Accuracy of the 2S35’s capabilities may be questionable due its recent release and the reliability of Russian new sources.⁵⁴

2S5

The 2S5 “Giatsint-S,” introduced in the early 1970’s, is a 152mm self-propelled howitzer. It is chemical, biological, radiological, and nuclear protected, capable of firing nuclear munitions, and is more advanced than its earlier counterparts such as the 2S3. The 2S5 can fire standard projectiles up to 28km and rocket assisted projectiles with a maximum range of 40km. Its available munitions include: HE, high explosive anti-tank, cluster, smoke, and nuclear projectiles. The 2S5 can emplace in three minutes and fire a sustained rate of 5-6 rounds per minute. The 2S5 continues to be employed in operations and has used by Ukrainian forces in Donbass.⁵⁵

2S7

The 2S7 “Pion”, introduced in the mid-1970’s, is a nuclear-capable, 203mm self-propelled howitzer built on a T-80 chassis and fires a larger projectile at greater ranges than the 2S5. It has a 5-6-minute emplacement time and can fire 2.5 rounds per minute. The S25 can fire HE projectiles up to 37.5km and rocket assisted projectiles with a maximum range of 55km. The intense pressures produced during firing have the ability to incapacitate exposed personnel. The 2S7 has the ability to fire up to two rounds at long range and displace before those rounds impact. This gives the 2S7 increased survivability and reduced susceptibility to counter-battery fire. The 2S7 continues to be employed in operations and was also recently used by Russians and Ukrainians in the Donbass.⁵⁶

Rocket

BM-21

The BM-21, “Grad,” introduced in the early 1960’s, is a 40-barrel 122-millimeter MRL. The launcher is transported on a six-by-six truck. Manned by a crew of three, the BM-21 can be emplaced and ready to fire in three minutes and displaced within two minutes. The crew has the ability to fire the launcher from within the truck cab or via a 64-meter-long cable. The BM-21 can fire rockets in clusters, a single rocket at a time, or all 40 of its rockets within 20 seconds. Manual reloading operations can take ten minutes to complete. The BM-21 has a maximum range of 45km can deliver a variety of munitions such as HE, incendiary, illumination, scatterable mines, smoke, and radio frequency jamming. rockets. One battalion consisting of eighteen launchers can fire 720 rockets in one mission. The BM-21 is a very popular and highly effective system that is utilized by numerous countries.⁵⁷

BM-30

The BM-30 “Smerch” also known as the 9A52-2, is a 12-barrel, 300mm MRL introduced in the late 1980’s. It is mounted on an eight-by-eight wheeled chassis. The BM-30 is manned by a crew of four personnel, capable of emplacing in three minutes and displacing in two minutes. It contains a high level of automation which allows for rapid firing capability. The BM-30 can fire all twelve of its rockets in 38 seconds and reload in 20 minutes. Its munitions have minimum ranges between 20-25km and maximum ranges between 70-90km depending on projectile. Munitions available include: high explosive, cluster munitions, scatterable mines, high explosive antitank, and thermobaric. The BM-30 was recently employed in Ukraine and Syria.⁵⁸

9K512

The 9K512, also known as the BM-27 “Uragan,” is a 16-barrel, 220mm MLRS, mounted on an 8x8 wheeled chassis. The BM-27 has a maximum firing range of 35km and fires HE, chemical, scatterable mine, and submunition rockets with warheads weighing between 90-100kg. It can fire its full payload in 20 seconds. Because of its rapid rate of fire, it is an excellent tool for emplacing scatterable minefields. The BM-27 and its variants continue to be employed today.⁵⁹

TOS-1A

The TOS-1A (Heavy Flamethrower System), also known as the BM-1, is a 24-barrel, 220mm multiple launcher rocket system mounted on a T-72 tank chassis. The system is found with Russian chemical, biological, radiological, and nuclear units and fires primarily incendiary and thermobaric munitions. The TOS-1A fires is able to expend its payload within 6-12 seconds with a maximum range of 6km. It is reported to have been used in Ukraine and Syria as recently as 2018. The TOS-1A is a short-range multiple launch rocket system capable of unleashing devastating firepower in a very short amount of time.⁶⁰

9K720

The 9K720 Iskander, also known as the SS-26 “Stone,” is a mobile short-range ballistic missile system for theater level engagements. The 9K720 and its variants have a minimum range of 50km and maximum ranges of up to 500km. It is often carried on an 8x8 wheeled chassis carrying up to four missiles on the vehicle. The Iskander missile system is believed to be key evidence of Russia’s non-compliance with the INF Treaty.

