The Capabilities Gaps of the US Army on a Nuclear Battlefield

A Monograph

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Since the end of the Cold War, the Army executed operations in asymmetric conflicts without the threat of tactical nuclear weapons. Before the collapse of the Soviet Union, U.S. Army doctrine and capabilities were obligated to account for the potential use of low yield nuclear weapons to destroy, degrade and deter land forces in the event of an escalation to armed conflict. When the threat of great powers and regional actors utilizing nuclear weapons dissipated the Army moved away from thinking about the considerations of those weapons. The Army's priorities changed, and no longer included a focus on capabilities related to nuclear weapons use. However, the global political situation over the last decade is trending back towards great power competition. The Army is shifting its professional military education and training to large-scale combat operations. The National Training Center returned to decisive action training rotations to prepare for near-peer adversaries once again, after years of counterinsurgency rotations. However, in the return to preparing for a great power conflict, the Army must consider the potential use of tactical nuclear weapons once again. Russia and China specifically have the potential to utilize these weapons as part of an anti-access, area-denial strategy. Therefore, the Army must discern the capabilities gaps that exist to project and sustain U.S. combat power in future conflicts, under the threat of a nuclear operating environment.

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Abstract

The Capabilities Gaps of the US Army on a Nuclear Battlefield, by MAJ Robert Q. Deppa, 41 pages.

Since the end of the Cold War, the Army executed operations in asymmetric conflicts without the threat of tactical nuclear weapons. Before the collapse of the Soviet Union, US Army doctrine and capabilities were obligated to account for the potential use of low yield nuclear weapons to destroy, degrade and deter land forces in the event of an escalation to armed conflict. When the threat of great powers and regional actors utilizing nuclear weapons dissipated the Army moved away from thinking about the considerations of those weapons. The Army's priorities changed, and no longer included a focus on capabilities related to nuclear weapons use. However, the global political situation over the last decade is trending back towards great power competition. The Army is shifting its professional military education and training to large-scale combat operations. The National Training Center returned to decisive action training rotations to prepare for near-peer adversaries once again, after years of counterinsurgency rotations. However, in the return to preparing for a great power conflict, the Army must consider the potential use of tactical nuclear weapons once again. Russia and China specifically have the potential to utilize these weapons as part of an anti-access, area-denial strategy. Therefore, the Army must discern the capabilities gaps that exist to project and sustain US combat power in future conflicts, under the threat of a nuclear operating environment.

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Abbreviations

ABCT	Armored Brigade Combat Team
ADP	Army Doctrinal Publication
APODS	Aerial Port of Debarkation
ATACMS	Army Tactical Missile System
BCT	Brigade Combat Team
BSA	Brigade Support Area
CAB	Combat Aviation Brigade
CBRN	Chemical Biological Radiological Nuclear
DIVARTY	Division Artillery
DSA	Division Support Area
FM	Field Manual
FSCL	Fire Support Coordination Line
FLOT	Forward Line of Troops
GIMLRS	Guided Multiple Launch Rocket System
HIMARS	High Mobility Artillery Rocket System
IBCT	Infantry Brigade Combat Team
IPB	Intelligence Preparation of the Battlefield
ISB	Intermediate Staging Base
ISR	Intelligence Surveillance and Reconnaissance
JOA	Joint Operations Area
LOC	Line of Communication
LYBNW	Low Yield Battlefield Nuclear Weapons
MDO	Multi-Domain Operations
MEB	Maneuver Enhancement Brigade
MISO	Military Information Support Operations
MILDEC	Military Deception
MLRS	Multiple Launch Rocket System
MSR	Main Supply Route
OPSEC	Operational Security

NATO	North Atlantic Treaty Organization
NBC	Nuclear Biological Chemical
PLS	Palletized Load System
SBCT	Stryker Brigade Combat Team
SPOD	Sea Port of Debarkation
THAAD	Terminal High Altitude Air Defense
WFF	Warfighting Function

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Introduction

Since the end of the Cold War, the US Army conducted asymmetric operations without the threat of tactical nuclear weapons. Before the collapse of the Soviet Union, US Army doctrine and capabilities were obligated to account for the potential use of low yield nuclear weapons to destroy, degrade, and deter land forces in the event of an escalation to armed conflict. When the threat of great powers and regional actors utilizing nuclear weapons dissipated the Army moved away from thinking about the considerations of those weapons. The US Army's priorities changed, and no longer included a focus on capabilities related to nuclear weapons use. However, the global political situation over the last decade is trending back towards great power competition. The US Army is shifting its professional military education and training to large-scale combat operations. The national training center returned to decisive action training rotations to prepare for near-peer adversaries once again, after years of counterinsurgency rotations. However, in the return to preparing for a great power conflict, the Army must consider the potential use of tactical nuclear weapons once again. Russia and China specifically have the potential to utilize these weapons as part of an anti-access, area-denial strategy. Therefore, the Army must discern the capabilities gaps that exist to project and sustain American combat power in future conflicts, under the threat of a nuclear operating environment.

The US Army faces additional problems from regional actors that possess low yield nuclear weapons including North Korea, and potentially Iran. These powers may act with nuclear weapons to attack Army units concentrating for operations in these theaters or to threaten American allies on a limited scale. North Korea and Iran possess intermediate-range missiles, the No Dong and Shabab-3, capable of delivering a nuclear payload at a range of 1,300 km.[1] The

[1] David A. Ochmanek, Lowell H. Schwartz. *The Challenge of Nuclear-Armed Regional Adversaries.* (Santa Monica, CA: RAND, 2008) 20.

message from American adversaries is that they are preparing for the use of non-strategic nuclear weapons. In 2017 the President of Russia, Vladimir Putin, intimated as much and even this year the Russian Army conducted exercises using a tactical nuclear use scenario.[2]

This should not be considered a departure from strategic deterrence, but as a complement to it as it furthers the deterrence capability of NATO.[3] The asymmetric advantage is that non-strategic nuclear weapons change the battlefield in such a way that causes self-deterrence. The definition of these Low Yield Battlefield Nuclear Weapons (LYBNW) must be refined and discussed. In terms of a practical definition for this monograph, it will be one with a 15Kt yield. One Kt, or kiloton, is the equivalent of one thousand tons of dynamite. These weapons create self-deterrence, because there is now a credible fear of nuclear retaliation against conventional forces, with the use of strategic nuclear weapons as the only option remaining. In this sense, the decision to use conventional forces produces a potentially untenable all-or- nothing strategy. This is especially true considering that currently, the United States lacks tactical offensive capabilities in ground combat units.

The result is the potential that American adversaries may be able to deter American actions, even those with inferior conventional forces. The Army requires the ability to deploy, build, and maintain combat power. The Army must protect forces, shield combat systems, and maintain a high degree of mobility, detection, and survivability. The presence of LYBNW creates an asymmetric advantage that the United States must account for in future operations. This paper seeks to outline the problems associated with operational design, beginning with a description of the framework a unit must operate in, then discussing the necessity and problem of

[2] Mark B. Schneider, "Will Russia Further Lower Its Nuclear Weapons use threshold," Real Clear Defense, September 19, 2020, accessed 14 September 2020, https://www.realcleardefense.com/articles/2020/09/19/will_russia_further_lower_its_nuclear_weapons_use_threshold_577995.html

[3] Lawrence Freedman, *Deterrence.* (Malden, MA: Polity Press, 2004) 27.

dispersion created by LYBNW, the effect of that dispersion on operations, and then the present gaps in Army capabilities in addressing those effects.

Methodology

This monograph focuses on the impact of LYBNW in the future operating environment. It asks: what nuclear and non-nuclear capabilities may the US Army need to build and sustain combat power in a conflict with an adversary who can employee low yield battlefield nuclear weapons? In researching a topic that covers nuclear weapons there are several important factors. First, nuclear weapons are not nascent technology. Second, the US Army previously addressed the issue in terms of organization and equipment. This presented both a challenge and opportunity. The challenge is that analysis must be conducted by examining older Army tests and drawing comparisons with current systems. The opportunity is that there is a wide array of secondary research available. The secondary research method was useful to frame the topic to demonstrate emerging shortfalls to dealing with the nuclear threat.

The separate subjects of the research include the effects of nuclear weapons, the Army's organizational structure, doctrine, and materiel capabilities, in the past, present, and future. The research focuses on the division as the primary maneuver unit. The operational framework is used as a lens to calculate specific impacts of nuclear weapons determined by the research, and therefore construct an ideal nuclear battlefield environment. From there research topics included the capabilities in the current Army by warfighting function. This included comparisons with past organizational concepts and doctrine. It also includes research material on future Army concepts and emerging technology that can potentially be applied to problems inherent on a nuclear battlefield.

The research behind each monograph section applies principles from the past, present, and future, as well as theory and doctrine, to provide more granular detail on Army operations at

the division level, and to support the division in conflict. The operational framework and division structure, coupled with the real-world capabilities of combat systems, provided workable units of measure. These units of measure made it possible to analyze specific impacts of a nuclear battlefield, that were used to calculate distances and identify gaps across the warfighting functions when confronted with a nuclear battlefield scenario. Current logistics estimate workbooks, engineer estimate workbooks, weapons ranges, organizational structure, and doctrine were applied with considerations to nuclear effects to provide analysis demonstrating key points. These key points constitute where the Army will fall short in a nuclear conflict if no changes are made.

The procedural context of the monograph is designed to be straightforward. To layout the research in each topic to build towards recommendations for the future force. It begins by outlining a framework for the nuclear battlefield, and then the impacts on each warfighting function, leading to a comparison between past Army considerations and future operating concepts. It is focused at the division level, as the division is the primary fighting unit of the Army. Then there is also a theoretical consideration of a return of LYBNW to the Army's arsenal given the impacts expressed above.

This monograph does not seek to answer every possible capability gap. Specifically, the impact of nuclear weapons on command-and-control systems. It also does not seek to measure layering enemy capabilities with nuclear weapons. This is strictly to frame the subject in a more simplistic and coherent context, focusing on US Army capabilities in specific warfighting functions. This monograph also utilizes previous and current doctrine to determine areas where gaps may exist, but it is not the intent of this paper to argue for any specific doctrine in the future.