As stated, some of its missile variants have an advertised range in vicinity of 500km or more and carry a 700-800kg warhead. Weapon guidance is supported by optical homing and encrypted radio capabilities, providing reported accuracy within 5-7m. There is speculation that its latest missiles travel at hypersonic speeds and have the ability to pull “high-G” turns enabling them to evade anti-ballistic missiles, however these reports are questionable. Extended range cruise missiles also exist with reported ranges over 5,500km. The Iskander missile system is an advanced and dangerous strategic level weapon.⁶¹

Why do the U.S. and its coalition partners need to combine fires efforts?

The need to combine fires forces and military forces in general in NATO is of renewed and increasing importance. As stated earlier, Russian forces are currently and actively practicing and preparing for the employment of ground fires in the LSGC environment. They are doing so against a worthy opponent in live-fire capacity. It has already been demonstrated that the Russians have renewed their doctrine of using maneuver forces to fix and artillery forces to destroy. The increased investment in new systems and formations and the employment of longer range, more lethal munitions, is evidence of their doctrinal intentions.

NATO is an alliance of nations with a key purpose of mutual protection. Member nations of NATO, either through budgetary requirements, political desires, or military necessity, have structured their defensive capability with the underlying expectation of an effective military alliance. With the presence of 29, likeminded governments, each with their own functioning economies and tax bases, it is most cost effective to combine efforts where possible.

Rather than each nation researching, developing, and producing every military capacity and technology, NATO members can benefit from sharing and distributing military costs. When pitted against a lone adversary, with a struggling economy, there is great benefit in leveraging the economic ability of member nations to share investment. Simultaneously, respective member nations can specialize in and focus their investment or industry, in specific technologies and share those with the collective. Presenting a successful deterrent in the face of geopolitical or military aggression is better accomplished with a unified stance. Providing for the “collective defense,” a key tenant of the U.N. charter, will likely be more successful if members can collectively agree to combine and compliment their efforts, reducing redundancy and finding efficiencies.

Russian military forces present a significant numerical advantage in fires capability. One NATO member alone cannot meet or exceed the volume of fire Russian forces can bring to bear. Through mechanisms such as the ASCA program and NATO multinational corps, NATO can begin to mitigate this Russian threat.

What are the current impediments to the use of joint-multinational fires?

The critical vulnerability in any joint-multinational military cooperation is the strength of the union and effectiveness of its interoperability. Napoleon’s method of divide and conquer proved to be effective in the defeat of the European allies. Facing an overmatch in manpower and resources, Napoleon adeptly maximized the capability of his forces to defeat his adversaries from positions of tactical and operational advantage. Continued examples can be seen in the Arab-Israeli wars in the 1960-1970’s. The combined Arab forces maintained numerical superiority, but failed to effectively coordinate their actions with a unity of command and unity of effort. The vulnerability of

the Arab coalition was not their size, it was their inability to coordinate their efforts resulting in a surprising defeat. This section will highlight a few of the current impediments in the use of joint-multinational fires.

Interoperability is perhaps the biggest hurdle in U.S.-NATO fires. Differing systems between members requires unique integration and logistical support. An example of integration and logistical complications can be seen between U.S. M109A7 and German PzH 2000 SP howitzer battalions. The operation of these two systems in coordination requires the management of two different ammunition variants. U.S. 155mm howitzers like the M109A7 fire 155mm 39-caliber rounds while the PzH 2000 fires 155mm 52-caliber rounds. A logistical mistake could put one of these battalions out of action until the correct ammunition could be delivered. The PzH 2000 can fire 39-caliber ammunition, but with significant range and accuracy degradation. The M109A7 can only fire 39-caliber ammunition.⁶²

In addition to ammunition differences, digital systems interoperability continues to be an impediment. Currently only there are only five active participants and five pending participants seeking full membership in the ASCA program. The remaining members have no direct and secure method passing fire mission data digitally. Fire mission requests, movement reports, battlefield geometries, and other key data, requires delivery by liaisons and hand drawing. These methods of passing fire support data incur significant risks of error and delay, while NATO adversaries are rapidly increasing digital capability. An overreliance on physical liaisons does not match the speed and dynamic nature of modern warfare.⁶³

The lack of an inherent, organic, and integrated command and control fires infrastructure does not support the effective employment of fires in the LSGC environment. While improvements have been made in the tactical command and control fires realm with process like ASCA, NATO remains rudimentary at the operational level.

Multinational military operations are complicated in nature and contain numerous intricacies. These intricacies include to name a few: national caveats, rules of engagement, command relationships, gross domestic product (GDP) military spending rates, commonality, national political interests, language barriers, and software and intelligence vulnerabilities. For instance, member nations may individual rules of engagement which are more sensitive to infraction in the use of force and collateral damage. These individualized rules of engagement may not be fully published to the rest of NATO. This leaves room for confusion, mistrust, and further complications full interoperability. These items make efficient multinational operations more challenging.

In recent events, disparity in GDP military spending has caused consternation amongst leaders in the alliance. NATO's 2% national GDP spending goal is not adhered to by all members of the organization. Few members such as the U.S. and the U.K. actually meet the annual 2% threshold. The majority of member nations spend around 1% of their GDP for defense. This deficit has caused disagreement and contention, forcing NATO to rely on only a few of its members to shoulder the burden.

What upgrades and modernization efforts are the U.S., NATO, coalition, and partners making?

The U.S. and its fellow NATO members are making significant strides to upgrade and modernize, improving both their technological capabilities and interoperability. This

is evident in recent GDP expenditures and dedicated multinational training exercises such as Dynamic Front. This section will highlight a few of the modernization efforts underway.

U.S. Army Europe and NATO are working to create a fires command and control element, residing at the Land Component Command or Theater Army level. This C2 element would serve to coordinate and direct multinational fires in a LSGC environment. Efforts to construct such an element are moving gradually and require multiple nations to support and invest. Multiple NATO members and European partners are procuring new systems and technologies. Examples of this investment include the following: Romanian purchase of HIMARS, Swedish artillery munition research and development, French upgrade of towed, GPS aided, cannon artillery, and Bulgarian and Hungarian development of modernized BM-21s with increased range and precision capabilities. A few of the key modernization efforts the U.S. and NATO are making to advance its systems and technologies are the extended range cannon artillery (ERCA) project, precision strike missile (PRSM), hypersonic munitions, ASCA, advanced munitions and propellants, and procurement and distribution of MRL systems. These projects are primed to meet the capability and interoperability gaps provided by Russian forces. The PRSM for instance will surpass the range of current MLRS missiles (ATACMS) with a range of 400km..⁶⁴

Analysis

Doctrine

There is limited ability for accurate comparison due to the availability of Russian doctrine. Russian fires employment is the best example of current Russian fires doctrine.

Using the premise that militaries generally adhere to their doctrine, the activities of Russia in Ukraine and Syria allow for the use of deduction in determining Russian fires doctrine.

Across the categories of literature on the research topic, the common missing component, a lack of doctrinal answers, was confirmed. There is a general lack of doctrine discussion amongst authors and contributors and a gap in fires doctrine as a whole. As earlier mentioned, a capability gap is commonly acknowledged, specifically in professional publications and outside, articles, but workaround solutions are rarely offered. Solutions focus primarily on new technologies and investment. For the purposes of joint and multinational operations, the respective doctrine available is severely lacking. These two sources, key to effective joint-multinational efforts do not provide the necessary guidance to operate as a combined fires force. Fires leaders are left without viable doctrinal solutions on how to fight and win with current capabilities against peer and overmatching threats. Air supremacy as a capability gap mitigation seems to remain as the prevailing standard.