Description of the framework

To better understand the problems facing the Army it is important to define the battlefield framework that deployed units will operate in. The Army must consider a scenario in which units are deployed and must conduct operations under threat of LYBNW. This requires multiple lines of communication (LOCs) through airports of debarkation (APODs) and seaports of debarkation (SPODs), with the knowledge that one or more can be denied using nuclear weapons.[4] Division planning considerations require coordination of US combatant commands to disperse deployment operations along with multiples LOCs. Port operations will require dispersion of forces from the outset of deployment. Units with the greatest survivability are likely to be heavy. This requires significant shipping to project combat power, which will concentrate combat power at logistics nodes. Therefore, it also requires protection from short to medium-range low-yield nuclear weapons, including theater anti-ballistic missile protection in theater before deployment. Figure 1 below is from the current FM 3-0, to describe the deployment of forces from the United States to a theater and into an operational framework.

[4] US Department of the Army, *Field Manual 100-30, Nuclear Operations* (Washington, DC: Government Publishing Office, 1993) 3-4.

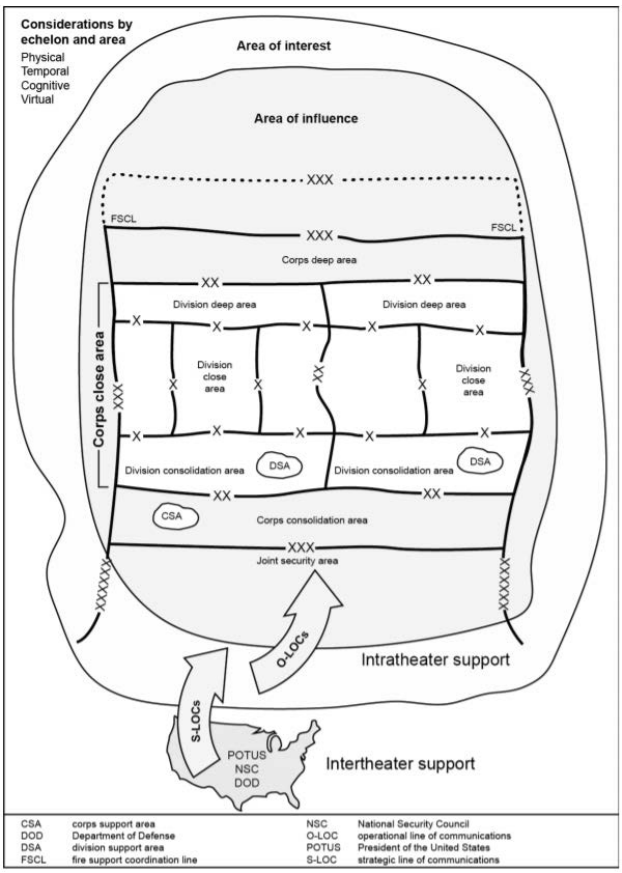

Figure 1. Contiguous Corps Area of Operations. US Department of the Army, *Field Manual 3-0, Operations* (Washington, DC: Government Publishing Office, 2017), 1-32.

The next step for the heavy division to deploy into theater includes the use of intermediate staging bases. Once again this is a node where units will meet their combat vehicles and prepare for onward movement to their area of operations. This concentration of forces is another area in which forces will be vulnerable to attack by nuclear weapons. Therefore, intermediate staging bases (ISBs) must be a consideration in terms of capabilities. Combat vehicles, such as the M3 Bradley and the M1 Abrams tank offer the most protection from nuclear weapons, however, they will require movement from heavy equipment trucks that are not shielded from nuclear weapons. ISBs must not be consolidated as they have been previously during the Global War on Terror, and special political consideration must be paid to the location

to preclude unacceptable collateral damage.[5] Routes must also be redundant, and varied, with consideration to civilian areas. Forcible entry operations to secure airfields will also be under threat as targets for low- yield nuclear weapons. Their selection must take into consideration protection assets and greater distribution of effort.

The Problem of Dispersion

The battlefield framework in the division area of operations after onward movement will be broken up into the support, consolidation, close and deep areas. Commanders must be forced to take action to protect their forces in this framework in response to the threat of LYBNW. Assigning areas of operation to combat units requires terrain management that limits the possible effects of these weapons. The commander must understand the various threats of nuclear weapons to determine the best way to prevent mass casualties. The most important consideration must be to plan operations with adequate dispersion of forces. There is a wide latitude of thought on what a division frontage should be, with doctrinal answers ranging widely, or simply suggesting that the commander has ultimate discretion.[6]

[5] US Army, FM 100-30. 3-4.

[6] US Department of the Army, *Army Doctrine Publication 3-90*, *Offense and Defense* (Washington, DC: Government Publishing Office, 2019), 4-6.

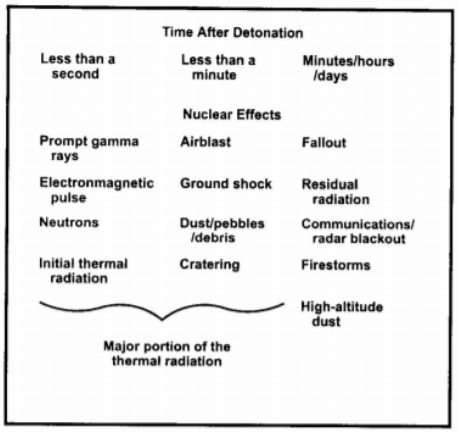

Figure 2. Nuclear Effects by Time. US Department of the Army, *Field Manual 100-30*, *Nuclear Operations* (Washington, DC: Government Publishing Office, 1993), 2-7.

To understand the need for dispersion it is necessary to discuss the effects of a nuclear weapon more specifically. The graphic above from FM 100.30 lays out the effects that a nuclear weapon produces. The various effects can cause damage to equipment and casualties at various distances from the point of detonation or ground zero. Vehicles are vulnerable to the blast, heat, and electromagnetic pulse. Most personnel casualties are likely to be caused by the blast, heat, and radiation that is produced. The radioactive effects produced by a nuclear detonation also impact the ability of forces to move through an area following a detonation for various amounts of time. These effects can be projected to determine the necessary dispersion of troops to avoid casualties and loss of equipment and vehicles, as well as project the time constraints of moving through a radioactive area. The table below lists specific considerations for some of the warfighting functions.

Dynamics of Combat Power	Actions: Initial Blast	Residual Radiation	Radiation	Thermal	EMP
Maneuver	Creates obstacles	Creates NIGA (note)	Creates fallout	Creates flash blindness	Disrupts C^2 Disrupts intelligence Disrupts logistics
Firepower (target nomination)	Destroys equipment	Produces latent ineffectiveness on deep targets	Minimizes fallout (low air burst)	Not used	Disrupts fire control instruments
Protection	Destroys equipment	Kills soldiers	Causes fallout considerations	Increases survivability concerns	Increases mitigation requirements
Leadership	Produces mass casualties	Increases radiation status of units	Causes psychological effects on soldiers	Increases the complexity of triage with burn and blast injuries	Results in loss of C^2

NOTE: Neutron-induced gamma activity.

Figure 3. Nuclear Effects on Elements of Combat Power. US Department of the Army, *Field Manual 100-30, Nuclear Operations* (Washington, DC: Government Publishing Office, 1993), 2-8.

At first glance, the need for dispersion under threat of a nuclear weapon is extremely obvious, but several other factors contribute to this need or mitigate it. The effect of terrain, especially relief is critical. Open areas are more susceptible to attack. Low yield battlefield nuclear weapons, defined previously as a 15Kt weapon, produces damage in several ways, including blast, heat, and radiation.[7] Each of these effects has different ranges of damage and lethality. In the past, this was taken into consideration to create the R50 line, which is the distance from ground zero of a nuclear explosion at which personnel have a 50 percent probability of death. This concept was used in past estimates to create recommended dispersion of troops in the Pentomic Division.[8]

[7] Theodore C. Mataxis, *Nuclear Tactics, Weapons, and Firepower in the Pentomic Division, Battlegroup, and Company*. (Harrisburg PA: Military Service Pub. Co., 1958), 13.

[8] Ibid., 21.

In older doctrine, dispersion for nuclear weapons, such as a 15-kiloton yield, was recommended at 2,300 to 3,300 meters between companies.[9] To explore this concept further it should be noted that a 15kt weapon can destroy a tank at approximately 350m and incapacitate the crew at 700m.[10] Additionally, it can cause third degree burns up to 1.7 km away from ground zero, or in other words a 3.4 km frontage.[11] Therefore, a picture of what operations may look like in terms of dispersion begin to emerge. It must be noted that it is not possible to achieve dispersion that is directly tied to specific yields of an enemy's nuclear arsenal. It is, therefore, a risk mitigation measure, rather than a specific guideline.[12]

It is necessary to understand what a conventional division frontage looks like to understand how it must change due to the threat of LYBNWs. This is difficult because of the discretion in doctrine that commanders have when employing forces, as previously discussed. To discuss this impact further it is necessary to discuss a brief and plausible scenario for types of operations. Further discussion in this paper will deal with a deployed division that must conduct various types of defensive and offensive operations under the threat of LYBNW. This scenario could take place in an area geographically equivalent to Eastern Europe (mostly open terrain), but more importantly, it will aid with conceptualizing the challenge of dispersion due to nuclear weapons on the execution of operations. It also provides the context for analyzing a heavy division's capabilities, as they are critical for survivability and rapid offensive operations, while simultaneously requiring the most sustainment and engineering support.

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[9] John P. Rose, *The Evolution of US Army Nuclear Doctrine, 1945-1980* (Boulder, CO: Westview Press, 1980), 177.

[10] William R. Van Cleve and S.T. Cohen, *Tactical Nuclear Weapons: An Examination of the Issues* (New York: Crane, Russak 1978) 43.

[11] Mataxis, 83.

[12] US Department of the Army, *Field Manual 100-30, Nuclear Operations* (Washington, DC: Government Publishing Office, 1993), 2-5.