Organization

An accurate comparison of organizations and related weapon systems is difficult to do in an unclassified forum. Russian organizational structure is not broadly published in the same fidelity as western forces. Analysis does provide a comparison of each opponent's order of battle. Russian forces significantly out-weigh western artillery to maneuver force ratios. As stated earlier, Russian forces place greater emphasis on the use of artillery forces to achieve desired effects. The U.S. fields a total of 93 field artillery

battalions of various systems (see Table 1). Further analysis of NATO member organizations would improve the accuracy of this comparison.

Material

This thesis attempted to provide a thorough review of ground fires platforms and systems. It also confirmed that Russia fields a sophisticated and effective fires fleet. Nearly two decades of counter-terrorism operations have atrophied western use of massed fires in favor of precision capability. The U.S. and NATO's emphasis on precision capability may cause problems in LSGC. The volumes of fire required to successfully defeat enemy formations in LSGC does not support the use of limited and expensive precision munitions. Commanders must also consider the ever-evolving nature of electronic warfare and degraded signals operating environments.

While western forces do maintain very capable systems armed with leading-edge technology, these are limited in number. The key vulnerability of western artillery forces is amount and the ability to mass. Russia has invested in less expensive, tested equipment.

Summary

This chapter set forth to highlight analysis regarding how the U.S. and its NATO allies can use joint and multinational fires to bridge the NATO Coalition-Russian fires capability gap. It set the stage for findings through a brief case study of Russian activities in eastern Ukraine. Russian fires activities in Ukraine are useful to highlight the current state of affairs and need for continued technological advancement. This case study,

though not perfect for comparison, with its limited scope and lack of a testing control, provides the best, most recent, and closest comparison available today.

To provide further detail, this chapter included an extensive review of U.S., NATO, and Russian material, organizations, and doctrine. In greatest detail, U.S. and Russian equipment and munitions were explored. This provided a comprehensive comparison of the two largest actors in this problem set. Though more challenging to find, a thorough report of Russian fires employment and tactics was presented. Here, Russia's activities in Ukraine and their doctrinal employment of fires forces was analyzed. Paired with U.S. and NATO doctrine found in chapter two and Appendixes A-C, contrasts between the forces can be seen. Chapter four clearly demonstrated Russia's reliance and focus on a strong and robust fires force. The lists of fires tasks, planning classifications, and employment trends combined with their order of battle, described in the chapter, proves they fully intend to maximize the use of fires in LSGC.

Chapter four continued by outlining reasons why NATO should further combine forces and efforts for the betterment of the organization. It stressed the importance of unified effort in the face of an increasingly aggressive opponent with a singular purpose. In line with the importance of combining forces, chapter four also highlighted current impediments the alliance must improve. Finally, the chapter described a few of the modernization efforts the U.S. and NATO members are currently undertaking to mitigate current and future threats. Chapter four ended with a brief synopsis of the doctrine, material, and organizational framework used to help define this thesis.

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²⁴ Ibid.

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study indicates a significant capability gap. Data is the vehicle by which we conduct analysis. The strength of any analysis is the viability, relevance, and accuracy of the data it contains. Though, like stated, this study indicates a capability gap, in some technical and investment means, that statement appears to be true. This study does not investigate Russia's ability to sustain mid or high intensity armed conflict, project combat power, and finance operations. The Russians displayed high levels of effectiveness in brief instances in eastern Ukraine as the case study described. This study does not expose why Russia's advances and military effects have seemingly stalled. The Russian military's ability to maintain, sustain, and finance their mass overmatch is a critical weakness. They do possess highly capable, elite units, but those units are of limited supply. Their reliance on "gray zone" or hybrid warfare, operating just below the threshold of larger, international armed conflict, capable of only limited gains is perhaps an indication of a strategic weakness.

There is likely credence in investing in focused counter-measures to check your adversary's advantages. Upon further analysis, this method begs two serious questions. The first question; is this investment to check and maintain superiority in a particular function? The second question; is this investment a cost-saving measure to provide pointed overmatch, avoiding investment costs in other areas and providing distraction from potential vulnerabilities?