Inside of this scenario, we can look at the layout of a division footprint and begin to apply planning factors for division frontage and depth discussed above. This will enable an analysis of the effects of dispersion on Army capabilities. By some estimates, a combined arms battalion can realistically cover a 5km front.[13] US Army divisions are not all the same, but some assumptions can be made. A heavy division with three brigade combat teams (BCTs), each with three combined arms battalions, creates a division capability covering 45km. Reconnaissance and security planning factors show that an armored brigade combat team's (ABCT) reconnaissance squadron can provide a screen of 13-25km, or guard of 3-13km, therefore 45km for a division is a good estimate.[14] Studies into fires capabilities also estimate that on NATO's central front in Eastern Europe a division is responsible for a 45km front, with a 20km depth.[15]

In the past the Pentomic Division created guidelines of a 20,000-meter frontage and 25,000-meter depth, to mitigate the effects of LYBNW.[16] In the same Eastern European fires case study cited above, given modern equipment, a division in the Baltics may be required to cover a 120km frontage.[17] To prevent the loss of significant combat power, units must be dispersed to avoid the loss of a whole company. This takes into consideration the blast and burn effects of LYBNWs at 3.4km. Therefore, each company's frontage should be between 3-5km. The battalion frontage with three companies is then 9-15km instead of 5km, and the division is 81-135km, with a 90km depth. Therefore, a division will require an operational framework on par with a corps. The figure below demonstrates an increased frontage and depth in the division operational

[13] Dennis Burket, *Large-Scale Combat Operations: The Division Fight*. (Fort Leavenworth, KS: Army University Press, 2019), 289.

[14] US Department of the Army, *Army Training Pamphlet 5-0.2-1, Staff Reference Guide Volume 1* (Washington, DC: Government Publishing Office, 2020), 183.

[15] Barnett, et al, *Army Fires Capabilities for 2025 and Beyond*. (Santa Monica, CA: RAND Corporation, 2019) 205.

[16] Mataxis, 131.

[17] Barnett, et al., 206.

framework based on the worst-case scenario. It demonstrates the massive expansion of the division area of operations (AO) that may be necessary. It must be noted once again that the commander is obliged to shape his operational framework based upon the physical and temporal considerations present in the AO.[18]

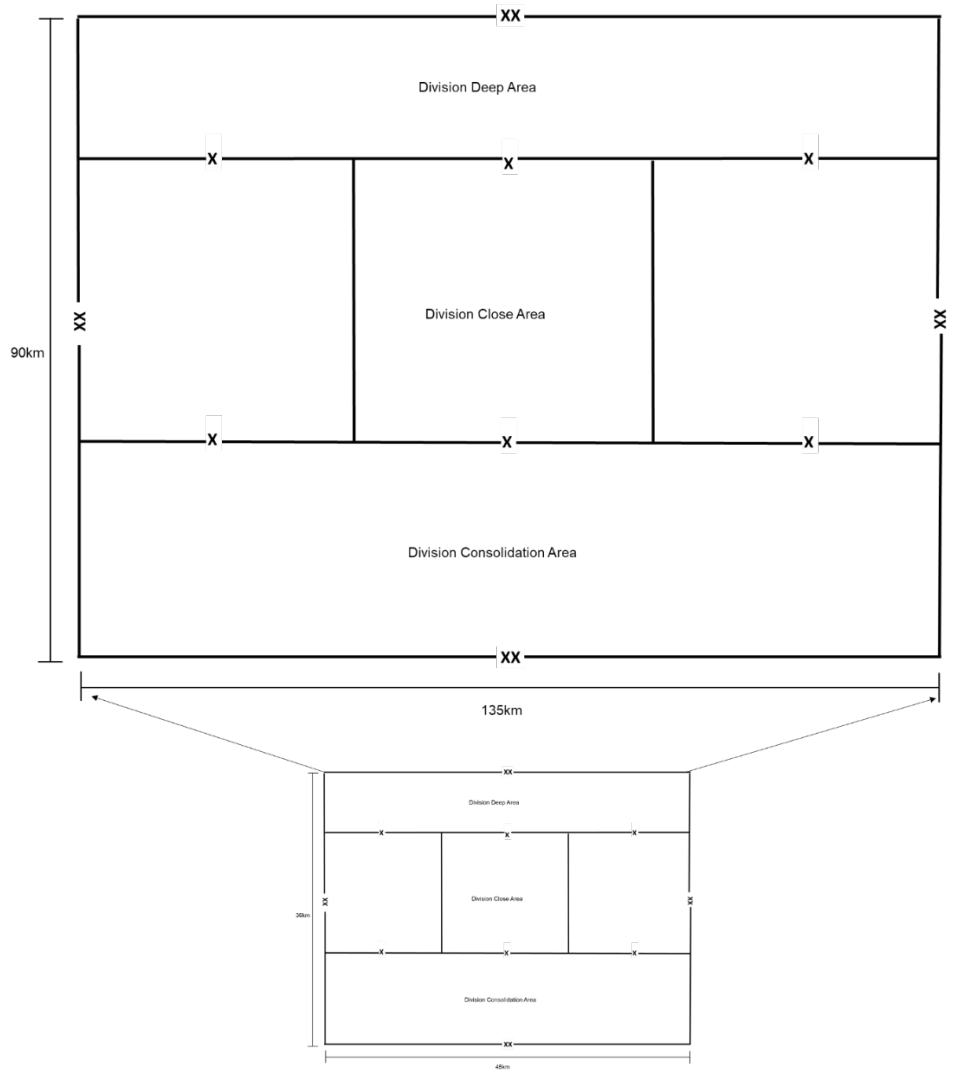

Figure 4. The Expanded Operational Framework for the Division. Created by author.

[18] US Department of the Army, *Field Manual 3-0, Operations* (Washington, DC: Government Publishing Office, 2017), 1-26.

The use of deployment and staging bases is an operational consideration for planning that must also incorporate the need for dispersion. Units typically deploy equipment through ports. This can create obvious targets that an adversary may target to prevent entry into the theater of operations. Additionally, as units move from seaports (SPODS) to intermediate staging bases (ISBs), the routes and assemble areas create points of concentration that must be avoided.[19] This necessitates planning for rapid onward movement across a wider array of main supply routes (MSRs), and the use of multiple or redundant ISBs within the joint operational area (JOA), with planning considerations for contingency ISBs in the event nuclear weapons are used to deny previously selected terrain. These considerations are not all that dissimilar to recommendations provided in the Army's 2028 multi-domain operations concept.[20]

The operational framework described above has a few key components. The first is the consideration of the effects of LYBNW. Those effects coupled with the material capabilities currently in the armed forces provide parameters for necessary dispersion to increase survivability. This operational framework can then be coupled with the deployment concepts inherent to any broad operation and integrated with the Army's multi-domain operations (MDO) concept and subsequent concerns aside from nuclear weapons. This creates the definition of a nuclear battlefield, and this frame can be utilized to examine the impacts and shortfalls of the Army's capabilities by specific warfighting functions.

The Effect of the Nuclear Battlefield on Intelligence

Intelligence on the nuclear battlefield goes far beyond the enhanced distances that are required to conduct operations. Intelligence collection will also be performed in a degraded environment where no singular asset can be guaranteed. In the multi-domain fight maneuver units

[19] US Joint Staff, JP 3-11, F-7.

[20] US Army Training and Doctrine Command (TRADOC), *TRADOC Pamphlet 525-3-1 The US Army in Multi-Domain Operations 2028* (Fort Eustis, VA: TRADOC, 30 November 2018), 37.

will be reliant on ground-mounted reconnaissance. This reconnaissance must provide early warning of nuclear use, and intelligence preparation of the battlefield and early detection of enemy maneuver forces in-depth to prevent concentration against dispersed maneuver units.[21]

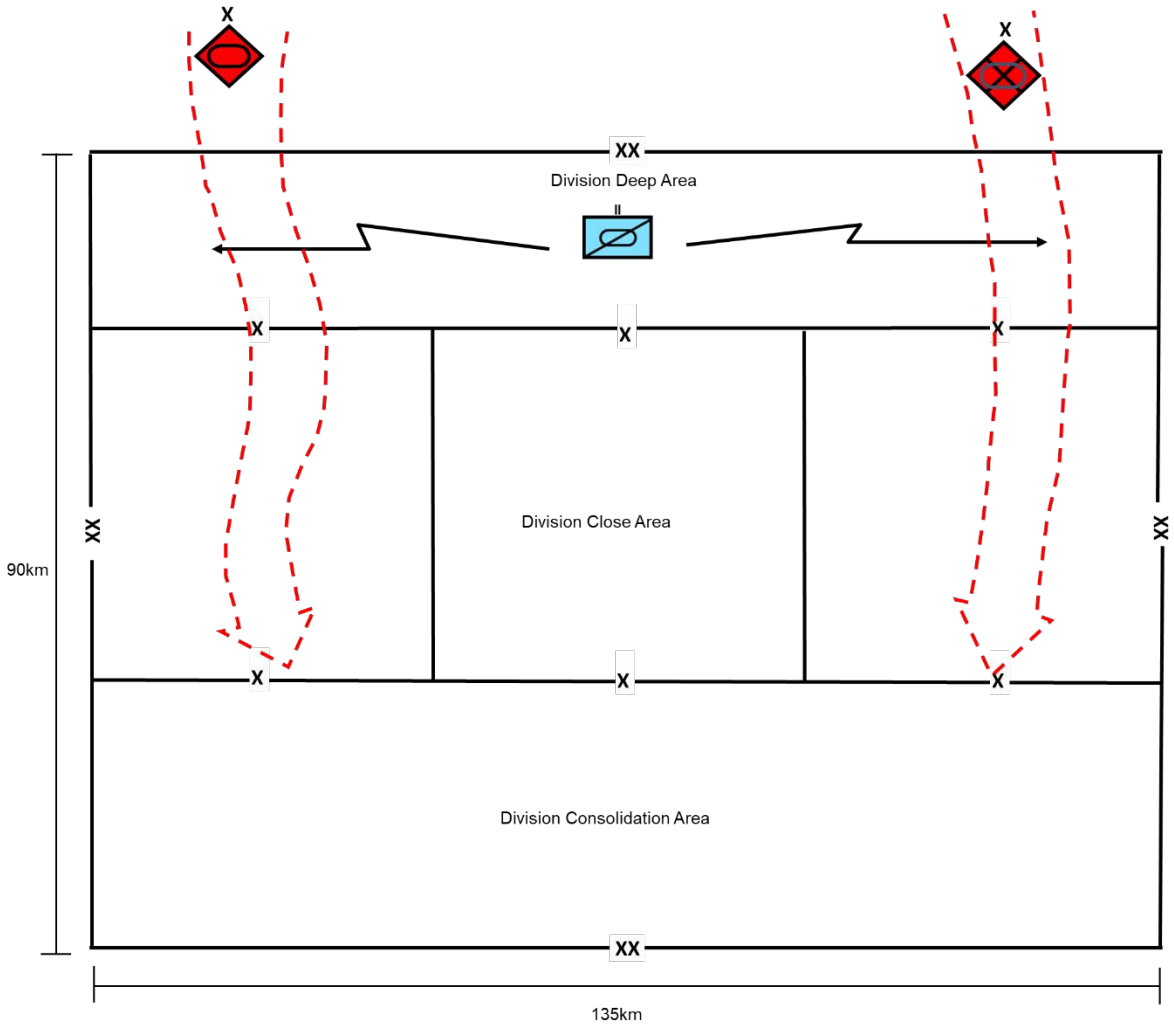

Figure 5. The Expanded Framework and Reconnaissance. Created by author.