Analysis of the Russian fires complex shows that Russian forces are mass, not precision focused. Unlike U.S. and NATO forces who predominately rely on few, more precise and expensive munitions, the Russians rely on sizeable formations firing high volumes of rounds to achieve desired effects. Their plethora of artillery formations and rocket and cannon systems, as well as their recent activities in Ukraine support this conclusion. Russian forces have also shown evidence of spoofing and hacking electronic and signals systems. In an ever-increasing digital world, Russian forces have shown their emphasis on degrading and capitalizing on enemy signals and communications. Paired with their extensive use of SUAVs for aerial observation and targeting, U.S. and NATO forces must instill a renewed focus on visual and signals concealment.

Paused procurement of new fires systems and technologies has placed U.S. and NATO forces at a disadvantage in the LSCO environment. A key element of LSGC is the employment of massed fires and heavy artillery proficiency. A heavy reliance on aerial superiority has precipitated the above-mentioned capabilities. The Russians have displayed proficiency employing heavy, massed artillery, integrated with maneuver and air support elements. The U.S. militaries' fires formations (as listed in Table1), paired with the combined forces of NATO, does not match the range, mass, or lethality of our Russian adversaries.

Hybrid warfare is a key component of the Russian way of war. It is narrow minded to just discuss kinetic LSGC as only a war of equipment and technology. Russia's simultaneous and/or transition to hybrid warfare (gray zone) will have impact on the fires fight and change the ways they employ fires. The importance of acknowledged

non-lethal effects is ever more apparent. Hybrid warfare is the current trend, focusing solely on big buns and big organizations is over simplifying modern warfare.

Recommendations

The conduct of this thesis has led to five key recommendations. Throughout the process of reviewing literature and comparing NATO-Russian structures and ground fires capabilities, these recommendations have shown reasonable promise for success. The following recommendations will be addressed below for consideration and future investment.

The first recommendation provided by this study is the provision of organic MRL capability at each U.S. Army division. DIVARTYs once housed significant fires capabilities providing tactical commanders with significant ability to shape their deep fight, achieve fires overmatch, and weight efforts. The removal of assigned divisional fires has forced divisions and their DIVARTYs to rely on the attachment of fires units from outside their organization when the situation requires. In resource constrained environments, the availability of fires units above the division level may be in short supply or committed elsewhere. The reliance on fires units held in corps field artillery brigades to directly support DIVARTYs, spreads a limited resource and reduces the ability of corps to shape their own deep fights and provide general support and reinforcing fires to subordinate divisions.

The absence of organic long-range DIVARTY fires denies divisions the ability to shape their respective deep fight. FM 3-0 prescribes in its operational framework, that divisions maintain a “deep fight” in large-scale combat operations. Currently, however divisions only have the ability to surveil and employ rotary aviation assets beyond their

forward line of troops. Action in response to the intelligence provided by these surveillance platforms, beyond attack aviation is limited. Beyond the use of air power, withholding of brigade cannon assets, or relying on the support of fires at the corps level, there are no other options to achieve kinetic shaping effects between the forward line of troops and fire support coordination line in U.S. Army divisions currently. In order to fully operationalize the operational framework described in FM 3-0, the provision of an organic MRL capability at the division level is recommended.

The second recommendation is the establishment of a NATO Fires Center of Excellence (FCoE). In similar fashion to the U.S. Army FCoE, a NATO FCoE would serve as the center of fires integration, advancement, and standards for the fires warfighting function in NATO. The pure nature of fires and its ability to provide highly destructive effects well beyond a local supported unit or across a boundary, supporting any number of customers requires an increased level of coordination, integration, and standardization. It could be argued that the need for fires to achieve and maintain these attributes is similar to that of military and commercial aviation. The ability of aviation assets to move rapidly across geographic areas in three-dimensional space, land at a wide variety of locations, interfacing with numerous languages, and perhaps international governmental agencies requires a high level of internationally recognized standards. Otherwise, the relative ease, convenience, and safety of international air travel enjoyed today would not be possible. In light of these factors, the creation of a recognized organization to facilitate these standards is advisable.