The graphic above demonstrates the need for reconnaissance forces in the division deep area. It simultaneously describes a problem, which is that divisions do not possess the necessary

[21] US Army, FM 100-30, 3-17.

reconnaissance forces to screen such a frontage. The frontage supported for screening operations is more than doubled, while reconnaissance assets must be pulled from the brigades in the close area, as divisions do not have division cavalry. These brigades are already dispersed themselves and therefore require significant reconnaissance assets in the close area. There is a clear need for the division structure to gain a division-sized reconnaissance element, as the pentomic structure had.[22] The Army today can use far more advanced technology to solve this problem, including autonomous systems. The Department of Defense's third offset strategy includes the use of robotics and unmanned platforms, as well as human machine-teaming.[23]

There are initiatives to produce smaller, more autonomous drone systems. In this dispersed reconnaissance environment, autonomous drone swarms are essential for filling in gaps between units without providing a target for a nuclear-capable enemy. Increased drone autonomy, without a human constantly in the loop, provides an opportunity to negate the impact of a contested electromagnetic environment.[24] Increased use of more autonomous drones at unit levels below brigade will assist in creating a more independent force structure capable of detecting and engaging the enemy on a nuclear battlefield. Autonomous systems can also assist in detecting radiation following the use of nuclear weapons, determining where forces may maneuver without risking human life. While greater decentralized control of forces and assets is key, it is also imperative to retain the capability to concentrate at decisive points.[25]

One emergent concept in the Department of Defense is convergence. In terms of intelligence on a nuclear battlefield, dispersion and contested electromagnetic spectrum are the greatest obstacles to detection and IPB. In the Army's future multidomain operating concept

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[22] Mataxis, 118.

[23] Paul Scharre, *Army of None* (New York, NY: W.W. Norton, 2018), 59.

[24] Ibid., 72.

[25] Rose, 191.

assets are employed across the land, air, sea, space, and cyber domains. Units down to the brigade level can integrate their intelligence surveillance and reconnaissance (ISR) assets with theater army and national level assets in a layered, or convergent approach.[26] Convergence enables Army forces to detect the enemy with layered and redundant assets that fill gaps left by dispersion and remains resilient against enemy attempts to disrupt it. Higher echelons, including the theater army, must also enable maneuver units such as the division in the figure above, by countering enemy ISR across domains, to include space and cyberspace.[27] This is critical to prevent the enemy from identifying high payoff targets to employ nuclear weapons against the offense or defense, and to prevent them from concentrating forces against vulnerable points in the offense.

The Effect of the Nuclear Battlefield on Maneuver

Maneuver units, as previously discussed, must be dispersed to increase survivability. The concept of dispersion due to nuclear weapons is not new. There are numerous historical examples of armies dealing with the effects of new weapons that required a significant change in maneuver principles. An example of this is the arrival of gunpowder on the battlefield. This 'emptied' the battlefield but affected tactical rather than strategic change.[28] Nuclear weapons are a reality that must be accounted for by maneuver units. The openness of adversaries about the potential use of these weapons at the tactical level points to the need for a paradigm shift, in a sense relating to the works of Thomas Kuhn as a different way of conducting the normal science of tactics, but in this sense back to a paradigm used by the Army during the cold war.[29]

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[26] US Army Training and Doctrine Command (TRADOC), *TRADOC Pamphlet 525-3-1 The US Army in Multi-Domain Operations 2028* (Fort Eustis, VA: TRADOC, 30 November 2018), 23.

[27] US Army, TRADOC PAM 525-3-1, 36.

[28] Mataxis, 100.

[29] Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: University of Chicago Press, 1970), 79.

Companies may have to be dispersed to a point that they can no longer easily support one another. Commanders will make decisions that consider how to utilize the mission variables to mitigate the risk of a nuclear attack, but also to accomplish their mission. These variables include mission, enemy, terrain, time, troops available and civilian considerations (METT-TC). On one hand, they cannot simply disperse Soldiers to a point where atomic weapons will not affect; this is an extreme that prevents mission execution. It is more important to understand that dispersion must consider unit mobility and mission requirements. Dispersion of units that are concentrated internally is also ineffective.[30]

Commanders must make decisions to mitigate the risk to troops of LYBNW in various operational situations. The considerations will vary depending on the operation type, as well as the types of maneuver units used. The survivability and mobility of Army units will vary depending on formation type and vehicle platform. The primary combat systems of ABCTs are the M1A2 tank variant, with each ABCT authorized 87 tanks. The survivability and mobility of this system compared to strykers in a stryker brigade combat team (SBCT) and light vehicles in an infantry brigade combat team (IBCT) could be dramatic, especially if protection measures are not taken. ABCTs however, are highly reliant on sustainment which will be discussed later in this monograph.

In a defensive posture, the main problem for maneuver units is that they must now defend across a broader front, creating situations where the enemy can penetrate defenses on a narrow front, demonstrated by the figures below. The scale of the nuclear battlefield increases the likelihood that enemy units will encounter battalion-sized engagement areas rather than brigade-sized engagement areas, significantly shifting force ratios. Alternatively, Army units must avoid concentrating on a narrow front in the offense. In this way, the enemy essentially disrupts Army

[30] Mataxis, 83.

maneuver formations in the offense before they employ any close direct or indirect fire systems in their disruption or main battle zones. Therefore, combat power must be measured in terms of maneuverability and firepower.[31]

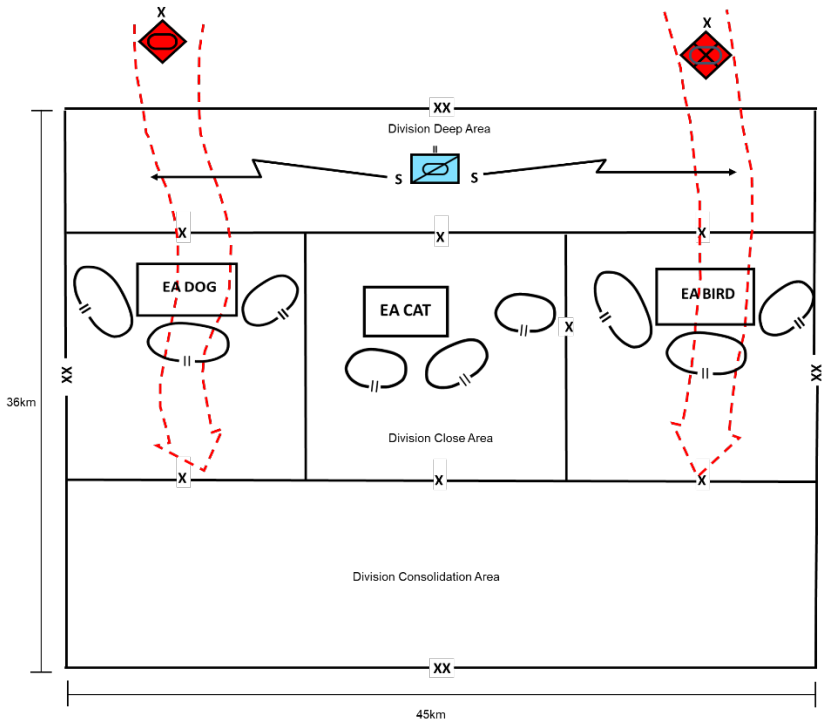

Figure 6. Defense in the Conventional Framework. Created by author.

[31] Rose, 192.

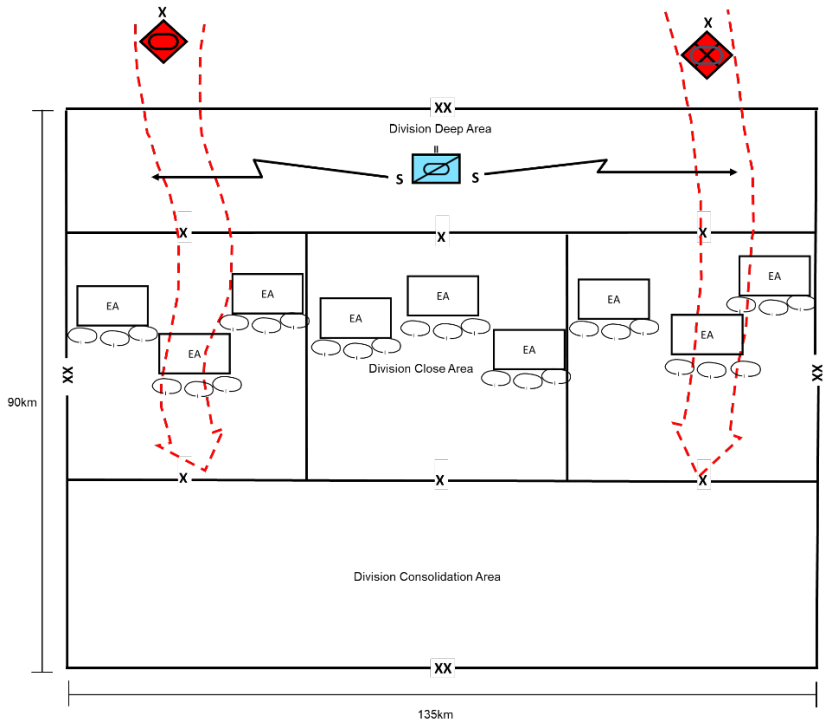

Figure 7. Defense in the Expanded Framework. Created by author.

The Army must be able to build this combat power in theater entry operations and retain it in the defense to transition effectively to the offense. Maneuver units must be able to remain dispersed until it is necessary at decisive points in time and space.[32] Previous Army doctrine stated the need to integrate combined arms teams with multi-domain capabilities. Today this includes the space and cyberspace domains. Convergence, as previously mentioned regarding intelligence, is also critical to maneuver.

The division is the foundational maneuver echelon described in the Army's MDO 2028 concept, but it must also be supported by higher echelons across the domains.[33] The MDO concept becomes even more important inside of a dispersed operational framework to counter the potential use of LYBNW. In the example above there are two frameworks, one showing

[32] Rose, 193.

[33] US Army, TRADOC PAM 525-3-1, 42.

conventional considerations for division frontage and maneuver brigade battle positions in the close area. The larger framework shows the potential impact of expanding the battlefield framework and implementing increased dispersion. In the defensive example, multi-domain operations must work to disintegrate and disrupt enemy formations entering the division AO to reduce their concentration while other assets including air can be used to protect gaps and vulnerable flanks and rear areas.[34] [35]

To accomplish greater dispersion and subsequent rapid concentration, cross-country mobility is paramount. In many potential theaters of operation, the Army's cross-country mobility will be impacted by wet gap crossings. The Army's heavy units are very reliant on engineering mobility assets to conduct wet gap crossings. This also creates a significant vulnerability to attack as units' stage and cross obstacles. The Army must focus on creating greater mobility and organic crossing capability to gain greater dispersion in movement. Nuclear weapons prevent the concentration of forces at obstacles and key terrain, therefore vehicles with greater amphibious ability will be necessary.

Maneuver units must also be able to act as independently as possible to conduct frequent movement. The command and control of combat units cannot be static and must be capable of operating on the move. This prevents the enemy from deploying low-yield nuclear weapons with confidence that they can disrupt movement and destroy a significant number of US ground forces. Previous doctrine and theorists argued that offensive operations are still valuable in achieving objectives, but that operations should also incorporate the use of atomic weapons.[36] The Army's MDO concept applies similar ideas of penetrating enemy defenses with maneuver units, while

[34] Rose, 193.

[35] US Army, TRADOC PAM 525-3-1, 39.

[36] Mataxis, 159.

simultaneously attacking anti-access and area-denial systems, and fires capabilities, in-depth.[37] In rapid maneuver, converging multiple capabilities can prevent the enemy from targeting formations with LYBNW, by increasing the frequency of engagement and disrupting the enemy's decision cycle.[38]

The Effect of the Nuclear Battlefield on Sustainment

Ground combat units will be dispersed on a nuclear battlefield. This survivability measure prevents the concentration of forces that allow the enemy to destroy more than a company at a time with a single LYBNW. This also means that units will be separated from their support areas, and potentially separate them from ground lines of communication. It is critical therefore to discuss the impact of these extended lines of communication to understand the full impact of the effects of battlefield dispersion on the Army's current logistics infrastructure.

Operational reach, defined as the distance and duration across which a unit can successfully employ military capabilities, will be significantly affected by dispersion.[39] Ground lines of communication are dependent on key terrain that is vulnerable to nuclear effects. The capability of fuelers, maintenance vehicles, and light combat vehicles will be under threat. These assets lack shielding to nuclear effects, potentially threatening a heavy division's capability to project combat power. Rail is also a static point of sustainment distribution that will be under threat. Therefore, sustainment along ground lines must be dispersed, and unpredictable to the enemy, coupled with an increased reliance on sustainment from aerial platforms to forward units.[40]

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[37] US Army, TRADOC PAM 525-3-1, 32.

[38] Robert Leonhard, *Fighting by Minutes.* 2017. 93.

[39] US Department of the Army, *Army Doctrine Publication 4-0, Sustainment* (Washington, DC: Government Publishing Office, 2019), 3-4.

[40] US Army, FM 100-30, 3-4.

On a nuclear battlefield, units must be able to sustain themselves to the highest degree possible. This means that all units must deploy to positions fully supplied with a basic load and cannot rely on rapid support from sustainment units. Each unit's level of supply, especially with class I, III, and V must be such that a unit can fight for longer durations without remaining linked to the division support area (DSA). The greatest challenge of those will be class III (CL III) resupply, especially bulk fuel.

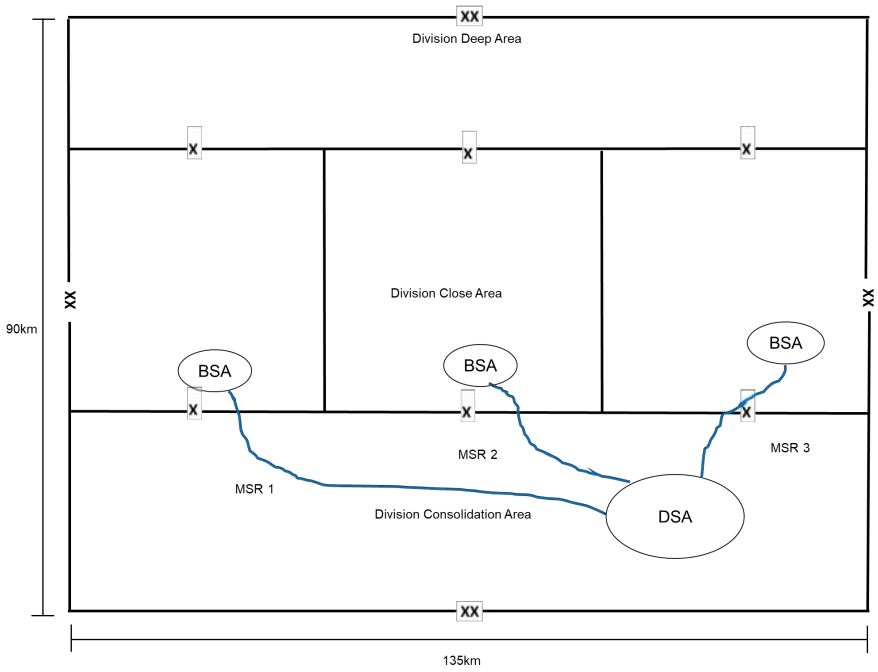

Figure 8. Sustainment in the Expanded Framework. Created by author.

The figure above provides a general idea of extended supply routes due to the increase in distances created by dispersion. In this figure, the division is merely reacting to the possibility of LYBNW use and mitigating the risk accordingly. The table below shows the impact on CL III logistics for an ABCT in the division conducting a movement to a set in a prepared defense.

ABCT CL III Bulk Fuel Requirements 24hrs		
	Movement to Defense	Prepared Defense
Conventional Battlefield	46,620 GAL	71,075 GAL
Nuclear Battlefield	192,588 GAL	95,304 GAL

Table 1. CLIII Requirement Comparison for an ABCT in the Conventional and Expanded Framework. Created by author.

The above table was produced by utilizing the current table of organizational equipment (TOE) for an ABCT, and the input of planning factors from the operational framework within the simple scenario previously described. Those factors were used in a logistics estimate workbook to produce a realistic logistics estimate. The effect of dispersion is clear for basic uncontested movement. A division's ABCTs will extend along longer MSRs and likely take more dispersed routes that include more time moving cross country. These simple findings can be used to extrapolate some capability gaps within an ABCT and the division. An ABCT can provide direct support of 81,000 gallons of fuel with 96 tankers with a 2.5k gallon carrying capacity.[41] In the prepared defense the impact of nuclear weapons creates a shortfall in support capacity that requires additional resupply convoys each day. The movement to a defense creates the need for up to three full resupply convoys from the DSA. More importantly, in terms of organic fueler capacity, the current ABCT structure will suffer from a 41% shortfall. There is another significant capacity problem described in the next figure, and that is if an ABCTs fueling assets, which are entirely ground vehicles, are cut off from the DSA using LYBNW.

[41] David F. Sales, "Logistics Estimate Workbook," CGSC Tactics Digital Smartbook, Command and General Staff College, September 16, 2016, accessed 05 December 2020. https://www.milsuite.mil/book/community/spaces/cgsc/tactics-community/battlefield-calculations.

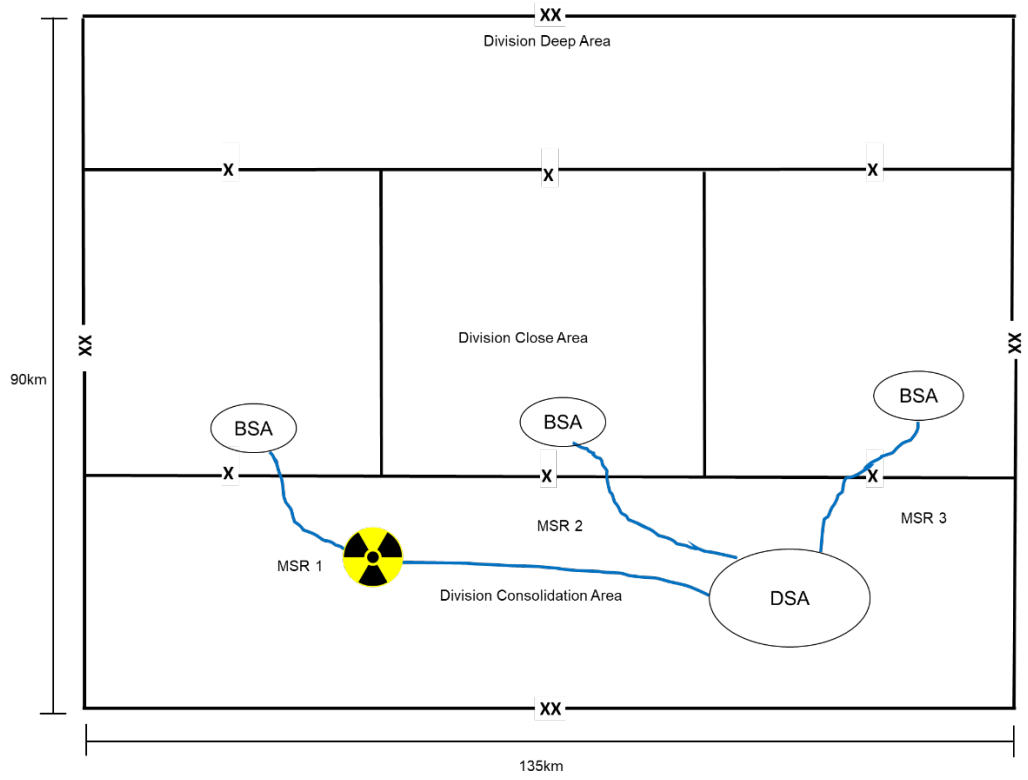

Figure 9. The Impact of LYBNW Employment on Sustainment. Created by author.