In any U.S. Army field artillery organization, the unit “Redbook,” serves as the repository of standardization policies, procedures, and requirements for a field artillery

unit to operate within regulation, effectively, and safely. Fires employment can have devastating effects if not properly controlled and observed. Because of its destructive capability, the Redbook serves as a common rule book. It contains the certification standards for all essential positions and respective personnel to complete and abide by before employing field artillery systems or formations. These standards are in adherence with U.S. Army and garrison regulations and endorsed by the appropriate unit commander. As mentioned above regarding the aviation example, there needs to be a universal set of standards for the safe and accurate employment of fires effects. Standards could include certification by position, weapon system maintenance and tolerances, and accuracy to name a few.

Ideally, when working with a joint or multinational field artillery formation, commanders should have verifiable trust that the formations and systems they are employing, are operating in accordance with recognized standards and in the safety interest of the units they are supporting civilian populations as appropriate. These standards would also arm multinational combat training center observers with published guidelines to more accurately evaluate training units. The best way to achieve effective, recognized standards is through the creation of an office, manned with multinational fire support professionals educated in the safe employment of fires.

The third recommendation is the continued investment, refinement, and participation of the ASCA interoperability program. Started in the late 1990's, the ASCA program has worked to build an interface capable of bridging technical and tactical fire digital networks, allowing units with different systems to share firing information.

The fourth recommendation is the renewed focus on common ammo and material manufacturing among NATO members. The last few decades and recent conflicts have seen the divergence of common ammo and material. NATO members have begun developing new weapons systems and munitions for their individual needs. Some members have discontinued use of U.S. equipment and purchased elsewhere, or developed their own systems. An example of this shift can be seen in the U.K. Army. Before developing the AS90 self-propelled howitzer, the U.K. Army operated the U.S. made M109 Paladin.

The final recommendation is the integration of common language liaisons and Joint Terminal Attack Control specialists into multinational fires and maneuver organizations. Continued and improved common language integration would serve to better link formations to NATO ground and air fires.

Additional Future Research

Through the course of researching for this study, numerous topics became apparent and of interest for future research beyond the scope of this study. The fires warfighting function is in a period of significant change and adaptation. Investment and renewed energy by United States' adversaries have fueled rapid advancement in fires technology. Many of these technologies, such as hypersonic, are poised to drastically change the bounds of ground-based fires and modern warfare strategy. Listed below, are specific topics related to this study that deserve additional future research.

Hypersonic technology poses significant challenges and opportunities in future battlefields. The velocity and range of hypersonic weapons currently have the ability to penetrate air defense systems and radars. Their long-range capabilities will likely alter

operational frameworks like those seen in Figure 7, changing battlefield geometries, and contest the building of combat power in staging areas. Hypersonics will provide commanders a viable, lethal long-range strike capability previously only provided by vulnerable aircraft or slower moving ballistic missiles. The role and effects of these weapons require further research and analysis.¹

The implications and ramifications of the United States' suspense of the Intermediate-Range Nuclear Forces Treaty (INF) have yet to be seen. Created in 1987, the INF was established to curb the proliferation of intermediate-range missiles in Europe.² These missiles, capable of delivering nuclear payloads within minutes, were poised to ignite a nuclear confrontation. The INF set the range limit of ground-based missiles to between 311 and 3,420 miles. This restriction did not apply to sea or air delivered munitions such as the U.S. Tomahawk or Russian Kalibr cruise missiles. Recent concerns that Russia has failed to abide by the INF and China's exclusion from the treaty pact, prompted U.S. officials to pull away from the agreement.³ Russian activities in the Ukraine War and its deployment of its new SSC-8 land-based cruise missile provided reasonable concern for treaty violations. The strategic implications and weapons development that derives from the disintegration of the INF may likely change armed policy in Europe.⁴

In a similar fashion as the INF, the suspended use of dud producing cluster munitions amongst several NATO countries, will require further research. Originated with the Convention on Cluster Munitions in 2008, a treaty which the U.S., Russia, and China did not sign, the banned used of dud producing munitions puts the fires community in a precarious position. In response to the Convention on Cluster Munitions, then U.S.