The Army must then have the capability to conduct significant sustainment operations through the air. The Army's current combat aviation brigade task organization and equipment do not allow for the sustainment of heavy units for a significant length of time. ABCTs themselves do not contain organic fuel blivets, or bulk fuel storage capacity. The ABCT in the scenario above requires an estimated 191, 500-gallon fuel blivets to sustain a prepared defense.[42] The lift assets inside a current division come from the combat aviation brigade (CAB). Inside of a CAB, the general support aviation battalion has 8 UH-60s and 12 CH-47 Fs.[43] The organic lift capabilities that can be utilized for resupply to an ABCT are far below the threshold necessary to support it in the scenario above. Lift assets will also be deployed to aid units conducting frequent movements

[42] Ibid.

[43] "CAB MTOE," FMS Web, accessed November 14, 2020, https://fmsweb.fms.army.mil/protected/webtaads/Frame_DocTypes.asp

inside the operational framework, so assets must be allocated to move only critical sustainment requirements. Commanders must plan for and be prepared to utilize air assets for emergency resupply to bypass potentially contaminated routes.[44] In future operations, there may also be a need for more autonomous ground systems to safely deliver supplies in this environment.

Vehicle maintenance teams must maintain a complete stock of common parts to sustain their fleet of vehicles, which requires leaders to anticipate needs and have parts on hand before units deploy to positions inside the battlefield framework. This may necessitate the need for an increase in the fleet of sustainment, and palletized load system (PLS) vehicles at lower levels. An increase in the PLS fleet would allow greater forward pre-positioning of supplies on flat racks to sustain units that may be cut off. Units must also be prepared to support a dual unit maintenance collection point for disabled vehicles. One will be required for normal operation in a non-nuclear environment, and one should be utilized for the collection of vehicles contaminated by radiation.

The Effect of the Nuclear Battlefield on Fires

The effect of greater dispersion also greatly affects the Army's fire support capabilities. With battalions and companies more spread out in the close area, there is a greater need for long-range fires. The ranges on a nuclear battlefield will be greatly extended, and support to maneuver units will likely be inhibited. Fire support at the brigade level does not currently possess the ranges necessary with organic 155mm Howitzers to conduct fire support or counterfire. In the Eastern European scenario with Russian forces, these organic fires assets are already likely to be outmanned 2:1 with conventional fires alone.[45] The effect is a significant lack of fire support capability for dispersed units, while simultaneously creating the need to cover open terrain and gaps. Templated ranges demonstrate a difficult situation in which position areas for artillery

[44] US Army, FM 100-30, 6-6.

[45] Barnett, 170.

(PAAs) will not allow significant coverage for units in the close area. The potential remedy for fires assets is to include more mobile artillery. M777 155mm mobile howitzers and other artillery assets that are not self-propelled will likely be obsolete on a nuclear battlefield. The US Army also lags both Russia and North Korea in the quantity of self-propelled artillery.[46] To use assets such as the M777 aviation assets must be continually dedicated to them to enhance mobility and conduct survivability moves, and those assets will also be critical for sustainment as previously discussed. Dispersion for maneuver units is critical, but for fires assets being static is lethal.

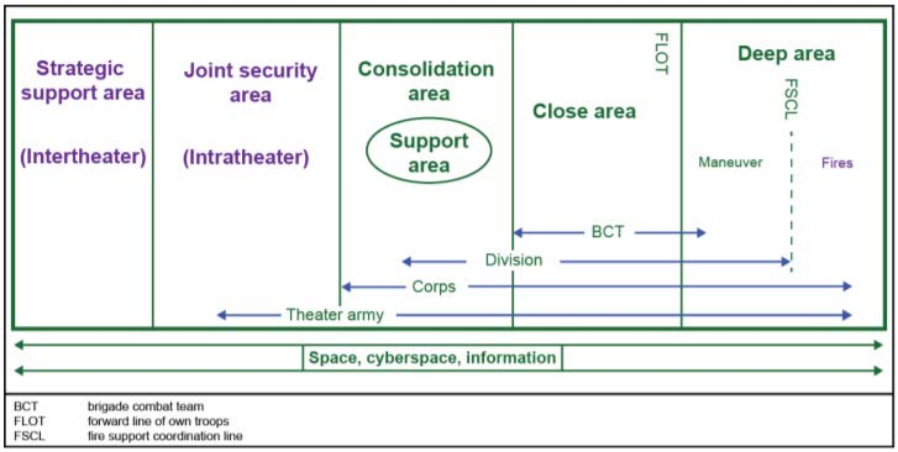

Figure 10. Corps Area of Operations within the Theater of Operations. US Department of the Army, *Field Manual 3-0, Operations* (Washington, DC: Government Publishing Office, 2017), 1-30.

Figure 10 above provides a reference to where each echelon is responsible for contacting the enemy. The fire support coordination line (FSCL) delineates a separation between maneuver forces at the Division level and Corps and Joint echelon of fires. This FSCL must be placed further out from the forward line of troops (FLOT) to disrupt enemy forces in-depth, without sacrificing dispersion across the depth of the operational framework. The problem facing the Army is that LYBNWs are not the lone driver of this requirement. In terms of fires, it is only

[46] Barnett, 86.

exacerbating the Army's disadvantage. The Russian armed forces already possess an advantage in conventional fires that is made more significant by the increased ranges of the nuclear battlefield.[47] Figure 11 demonstrates the conventional fires disadvantage along a notional line of contact against Russian forces in an eastern European scenario like the one discussed previously in this monograph. It shows that there is already a current conventional gap where the Army is incapable of ranging enemy long range conventional fires. On a nuclear battlefield with the expanded ranges associated with dispersion, there will be an even greater requirement to move long-range fires capabilities to a division artillery unit (DIVARTY), to adequately disrupt and destroy Russian maneuver and fires elements.

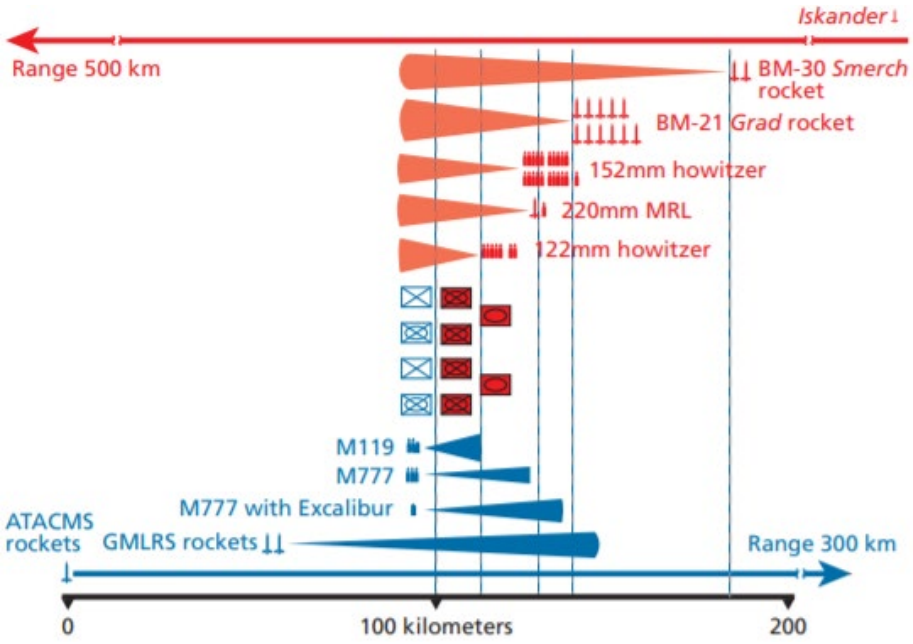

Figure 11. Conventional Fires Comparison with Russian Forces. Barnett, D. Sean, et. al. *Army Fires Capabilities for 2025 and Beyond* (Santa Monica, CA: RAND Corporation, 2019), 168.

The greater dispersion of maneuver forces in the operational framework creates a significant advantage for adversaries in terms of troop concentration, demonstrated by figure 7 in

[47] Ibid., 176.

the maneuver section. The conventional framework on the right allows a 1:1 force ratio with brigade-sized engagement areas. The expanded framework disperses companies in-depth and breadth at a minimum of 3,000-5,000 meters, based on previous army doctrine and analysis in this monograph.[48] This creates a situation where the enemy may move along the same axis of advance, occupying the same frontage and achieve a 3:1 or better force ratio, encountering battalion-sized engagement areas that are not mutually supporting. The increased number of dispersed engagement areas places a strain on organic fires resources to provide support.

An option is an increased reliance, especially at the Corps level of long-range precision fires. High mobility artillery rocket system (HIMARS) and multiple launch rocket system (MLRS) variants must have a greater presence to shape the deep fight inside the battlefield framework, while simultaneously pre-positioning stocks of ammunition forward with BCTs.[49] This can also include terrestrial-based hypersonic weapons that could have ranges up to 1,400 miles and defeat high payoff, anti-access area-denial (A2/AD) targets, or enemy long-range fires.[50] This also necessitates an emphasis on the joint fight to include as many aviation and naval assets as possible to create redundancy in fires assets. Simply put, the organic fires assets in a typical Army division cannot adequately support maneuver forces in the close fight when the enemy has an asymmetric advantage in troop concentration. Therefore, it is imperative to seek out ways to disrupt the enemy in-depth and attrit their forces to a much greater extent before they contact maneuver units in the close fight.

Theater missile support with terminal high altitude air defense (THAAD) systems to intercept enemy long-range fires, and LYBNW is another consideration. These systems can

[48] Rose, 176.

[49] Barnett, 177.

[50] Kelley M. Sayler, "Hypersonic Weapons: Background and Issues for Congress." Congressional Research Service, R45811, August 27, 2020. 6.

counter an adversary's asymmetric advantage and decrease the need for dispersed maneuver units. The problem with these systems is that it is unlikely that THAAD can provide protection over an entire theater, and therefore may be utilized to support small critical areas such as ISBs and ports for theater entry.[51] Divisions can also gain local support from Patriot missile batteries, which can defend against some LYBNW delivery systems such as cruise missiles up to a range of 100km.[52]

The additional consideration for fire support at lower levels is that both fire support and counterfire can create vulnerability to enemy employment of nuclear weapons. This critical vulnerability enables the enemy to achieve overmatch with conventional fires by preventing the Army from using its conventional fires. This increases the need for the Army to possess low-yield battlefield nuclear weapons to deter the enemy from using theirs, and to concentrate their fires on ground maneuver units.

Protection and Survivability on the Nuclear Battlefield

Engineering efforts in a nuclear environment must include enhanced shielding of forces. The Army will likely require mobility assets to achieve cross-country mobility, including aircraft to avoid contaminated areas.[53] Maneuver units will require enhanced attachments of engineering units in a dispersed environment to maintain independent operations. For this reason, engineering units will have to focus on providing increased class four support and dig assets to provide field fortifications with limited sustainment. In some cases, mobility may outweigh fortifications for survivability due to the logistics drain of building materials.[54]

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[51] Ibid., 3.

[52] US Army, ATP 5-0.2-1, 299.

[53] Mataxis. 89.

[54] Ibid., 92.

Army units must utilize the terrain provided, especially significant terrain features to provide protection and maintain dispersion between units. This minimizes the effects of LYBNW and enhance survivability. Engineering units can utilize these terrain features, reinforcing them with dig assets and overhead cover to minimize the effects of over-pressurization, while maximizing resources. As previously discussed, the use of LYBNW can significantly degrade sustainment by ground, and bulk fuel will likely be the priority of sustainment. Units must plan to employ all class four (CL IV) construction and building materials necessary for protection as early as possible.

Currently, the predominant CBRN unit design allows for decontamination of chemical weapons. SBCTs have a CBRN platoon capability, but this must be expanded in heavy units. The primary responsibility will be the decontamination of routes from the support areas through the consolidation areas. Secondarily the ability of heavy units to detect the employment of nuclear weapons must be expanded, as survivability will be increased by avoiding contaminated areas.[55] The Army's CBRN capabilities are largely present in National Guard units, requiring prior coordination for deployment to a theater with potential LYBNW threats.[56] With a near-peer threat such as Russia, this will likely have to be transferred to the active component to expand the capability of heavy units, especially in contested environments where CBRN commanders are required to support and organize activities at points of debarkation.[57] Detection capability must also be passed down to maneuver units, which is currently focused on chemical weapons.

The use of deception can also be used as another method of protection, by disrupting the enemy's ability to detect and target Army units and deliver LYBNW. A division commander has

[55] US Department of the Army, *Army Doctrine Publication 3-37, Protection* (Washington, DC: Government Publishing Office, 2019), 2-3.

[56] Joint Chiefs of Staff, *JP 3-41, Operations in Chemical, Biological, Radiological, and Nuclear Environments,* (Washington, DC: Joint Chiefs of Staff, 2020) I-18.

[57] US Joint Staff, JP 3-41, I-21.

deception capabilities including military information support operations (MISO), operational security (OPSEC), camouflage, and concealment, which can be coordinated by establishing a deception working group.[58] Part of deception must include a plan for physical deception, i.e., fake vehicles, and part must include masking electromagnetic signature. This is important considering the conventional fires disadvantage that already exists, but it is even more critical when considering the threat of nuclear weapons. Cyber operations must also support military deception by denying the enemy the ability to detect command nodes and other high-value American targets.

Comparing the Pentomic Division and the Modern Division

The Army evolved the Pentomic Division structure to deal with the potential threat of nuclear weapons. This concept can help show how the Army attempted to deal with the problems of a nuclear battlefield and its inherent dispersion in the maneuver, fires, sustainment, intelligence, and protection warfighting functions described above. The pentomic concept was designed with the importance of dispersion in mind. It sought to improve survivability against nuclear weapons, fighting on a deep and fluid battlefield where units may not be tied into one another.[59] The concept relied on pushing decision-making down to lower levels. Battalions were considered the lowest level unit capable of conducting an independent fight while being small enough to be considered expendable. The battalion was renamed the battle group and fires assets were pushed down to them from the division.[60]

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[58] Burket, 111.

[59] A.J. Bacevich, *The Pentomic Era: The US Army Between Korea and Vietnam* (Washington DC: National Defense University Press, 1986), 104.

[60] Ibid., 106.

The Pentomic Division structure has some similarities to the Army's combined arms battalions (CAB). Each battlegroup, like a CAB, was an administratively self-contained unit.[61] BCTs are a much larger unit than the Pentomic Division battle groups, but the combined arms battalions today have significant similarities with a headquarters company and four maneuver companies. The primary difference is in fire support. The pentomic infantry battle group had a battery of 105mm howitzers attached to the unit, whereas a CAB only has mortars as an organic asset. The overall divisional structure also differs greatly due to the lack of brigade headquarters in the infantry and airborne divisions.[62] The pentomic armor division more closely resembles today's heavy division, with three armored brigades. The major differences being that some brigades contained combined arms or armor pure battalions, and the division retaining a reconnaissance squadron and division artillery.[63]

This previous point is an issue that is currently in flux, as division artillery is a headquarters element in divisions today. Additionally, reconnaissance is a major issue as the Army went away from division cavalry, and placed squadrons at the brigade level. Division aviation was a critical element in the pentomic infantry division, as previously discussed, and the number of helicopters increased more than threefold.[64] The BCT system created a less standardized force than the pentomic concept as well. The eleven divisions in the Army have a mixture of infantry, armored, and stryker brigade combat teams, and the divisions themselves operate mostly as independent headquarters. In terms of independent action, one of the most glaring capabilities the Pentomic Division possessed that does not exist today is a LYBNW arsenal.

[61] Mataxis. 105.

[62] Ibid., 114.

[63] Ibid., 118.

[64] Bacevich, 108.

A Consideration of the Return of the Army's LYBNW Arsenal

The Army currently does not have low-yield battlefield nuclear weapons in the fire's arsenal. The implications of not having them create an asymmetric problem for ground forces against nuclear armed adversaries. The implication is that American ground force deployment can be deterred without an escalation to strategic nuclear weapons. To have local deterrence against adversaries in a theater of operations it may be necessary to bring back this capability. Joint doctrine states that joint force commanders (JFCs) must deter employment of weapons of mass destruction (WMD), including nuclear weapons, by providing a credible threat of unacceptable consequences.[65] The return of LYBNW to the Army creates a redundant capability to create that credible threat.

Low-yield nuclear weapons in the Army's arsenal allow ground forces to engage adversary nuclear weapons, forward and rear areas. The Army could utilize them to target the enemy at different echelons, including fixed targets such as airfields, enemy fire support, and nuclear storage areas.[66] This capability limits the enemy's ability to employ nuclear weapons on American ground forces without exposing their forces to the same effects. It also prevents the enemy from concentrating forces, forcing the same dispersion that American forces must employ in a nuclear environment. The effect of this prevents the enemy from concentrating forces on dispersed American maneuver units, preventing the enemy from pursuing limited objectives.

The current *National Security Strategy* states the importance of a modern nuclear deterrence, and the need to maintain a credible nuclear capability, but this is stated at the strategic level.[67]

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[65] Joint Chiefs of Staff, *Joint Countering Weapons of Mass Destruction. JP 3-40* (Washington, DC: Joint Chiefs of Staff, 2019), IV-6.

[66] Ochmanek, 196.

[67] The White House, *2018 National Security Strategy*, accessed 20 October 2020, https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf.

The problem is that Russia has already violated the Intermediate-Range Nuclear Forces treaty. This is compounded by the threat of regional nuclear actors such as Iran and North Korea. The importance of nuclear deterrence is stated, but there is an avenue in non-strategic nuclear weapons that may allow the US adversaries to attack conventional forces while avoiding a strategic retaliation. Therefore, LYBNW in the Army inventory could act as a deterrent on a regional scale. This also imposes an equal and opposite effect on enemy conventional forces, forcing them to fight in the same dispersed array as American conventional forces. This eliminates the potential asymmetric advantage America's adversaries currently possess. In the past, this idea was recognized insofar as to suggest that LYBNW capabilities are unlikely to be used but their deterrent effect is not predicated on their numbers, but rather what they mean for the enemy.[68]

The use of nuclear weapons also has considerable ramifications that must also be considered. There is considerable weight to the argument that there are no such thing as tactical nuclear weapons. Their use may prompt an escalation to the use of strategic nuclear weapons, and the impact of their use in allied countries may not be possible politically. President Lyndon Johnson stated as much six decades ago, "Make no mistake. There is no such thing as a conventional nuclear weapon. For 19 peril-filled years, no nation has loosed the power of the atom against another. To do so now is a political decision of the highest order."[69] LYBNW may not provide the deterrence needed alone but may also be coupled with a cross-domain deterrence strategy,

[68] Van Cleave, 87.