Secretary of Defense, Robert Gates, implemented an internal policy mandating the removal of these munitions from U.S. inventories by 01 January 2019. The purpose of this policy was to allow more time for the advancement of warhead technology and the replacement of current cluster munitions. This Department of Defense policy was recently suspended by the Trump administration. Rising peer threats will require effective and lethal munitions. Whether or not replacements for legacy cluster munitions will suffice requires more research.⁵

Further Future Research Topics

1. Increasing advancement of electronic warfare and its effect on fires. Fires technology has become increasingly digital reliant. Overlaid with advancement of jamming technologies, the employment of digitally aided weapons systems and munitions will become more challenging. A scenario which would serve as an excellent case study is the employment of a field artillery howitzer battery in a GPS denied environment. Simply relocating outside jamming range may not be the answer. Do we still maintain the capability to fire and locate in a pre-GPS world?
2. Implications on increased use of PGM. Western militaries have become increasingly reliant on the accuracy and precision of PGMs. As electronic warfare and denial capabilities continue to advance, PGM use may not be the reliable munition of choice in the future.
3. Continued use and growth of UAS and the methods used to counter and destroy them. This thesis highlighted the employment of UAS's in current LSGC operations. It should be expected that UAS's will see an increasing role

in years to come. As these systems become more capable, cheaper, and more widely dispersed, commanders will be faced with new challenges.

4. Future fires in dense urban terrain. As urban population centers continue to grow, the fires warfighting function will have to adapt in order to shape and influence actions in exponentially more complicated terrain.
5. Does current doctrine accurately depict deep fires in support of the division and corps? Much study devoted to the return of LSGC training and operations. How well this renewed doctrine incorporates modern technology in LSGC fight remains undetermined.
6. Do brigades have a deep fight and should the operational framework be refined to reflect this? The most recent update of the U.S. Army's FM 3-0, removes the "deep area" from brigade battle space and relegates its to the division.

Summary

This thesis highlighted capabilities comparison, new equipment and doctrinal needs in the fires warfighting function. In the future world of LSGC, an alliance or conglomerate of nations, reliant and vested in the strength of a coalition, needs to advance beyond traditional civil-military relationships. True interoperability, practiced and refined, will be required to maintain a strong deterrence and succeed on the battlefield. There may be a need for newly defined and structured relationships in the NATO alliance.

Chapter five saw the conclusion of analysis on the research topic. Five recommendations were offered to address the problem set. Each of these

recommendations are worthy of further exploration and testing. As the U.S. and NATO enters a new era of warfare, the fires capability gap discussed in thesis, will require continued emphasis. New technologies in the electronic and cyber fields, to name a few, are ever-changing dynamics on the battlefield. Fires will no longer be dominated by the side which owns the longest range or largest caliber. Overmatch will be maintained by the side that is able to best incorporate multiple battlefield domains. Achieving effects and applying constant pressure on the enemy in multiple domains, will be crucial to success.

The ability to safely and effectively employ other warfighting functions and platforms specifically, such as aircraft, may again depend on the fires. A new order of operational precedence may be on the horizon. The last several decades saw establishment of aerial supremacy key to engaging in further combat operations. The advancement of fires and multidomain operations may require fires supremacy in the future, to provide stand-off, protect key infrastructure such as airfields and staging areas.

Future research ideas pertinent to this topic were presented. After thorough study and review of the topic, these items became apparent questions important to joint-multinational fires, but outside the intent of this thesis. Each of these research ideas poses significant questions and dilemmas for commanders.

For the purposes of this study, Russia was analyzed as the primary pacing threat for U.S. and NATO. The analysis and subsequent recommendations may be generally universal but cannot be seen as the ultimate solution to close a capability gap. Focusing too closely on the threat provided by Russia could likely distract western militaries from the threat posed by a growing China.