[69] Ibid., 7.

reminiscent of NATO's flexible response strategy.[70] This includes the ability to deny the enemy space and cyberspace, which are critical to employing nuclear forces.[71]

In past doctrine, the corps was the release authority for tactical nuclear weapons. This makes sense in the operational framework, as the effect of nuclear weapons is likely to be targeted at operational objectives. However, the political reality may dictate that release authority remains at the national level. Therefore, consideration of nuclear weapons in the Army will likely follow the logic of Bernard Brodie: "Thus far the chief purpose of our military establishment has been to win wars. From now its chief purpose must be to avert them."[72] Authority for employment may be retained at a national level, but the existence of the capability can still help military leadership prevent escalation and contain conflict to conventional means.

The deployment of nuclear weapons must also be concentrated in the corps deep area beyond the fire support coordination line to achieve standoff from Army ground forces. The corps can utilize these weapons to maintain combat superiority over the enemy while maneuvering divisions to accomplish operational objectives.[73] A nuclear capability at the corps level also allows divisions to nominate operational targets in the targeting cycle. In this sense, the release authority must be high enough to maintain an operational focus, while low enough to achieve a flexible and timely response to the enemy. Even if LYBFNW are present in the Army solely for deterrence they will force units to train for these considerations and plan against a more realistic enemy composition. American forces must consider the potential of operating on a nuclear

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[70] David Fisher, *Morality and War, Can War be Just in the Twenty-First Century?* (Oxford: Oxford University Press, 2011), 151.

[71] John R. Lindsay, and Eric Gartzke, *Cross-Domain Deterrence: Strategy in an Era of Complexity* (New York: Oxford University Press, 2019), 13.

[72] Bernard Brodie, *The Absolute Weapon* (New York: Harcourt Brace, 1946), 76.

[73] US Army, FM 100-30, 3-4.

battlefield and avoid conventional thinking alone. LYBNW in the Army's arsenal can force that change in mindset.

Currently, nuclear forces are placed in the Navy and Air Force, making the Army reliant on them for any nuclear support.[74] Additionally, reliance on the Air Force and Navy to deliver conventional and nuclear weapons creates a significant vulnerability to complex enemy integrated air defense systems (IADS) and A2AD systems.[75] This limitation weakens the American military's ability to respond to enemy LYBNW use in kind. Theorists of massive retaliation felt that LYBNWs were useless and detracted from strategic deterrence, as any war between nuclear powers was sure to escalate to large scale exchanges.[76] The current reality is that a multi-polar world presents a realistic need for a return of LYBNW to the Army to maintain deterrence, improve training and planning, and ensure the possibility of limited response options. Ultimately, the conclusion here is one that Bernard Brodie made, "It is nonsense to hold that a force trained and equipped to fight conventionally – even though it has some essentially unusable nuclear weapons behind it – makes a better deterrent than one of comparable size trained and equipped to fight from the beginning with nuclear weapons designed exclusively for tactical use."[77]

Recommendations

Warfighting functions are significantly impacted in ways that create capability gaps. Intelligence systems rely on communications, with multi-domain operations providing capabilities to the division from national level assets. The problem is that on a nuclear battlefield this architecture may be degraded. The current division structure does not provide division

[74] US Army, FM 100-30, 3-2.

[75] Gordon, 176.

[76] Bernard Brodie, "The Development of Nuclear Strategy," *International Security* 2, no. 4 (Spring 1978): 76, accessed 09 February 2021, https://www.jstor.org/stable/2538458?seq=19

[77] Ibid., 78.

cavalry, which reduces necessary reconnaissance capability on a dispersed battlefield. It is recommended that divisions retain armored division cavalry capability. This squadron must also be equipped with autonomous systems that can help cover the depth and breadth necessary to detect enemy formations long before they can enter the close area. This prevents the enemy from massing forces against small and dispersed American elements. Division cavalry and BCTs must have the capability of employing drones to protect flanks and detect the enemy, while simultaneously having access to layered and redundant detection assets.

The greatest difficulty for movement and maneuver will be the effect of dispersion on concentrating forces. Cross-country mobility of assets will be critical, and vehicles must enhance survivability. Units will be spread out down to the company level in ways that prevent mutual support. Units must also be able to rapidly concentrate at specific points in the offense or defense to defeat massed enemy forces. With those considerations in mind, it is recommended that the Army increase funding for light armor platforms to increase mobility in heavy units and survivability in light units. At the same time, division maneuver enhancement brigades will require more bridging assets to enhance mobility and provide multiple options, preventing massing of forces that give the enemy a target for LYBNW.

Sustainment is a critical vulnerability on the nuclear battlefield. It is not fully addressed in previous doctrine and organizational formulations such as the Pentomic Division. Current logistics estimates with the changes in the size of the operational framework to accommodate dispersion, demonstrate this vulnerability. In the previous doctrine and in the pentomic concept there is an emphasis on using aviation for sustainment, and the Pentomic Division accommodated this with an increase in aircraft. CL III requirements for an ABCT today demonstrate that the division does not have the aircraft capacity to conduct resupply. It is recommended that divisions increase their number of rotary-wing transport aircraft, along with a significant increase in bulk fuel storage capability. Commanders must be able to pre-position classes of supply as far forward

with BCTs as possible. The Army must also invest in self-driving systems to deliver supplies by ground if MSRs are denied using LYBNW. Autonomous systems can help limit exposure to the effects of fallout and maintain the supply levels necessary to conduct operations. In terms of sustainment, commanders must possess the tools to create independence among units, as well as flexibility and redundancy to support them.

Current fires systems are inadequate to support maneuver units in the close area on a nuclear battlefield. The ranges required to disrupt enemy units and suppress even their conventional fires demonstrate significant capabilities gaps. The division does not possess the capability to disrupt the enemy at significant ranges to prevent their asymmetric advantage in maneuver. Towed artillery and artillery that must be moved by aircraft are simply not mobile enough to avoid becoming a target of LYBNW, or conventional enemy systems. On a nuclear battlefield, artillery systems must be as mobile as possible. Corps and theater army fires can provide shaping beyond the fire support coordination line (FSCL), but not enough to negate enemy advantages, and joint fires, including aircraft, must also contend with enemy integrated air defense systems (IADS). To counter enemy advantages, the Army must gain greater long-range precision fires capabilities, including hypersonic, and greater long-range mobile artillery at the BCT level. It is also imperative that missile intercept systems such as THAAD provide a capability down to at least the division level.

Survivability on a nuclear battlefield is primarily achieved through dispersion, but two other capabilities must be discussed generally. One is protection, provided by engineering assets and the second is nuclear biological chemical (NBC) decontamination capability. Dig assets, such as the D7, are necessary in greater numbers. This, coupled with bridging assets, make the maneuver enhancement brigade a focal point of investment for increased capability within the division structure. More assets in the maneuver enhancement brigade (MEB) can provide more survivable defensive positions at the outset of conflict. NBC capability must also be considered.

Currently, NBC platoons do not exist in every division. Decontamination must be incorporated into all division organizations. Detection capabilities must be pushed down to the company level as well. Units should bring back the position of a nuclear officer to calculate safe distances to be able to maneuver effectively. Also, the division must possess more military deception capability, including in the cyber domain, and on the electromagnetic spectrum, to mask the presence of critical assets.

The Pentomic Division provides a comparison to understand potential ways that the Army today is deficient in providing capabilities to operate on a nuclear battlefield inside the warfighting functions discussed above. The comparison demonstrated the need for division reconnaissance, the emphasis on maneuverability, and increased aviation assets, as well as pushing capable fires assets to lower levels. The comparison serves ultimately to prepare the modern Army to think about what the lowest level of a self-contained unit should look like, in terms of capability and expendability. The comparison also brings up the subject of the Army's nuclear weapon arsenal.

The primary consideration of returning the Army's LYBNW capability is deterrence. There is significant debate about how quickly their use may force the use of strategic nuclear weapons. The current doctrine and potential deployment of LYBNW by US adversaries creates an asymmetric advantage for their conventional forces that cannot be ignored. The capabilities gap that exists in the warfighting functions discussed throughout this monograph exists primarily due to how conventional forces on each side must operate. If the US Army possessed LYBNW, the operational framework returns to equilibrium for conventional forces. Currently, nuclear weapons are retained by the Navy and Air Force, but in a contested environment there is no guarantee that either can deliver a weapon to support ground forces. It is therefore recommended that the Army regain some capability so that effective deterrence can be messaged to a potential

enemy. A return of LYBNW to the Army's arsenal creates a more effective force, with the correct mindset to plan and train for a nuclear battlefield.

Conclusion

The Army does not have the luxury of avoiding the topic of nuclear weapons. LYBNWs create an asymmetric advantage for American adversaries. It is incumbent on Army leadership to modify existing capabilities to adapt to that threat. Russia, China, and North Korea are actively working on and training their forces for the use of these weapons. Leadership in the Army must address this fact in any scenario in which the Army is required to deploy, build, and sustain combat power, and conduct operations.

The tangible effects of adapting to this threat is manifested by an examination into the size and scope of the operational framework. The need for dispersion to enhance survivability is one of the greatest challenges in nuclear operations. It is necessary to prevent the enemy from massing LYBNW on lines of communication, ports, intermediate staging bases, and units conducting offensive and defensive maneuvers. This dispersion creates a set of problems by warfighting function on its own. This monograph argues what those capability gaps are, with the recognition that commanders must balance the risk to mission and risk to force, along with the natural constraints of terrain. Considering the specific effects of nuclear weapons, including blast, radiation, emp, etc., this monograph focuses more on heavy armor units, due to survivability considerations. It also utilizes its weapons systems to demonstrate distances in the operational framework and calculate sustainment requirements.

The analysis and recommendations in this monograph cannot completely approach a final solution to the question of LYBNWs and their impact on warfare generally. It does, however, present the need for an expanded examination of the Army's organizational structure, capabilities, and doctrine, so that future concepts incorporate this threat. The Army must adapt to this threat in

the future with new systems and expanded capabilities that allow commanders to build and sustain combat power and remain flexible and independent in conducting operations. The Army must seek to eliminate potential asymmetry in nuclear and conventional capabilities for America to maintain a continuing strategic advantage in the future.

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