¹ Ryan Pickrell, “4 New Weapons the US Army is Developing to Blow a Hole in Russian Defenses from Incredible Distance,” *Business Insider*, October 11, 2018, <https://www.businessinsider.com/here-are-the-4-long-range-weapons-the-army-wants-for-future-war-2018-10>.

² Bureau of Arms Control, Verification and Compliance, U.S. Department, “Treaty Between the United States of America And the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty),” December 8, 1987, accessed April 20, 2019, <https://www.state.gov/t/avc/trty/102360.htm>.

³ Andrew Kramer and Megan Specia, “What is the I.N.F. Treaty and Why Does it Matter?” *The New York Times*, February 01, 2019, <https://www.nytimes.com/2019/02/01/world/europe/inf-treaty.html>.

⁴ Ibid.

⁵ Mains, “ICM: Bridging the Capability Gap,” 1.

APPENDIX A

CURRENT U.S. ARMY DOCTRINAL PUBLICATIONS

Publication	Subject	Issue Date
ATP 3-09.90	Division Artillery Operations and Fire Support for the Division	OCT 2017
ATP 3-60	Targeting	MAY 2015
ATP 3-01.81	Counter-Rocket, Artillery, and Mortar Operations	MAY 2013
ATP 3-09.12	Field Artillery Acquisition	JUL 2015
ATP 3-09.13	The Battlefield Coordination Detachment	JUL 2015
ATP 3-09.23	Field Artillery Cannon Battalion	SEP 2015
ATP 3-09.24	Techniques for the Fire Brigade	NOV 2012
ATP 3-09.30	Observed Fires	SEP 2017
ATP 3-09.32	JFIRE Multi-Service TTPs for the Joint Application of Firepower	JAN 2016
ATP 3-09.42	Fire Support for the Brigade Combat Team	MAR 2016
ATP 3-09.50	The Field Artillery Cannon Battery	MAY 2016
ATP 3-09.60	Techniques for MLRS and HIMARS Operations	JAN 2014
ATP 3-91	Division Operations	OCT 2014
ATP 3-91.1	The Joint Air Ground Integration Center	JUN 2014
ATP 3-92	Corps Operations	APR 2016
ATP 3-93	Theater Army Operations	NOV 2014
ATP 3-94.2	Deep Operations	SEP 2016
ADRP 3-0	Operations	OCT 2017
ADRP 3-09	Fires	AUG 2012
ADP 3-09	Fires	AUG 2012
ADP 3-90	Offense and Defense	AUG 2018
FM 3-0	Operations	
FM 3-09	Field Artillery Operations and Fire Support	APR 2014
FM 3-90-1	Offense and Defense Volume 1	MAR 2013
FM 3-90-2	Reconnaissance, Security, and Tactical Enabling Tasks Vol. 2	MAR 2013
FM 3-96	Brigade Combat Team	OCT 2015

Source: Created by author.

APPENDIX B

CURRENT U.S. JOINT DOCTRINAL PUBLICATIONS

Publication	Subject	Issue Date
JP 3-0	Joint Operations	OCT 2018
JP 3-03	Joint Interdiction	SEP 2016
JP 3-09	Joint Fire Support	DEC 2014
JP 3-09.3	Close Air Support	NOV 2014
JP 3-16	Multinational Operations	JUL 2013
JP 3-30	Command and Control of Joint Air Operations	FEB 2014
JP 3-31	Command and Control of Joint Land Operations	FEB 2014
JP 3-32	Command and Control of Joint Maritime Operations	JUN 2018
JP 3-33	Joint Task Force Headquarters	JAN 2018
JP 3-52	Joint Airspace Control	NOV 2014
JP 3-60	Joint Targeting	SEP 2018
JP 5-0	Joint Planning	JUN 2017

Source: Created by author.

APPENDIX C

CURRENT MULTINATIONAL DOCTRINAL PUBLICATIONS

Publication	Subject	Issue Date
AJP-3.2	Joint Doctrine for Land Operations	MAR 2016
AJP-3.9	Joint Targeting	APR 2016
AJP-5	Operational Level Planning	JUN 2013
STANAG 2484	NATO Field Artillery Doctrine	NOV 2010

Source: Created by author.

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